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Cap and floor regime: Initial Project Assessment of the GridLink, NeuConnect and NorthConnect Interconnectors

Consultation

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Overview:

This consultation provides our minded-to position on the Initial Project Assessment of three interconnector projects - GridLink (to France), NeuConnect (to Germany) and NorthConnect (to Norway).

This Initial Project Assessment (IPA) considers the need for the three projects and interactions between them. It also considers the interactions and potential impacts that Aquind, a proposed interconnector to France, which is being developed under the exempt route, could have on these three projects. We seek views on our assessment of these three projects and aim to take a decision in September 2017.

Context

Electricity interconnectors are the physical links, which allow the transfer of electricity across borders. They have potentially significant benefits for consumers: lowering electricity bills by allowing access to cheaper generation, providing more efficient ways to deliver security of supply and supporting the decarbonisation of energy supplies.

In May 2014, we consulted on our proposals to extend the cap and floor regulatory regime to near-term interconnector projects. Our August 2014 decision confirmed this approach and established our cap and floor assessment process. The cap and floor regime is the regulated route for interconnector investment in GB, which sits alongside the existing exemption route.

Five projects applied for cap and floor regulation in our first application window (Window 1) which closed in September 2014. All five projects were granted a cap and floor regime in principle.

In November 2015, we confirmed that we would open a second application window (Window 2), between 31 March and 31 October 2016, for interconnector projects seeking a cap and floor regime. Three projects applied for cap and floor regulation in Window 2.

The three projects are GridLink (to France), NeuConnect (to Germany) and NorthConnect (to Norway).

This consultation provides our minded-to position on the IPA of these three projects. In conducting our IPA, we have also taken into account potential interactions and impacts that Aquind, a proposed interconnector to France, which is being developed under the exempt route, may have on these three projects.

We seek views on our assessment of these three projects and aim to take a decision in September 2017.

Associated documents

Cap and Floor Regime Summary for the Second Window
Published: May 2016

Final Project Assessment of the NSL interconnector to Norway
Published: October 2016

Enabling a range of financing solutions under the cap and floor regime
Published: December 2015

Decision to open a second cap and floor application window for electricity interconnectors in 2016
Published: November 2015

Decision on the Initial Project Assessment of the Greenlink interconnector
Published: September 2015

Decision on the Initial Project Assessment of the FAB Link, IFA2 and Viking Link interconnectors
Published: July 2015

Cap and floor regime: Initial Project Assessment for the FAB Link, IFA2, Viking Link and Greenlink interconnectors
Published: May 2015

Decision on the Initial Project Assessment of the NSN interconnector to Norway
Published: March 2015

Cap and floor regime: Initial Project Assessment for the NSN interconnector to Norway
Published: December 2014

Decision on the cap and floor regime for the GB-Belgium interconnector project Nemo
Published: December 2014

Decision on project eligibility as part of our cap and floor regime for near-term electricity interconnectors
Published: October 2014

Integrated Transmission Planning and Regulation (ITPR) project: draft conclusions
Published: September 2014

Decision to roll out a cap and floor regime to near-term electricity interconnectors
Published: August 2014

The regulation of future electricity interconnection: Proposal to roll out a cap and floor regime to near-term projects
Published: May 2014

Contents

Executive Summary

Electricity interconnectors can offer significant benefits to existing and future consumers. Our cap and floor regime for new electricity interconnectors facilitates the delivery of more interconnection in a way that is economic, efficient and timely.

Five projects came forward in Window 1 and, following Initial Project Assessments (IPA), were awarded cap and floor regimes in principle. Our second application window closed on 31 October 2016 and resulted in three applications from projects seeking a cap and floor regime in principle.

This consultation follows a similar structure and approach to the Window 1 consultation from March 2015[1] as we have taken a similar approach toward assessing Window 2 projects for an IPA.

We have now assessed three new projects – GridLink, NeuConnect and NorthConnect – at the IPA stage of our cap and floor framework.

We are minded to grant GridLink, NeuConnect and NorthConnect a cap and floor regime in principle, subject to the IPA conditions[2].

On the basis of our assessment, we expect these projects to be in the interests of GB consumers as well as connected countries and Europe as a whole. We are now seeking views on these minded-to positions.

About the projects

The GridLink project is a proposed 1.4GW interconnector between France and GB. The project is owned by iCON Infrastructure Partners lll, LLP and is being developed by Elan Energy GB Limited.

The NeuConnect project is a proposed 1.4GW interconnector between Germany and GB. A consortium consisting of Frontier Power, Meridiam and Greenage Power is developing the project.

The NorthConnect project is a proposed 1.4GW interconnector between Norway and GB. NorthConnect KS, a consortium consisting of NorthConnect AS, Lyse Produksjon AS, E-CO Energi AS, Vattenfall AB and Agder Energi AS., is developing the project.

The three proposed projects could provide an additional cumulative capacity of 4.2GW.

What our assessment shows

We have assessed the three projects in line with our principal objective, which is to protect the interests of current and future GB energy consumers. We have also taken

[1] Cap and floor regime: Initial Project Assessment for the FAB Link, IFA2, Viking Link and Greenlink interconnectors
[2] The IPA conditions are set out in Chapter 10 of this consultation

into account the expected overall impact of the project on GB and, where relevant, the EU as a whole, in line with the relevant provisions of the Third Energy Package.

Our assessment informs our decision-making and is comprised of both quantitative and non-quantitative analysis.

Each project links GB to a unique energy system, thereby deriving benefits from cheaper electricity, diversification of energy sources and differences in time zone and weather patterns. Our analysis indicates that all three projects are likely to generate significant net benefits for GB consumers.

GridLink – France: The differences between the French and GB energy system are related to policy, capacity mix, and time differences. Interconnection to France benefits from the short distance to GB and therefore relatively low capex requirements.

NeuConnect – Germany: Germany has experienced strong growth in solar PV and wind capacities, which have led to low wholesale prices in many periods, some of which are curtailed due to network constraints in Germany. Both daylight timing differentials and the sweep of east-west weather patterns drive further benefits from interconnection to Germany.

NorthConnect – Norway: There are large price differentials between GB and Norway. The Norwegian electricity system is almost entirely comprised of hydropower, which leads to low and less volatile power prices. The flexible nature of hydropower complements wind energy and would increase GB's access to renewable energy, while providing a secure, cheaper and dispatchable source of electricity.

Table 1: High-level summary of welfare impacts in the base scenario[3]

	GridLink	NeuConnect	NorthConnect
Net GB consumer welfare (£m NPV)	2,984	2,197	2,739
GB total welfare (£m NPV)	62	-254	-410

Our analysis indicates that the all three projects can also provide security of supply and sustainability benefits by providing access to alternative generation and increasing GB capacity of supply.

Whilst we do not have any material concerns with the project plans or technical characteristics of these projects, we note that all three projects need to agree and finalise regulatory arrangements in the connecting countries with the relevant National Regulatory Authority (NRA). We also note that timescales for project delivery are tight and subject to potential supply chain constraints. While we remain supportive of interconnector projects to EU countries, we recognise that Brexit may pose challenges for projects.

[3] Our minded-to position is informed by a quantitative assessment using the base scenario and marginal approach without capacity market revenues (explained in chapter 4). National Grid SO modelled system impacts including one-off reinforcement works, ancillary service benefits and constraint costs are included.

About this consultation

The IPA stage assesses the projects' impacts on GB consumers and GB welfare, including how the projects interact with each other. We have assessed these projects based on the information submitted to us by developers in October 2016.

This consultation is mainly aimed at interconnector developers and a technical audience. Stakeholders wanting a high-level overview of our assessment may wish to read Chapters 1 to 3. More detail is provided in the subsequent chapters and published reports.

This consultation document forms our impact assessment for the three projects. Stakeholders should submit responses to Cap.Floor@ofgem.gov.uk by 14 August 2017. Subject to consultation responses, we expect to publish our decision on the IPA of these three projects in September 2017.

1. Background and overview of projects

Chapter Summary

This chapter includes background on the cap and floor regime, an overview of the three projects assessed in this document and the scope of this consultation. It also provides a brief summary of the Aquind interconnector project that is being developed under the exempt route.

Background

1.1. Electricity interconnectors are the physical links that allow the transfer of electricity across borders.[4] They allow electricity to be generated in one market and used in another.

1.2. Interconnectors can offer significant benefits to existing and future consumers including:

- lowering electricity bills through allowing access to cheaper sources of electricity generation
- providing alternative, cheaper ways to achieve secure electricity supplies, for example by providing ancillary services to the System Operator (SO)
- supporting the decarbonisation of energy supplies by making it easier to manage intermittent renewable generation sources and locate low carbon generation where it is most efficient

1.3. The cap and floor regime is the regulated route for interconnector investment in GB and is designed to facilitate the delivery of more interconnection in a way that is economic, efficient and timely. The regime invites submissions from interconnector developers within a time-bound application 'window'.

1.4. Window 1 closed in September 2014. Following our assessment at IPA stage, five interconnector projects were awarded a cap and floor regime in principle.

Table 2: Window 1 interconnector projects

	NSL	IFA2	FAB Link	Viking Link	Greenlink
Connecting country	Norway	France	France	Denmark	Ireland
Capacity	1.4GW	1GW	1.4GW	1.4GW	500MW

[4] For ease, we will refer to electricity interconnectors as 'interconnectors' in the remainder of this document.

1.5. The NSL interconnector project to Norway has since been assessed at the Final Project Assessment (FPA) stage.[5] We are due to publish our final decision on NSL's FPA shortly.

1.6. In November 2015, we confirmed that we would open a second application window for the cap and floor regime for electricity interconnectors. Window 2 closed on 31 October 2016. Three projects applied to be assessed and regulated under our cap and floor regime. In November 2016, we confirmed that all three projects met our minimum eligibility criteria[6], and so were eligible for the IPA stage of our assessment process.

1.7. The cap and floor regime sits alongside the existing exemption route whereby project developers can apply for an exemption from certain aspects of European legislation).[7]

Overview of the Window 2 projects

1.8. We have assessed three projects in this consultation – GridLink, NeuConnect and NorthConnect - based on the information submitted to us in October 2016 by the project developers. The table below gives an overview of the main characteristics of each of these projects.

Table 3: Main characteristics of the window 2 interconnector projects

Project	Developers	Connection locations	Capacity
GridLink	Elan Energy GB Limited and iCON Infrastructure Partners III, LLP	Kingsnorth, GB and Warrand, France	1.4GW
NeuConnect	Frontier Power, Meridiam and Greenage Power	Grain, GB and Germany (final location TBC)	1.4GW
NorthConnect	NorthConnect KS	Peterhead, GB and Sima, Norway	1.4GW

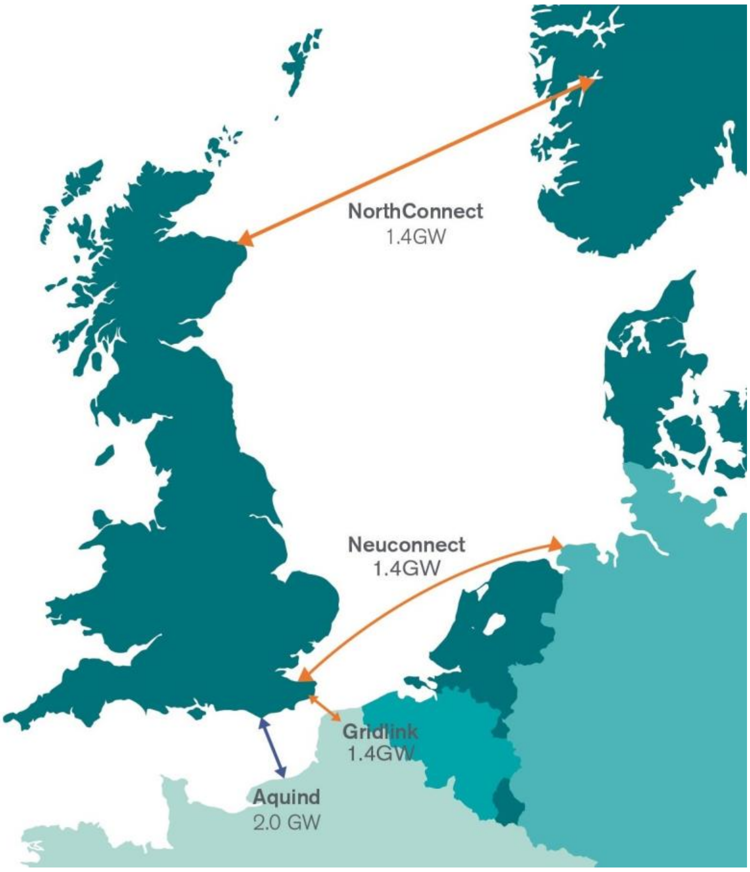
The Aquind interconnector project

1.9. Aquind is a proposed 2GW interconnector project to France that has elected to pursue the exempt route rather than apply for a cap and floor regime. Aquind has previously provided a draft exemption request to both National Regulatory Authorities (NRAs) and a formal exemption request is expected shortly. We have provisionally

[5] Final Project Assessment of the NSL interconnector to Norway
[6] Decision on project eligibility as part of our cap and floor regime for electricity interconnector applicants from the second window
[7] Under Article 17 of Regulation 2009/714/EC which allows new interconnectors to request an exemption from Article 16(6) of the Electricity Regulation (concerning Use of Revenues), and from Articles 9, 32, 37(6) and 37(10) of Directive 2009/72/EC of the European Parliament and Council of 13 July 2009 concerning common rules for the internal market in electricity (concerning Ownership unbundling and Third Party Access). The Regulation also sets out the decision-making framework and the specific criteria against which an exemption request must be assessed.

assessed Aquind alongside the Window 2 projects due to the interactions and dependencies between the needs case for new interconnector projects.

Figure 1: Map showing indicative GB connection points for the three projects applying for a cap and floor regime and Aquind



1.10. If the three window 2 projects were to proceed, it would represent a 4.2GW increase in GB electricity interconnector capacity. Current GB total interconnector capacity (existing and under construction[8]) stands at 8.4GW. This will increase to 11.7 GW if all the projects approved as part of window 1 go ahead and to 17.9 GW if all the projects in window 2 and Aquind also proceed to completion.

Scope of this consultation

1.11. This consultation contains our minded-to position on our IPA of the three Window 2 projects outlined in this chapter.

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[8] Existing interconnectors - IFA (2GW), BritNed (1GW), EWIC and Moyle (500MW each) - plus the following interconnectors under construction: Nemo Link(1GW), ElecLink (1GW), NSL (1.4GW) and IFA2 (1GW).

1.12. This document is also our Impact Assessment (IA) for the three Window 2 projects.[9] We have included the impacts of these projects throughout the analysis in this document. Areas relating to our IA guidance, which are not in the main body of the document, are included in Appendix 2 and 3.

[9]We assess these impacts in line with our IA guidance, available here: https://www.ofgem.gov.GB/publications-and-updates/impact-assessment-guidance

2. Structure of our Initial Project Assessment

2.1. Our IPA is an assessment of the needs case and impacts of the three projects, the interactions between them, and whether they are likely to be in the interests of GB consumers.

2.2. We have considered the impact on GB primarily by looking at the social welfare impacts of projects. When discussing total GB social welfare we consider a number of different factors:

- impacts of projected flows between the connecting markets
- impacts on the operation of GB's transmission system
- the costs of onshore transmission reinforcements needed to accommodate the four projects
- qualitative assessment of hard-to-monetise impacts, including strategic and sustainability benefits that the projects may provide.

2.3. In addition, we have reviewed a number of areas to ensure that the three projects are sensible and well-justified:

- assessment of project connection locations and routes
- assessment of project, finance and supply chain plans.

2.4. When reaching our minded-to positions on each project we have also considered distributional impacts and wider dynamic and efficiency effects, such as investment driven by longer-term impacts of changes to generator profit levels, which are not fully taken account of elsewhere in our analysis.[10]

2.5. Our IPA has been informed by a number of sources of information:

- Submissions received from the project developers. These submissions include background on the projects, economic modelling, details on the technical design of projects and project plans.

- A report from Pöyry consultants on the potential impacts of projected flows between connecting markets. This forms the basis of our assessment of flows between markets in Chapter 4. Figures presented in the report may differ from those presented in this paper as we have updated underlying cap and floor input parameters, such as the cost of debt, since its completion. All figures are indicative and parameters are only finalised at Final Investment Decision (FID), with cap and floor levels set at the FPA stage.

[10] For example, Pöyry's modelling assumes that any changes to generator profit levels resulting from interconnector build will persist over time without response from generators in terms of market entry, exit or bidding behaviour. We now include a 'capacity reduction' sensitivity.

- A report from National Grid Electricity Transmission (NGET) that assesses the potential consumer benefits that could be derived from the three projects providing ancillary services. It also assesses the impact of connecting each interconnector to the GB transmission system. NGET's analysis informs our analysis in Chapter 5.

- Our assessment of connection location (informed by the output the Connection Infrastructure Options Note (CION)[11]), capacity, cable route and technology choices. This is set out in Chapter 7.

2.6. Supporting reports[12] (published alongside this consultation) have been provided independently and were not drafted in consultation with the developers of the three projects that are being assessed under Window 2.

2.7. We have assessed the three projects in line with our principal objective, which is to protect the interests of current and future GB consumers. We have also taken into account the expected overall impact of projects on GB, connecting countries and the EU as a whole, in line with the objectives of the Electricity Directive.[13]

2.8. Chapter 3 provides an overview of our IPA for the three projects. This highlights the key points of our analysis and our minded-to position for each project, with further detail provided in later chapters and the associated reports.

[11] The CION records the output of work between the developers and NGET to identify the overall economic, efficient and coordinated connection option for interconnector projects.
[12] Public versions of these reports with commercially sensitive information removed, have been published alongside this consultation.
[13] The Electricity Directive refers to Directive 2009/72/EC, available at: http://ec.europa.eu/energy/gas_electricity/legislation/legislation_en.htm

3. Summary of our Initial Project Assessment

Chapter Summary

This chapter contains our minded-to position for each of the projects.

Question box

Question 1: Do you agree with our minded-to positions on the three projects considered in this consultation?
Question 2: Is there any additional information that you think we should take into account when reaching our decision on the IPA of the projects?

How we've reached our conclusions

3.1. In the sections below we have set out our minded-to position on the needs case for each of the three projects.

3.2. In reaching our minded-to position, we have considered both quantitative and hard-to-monetise qualitative analysis as described in Chapter 2. We look at the underlying rationale for each project and assess a number of potential quantitative outcomes based on several scenarios and sensitivities defined in detail in Chapter 4.

3.3. Our principal decision-making criteria for awarding an IPA for each of the Window 2 interconnector projects[14] is whether it is likely to be in the interests of GB consumers, in consideration of wider impacts in GB, connecting countries and Europe overall.

3.4. For each project, we have provided a summary of the key quantifiable outputs, which have informed our minded-to position.

- **The estimated impact on wholesale electricity prices** as a result of flows across the interconnector. These figures were modelled by Pöyry and are explained in Chapter 4.

- **The estimated impact of any cap or floor payments** that are triggered by interconnector revenues. These figures were also modelled by Pöyry based on indicative cap and floor values.

- **The estimated impact of the project on the operation of the GB transmission system including onshore reinforcement costs.** A range of scenarios were modelled by NGET and are explained its' report. We cannot publish the disaggregated figures of the impact; however, the total welfare impact of the

[14] Subject to the IPA conditions set out in chapter 10

provision of ancillary services, network constraint impacts and onshore reinforcements are included in the 'net GB consumer' welfare and 'total GB welfare' figures in the tables below.

3.5. For the quantitative element of our assessment, we used the base scenario marginal approach[15] (MA) without capacity market (CM) revenues. We use this scenario, as it is the most prudent approach for assessing possible impacts to GB consumers.

3.6. We carried out additional sensitivity analysis around this scenario to test a further range of possible outcomes and therefore ensure robustness of the analysis.

Our view on the IPA of GridLink

3.7. The case for GridLink is primarily driven by the high proportion of nuclear in the French energy mix as well as a growing proportion of renewables, which drives lower wholesale prices in France. This can provide security of supply benefits by diversifying energy resources in GB.

3.8. The lower wholesale prices in France are generally expected to drive imports to GB, which would lower GB wholesale prices. Differences in policy and time zone create further arbitrage opportunities. Further detail about the qualitative benefits can be found in Chapter 6.

3.9. Our analysis shows significant consumer welfare benefits in most scenarios and sensitivities net of all associated project costs. GridLink also demonstrates net benefits for system operation.

Table 4: GridLink - Summary of welfare impacts (£m NPV 2015 marginal approach)

		Base scenario sensitivities			
	Base scenario	Capacity reduction	Policy	Low value scenario	High value scenario
GB wholesale price savings	3,770	3,409	2,288	426	859
Net project cap and floor payments	-92	-90	-228	-382	-56
Net GB consumer welfare *(incl. system impact)*	**2,984**	**2,655**	**1,530**	**-110**	**1,352**
Total GB welfare *(incl. system impact)*	**62**	**178**	**-425**	**-677**	**465**

[15] All figures are from our 'marginal' MA modelling runs, meaning all known interconnector projects totalling 17.9GW are considered together. Further detail can be found in Chapter 4.

3.10. The high value scenario demonstrates the greatest benefit to GB total welfare owing to increased GB exports in a scenario of high renewables growth. However, GridLink shows some downside risk in the low value scenario. Our low value scenario is used as a stress test and is explained further in Chapter 4. We believe the significant benefits in the base scenario and sensitivities far outweigh any downside risk to consumers.

3.11. Having considered the information above, **we are minded to grant GridLink a cap and floor regime in principle, subject to the IPA conditions.**[16]

Our view on the IPA of NeuConnect

3.12. NeuConnect is the first proposed interconnector to Germany. Germany's energy system has high renewables penetration, continental demand profiles and lower average wholesale prices, which are positive for interconnection.

3.13. In principle, interconnectors could gain significant value from intra-day dynamic trading, particularly for east-west links such as to Germany, due to both daylight timing differentials and the sweep of east-west weather patterns. When intra-day trade come into effect, this could add further value to the interconnector, which was not valued in our assessment.

3.14. There are significant consumer welfare benefits in the base scenario and sensitivities. However, GB total welfare is negative in all but the high value scenario. Reasons for this include the reducing (cannibalisation) impact on other interconnectors' revenues and reduced generator profit exceeding the benefits to consumers. However, we consider the impact in the base scenario to be within an acceptable range.

3.15. The high value scenario suggests that GB wholesale prices fall due to investment in renewables, and GB exports to Germany rise in the later years. This results in positive GB total welfare, as producers gain from this export, but a downside risk to GB consumer welfare from a slight rise in wholesale prices.

3.16. NeuConnect shows downside risk in the low value scenario. The assumptions for this scenario drive the lowest price differentials leading to limited trading potential over the interconnector.

Table 5: NeuConnect - summary of welfare impacts (£m NPV 2015 marginal approach)

	Base scenario	Base scenario sensitivities		Low value scenario	High value scenario
		Capacity reduction	Policy		
GB wholesale price savings	3,273	2,911	1,758	391	-757

[16] The granting of a cap and floor regime in principle is subject to the IPA conditions set out in chapter 10

Net project cap and floor payments	-194	-193	-327	-438	-34
Net GB consumer welfare *(incl. system impacts)*	**2,197**	**1,868**	**729**	**-483**	**-297**
Total GB welfare *(incl. system impacts)*	**-254**	**-138**	**-749**	**-1,023**	**394**

3.17. On balance, we view the significant benefits to consumers across the base scenario and sensitivities as outweighing potential welfare risks. **We are minded to grant NeuConnect a cap and floor regime in principle**, **subject to the IPA conditions.**[17]

Our view on the IPA of NorthConnect

3.18. Large price differentials between GB and Norway, due to cheaper Norwegian hydropower, leads to lower and less volatile daily prices. Our modelling suggests significant and resilient consumer benefits in all cases. This highlights the unique opportunity of further interconnection to the Norwegian energy system.

3.19. We summarise the quantifiable overall impact of NorthConnect in the table below. Our analysis shows significant consumer benefits in the base scenario and sensitivities. However, NorthConnect's total GB impact is negative due to constraint costs as well as the impact to other interconnectors and domestic generators.

Table 6: NorthConnect - summary of welfare impacts (£m NPV 2015 marginal approach)

	Base scenario	Base scenario sensitivities		Low value scenario	High value scenario
		Capacity reduction	Policy		
GB wholesale price savings	3,536	1,641	2,472	2,267	11
Net project cap and floor payments	-16	-10	-80	-274	144
Net GB consumer welfare *(incl. system impact)*	**2,739**	**1,012**	**1,777**	**1,292**	**619**
Total GB welfare *(incl. system impact)*	**-410**	**138**	**-780**	**-1,343**	**584**

3.20. GB consumer welfare benefits derived from NorthConnect are robust and remain significantly positive for consumers in both the high value and in the low value scenario.

[17] The IPA conditions are set out in chapter 10

3.21. Having considered the information above, **we are minded to grant NorthConnect a cap and floor regime in principle, subject to the IPA conditions[18].**

Estimated impact on consumer bills

3.22. We have estimated the average domestic bill impact of each of the projects for the three scenarios modelled by Pöyry. This averages the impact to wholesale prices as well as any cap or floor payments on an annual basis across the 25-year regime period. However, this does not include constraint costs and wider system impacts modelled by NGET, and therefore is a simplification of the actual impacts.

3.23. Energy market data is from DUKES 2016.[19] Positive figures are costs and negative figures are savings.

Table 7: Average annual impact on domestic consumer bills (£/pa)

Base scenario	NorthConnect	NeuConnect	GridLink
Cap and floor payments	0.01	0.17	0.08
Average cap and floor annual bill impact	-2.14	-2.31	-2.68
Total bill impact	**-2.13**	**-2.14**	**-2.60**

Low value scenario	NorthConnect	NeuConnect	GridLink
Cap and floor payments	0.23	0.36	0.31
Average cap and floor annual bill impact	-1.31	-0.31	-0.36
Total bill impact	**-1.08**	**0.05**	**-0.05**

High value scenario	NorthConnect	NeuConnect	GridLink
Cap and floor payments	-0.16	0.02	0.03
Average cap and floor annual bill impact	0.32	0.79	-0.14
Total bill impact	**0.16**	**0.81**	**-0.11**

3.24. The above tables illustrate that, in the base scenario, all three Window 2 projects are expected to lower consumer bills.

[18] The IPA conditions are set out in chapter 10.
[19] DUKES 2016

4. Economic market modelling of the impact of interconnector flows

Chapter Summary

This chapter summarises the economic market modelling analysis carried out by Pöyry consultants. We also provide a high-level comparison of Pöyry and project developers' modelling results.

Question box

Question 3: What are your views on the approach Pöyry has taken to modelling the impact of cross-border interconnector flows?
Question 4: Do you have any additional evidence in this area that we should take into account?

Introduction

4.1. In this chapter we summarise the modelling approach and analysis completed by our consultants, Pöyry. We also compare this to the independent modelling developers submitted as part of their applications.

In particular, we present the following information for each project:

- the **social welfare impacts** as a result of electricity flows across the interconnector and associated changes in wholesale market prices
- **a summary of our sensitivity analysis** for each project
- **expected revenues** for the three projects
- **a high-level comparison of Pöyry and developer modelling** assumptions and results.

4.2. This chapter does not include the GB social welfare impacts of onshore reinforcements or of system operation costs or benefits. These are discussed in Chapter 5.

Summary of modelling methodology

4.3. The underlying electricity market modelling for this study has been conducted using Pöyry's in-house model, BID3. Pöyry has developed an economic model for Cost Benefit Analysis (CBA) of each project, with a focus on socio-economic welfare elements. This approach is broadly aligned with that of European Network of Transmission System Operators for Electricity (ENTSO-E)[20].

4.4. We assess the impacts of each project on consumers, producers and interconnector owners by first modelling a world with existing, exempt and Window 1 projects and then a world where Window 2 projects operate. The **changes to the parameters** in the table below combine to give us a view of the quantifiable welfare impacts. Total impact is the sum of all stakeholder welfare.

Table 8: Components of socio-economic welfare

Consumer welfare *- sum of changes to;*	**Producer welfare** *- sum of changes to;*	**Interconnector welfare -** *sum of changes to;*
Wholesale electricity price	Gross margin from electricity sales	Project capex and opex
Low carbon support regimes	Revenue from low carbon support regimes	Project total revenues (arbitrage, cap and floor payments)
New interconnector project cap and floor payments[21]	Revenue from capacity payments (if IC's win auctions)	Other interconnectors total revenues[22] (arbitrage, cap and floor payments)
Other interconnectors cap and floor payments[23]		
Provision of ancillary services[24]		

4.5. The welfare modelling results for each group (consumers, producers and interconnector owners) represent the sum of the change in welfare due to each new project. Unless otherwise stated, impacts are measured in net present value (NPV) terms over the duration of the cap and floor regime (25 years) and presented in GBP 2015 values.

4.6. The detailed methodology for calculating social welfare impacts is presented in Annex A of Pöyry's report.

Scenarios

4.7. Pöyry and Ofgem designed five primary scenarios and sensitivities for assessing a wide range of outcomes for the quantifiable economic benefit of new interconnection.

[20] Specifically, the Ten Year Network Developments Plan (TYNDP).
[21] Consumer welfare is inclusive of any cap payments received and net of any floor payments made.
[22] Indirect revenue impacts on other interconnector owners (e.g. 'cannibalisation' effect) where a flow on one interconnector may lead to less revenue on another interconnector.
[23] Should a new project reduce cap payments or increase floor payments to other projects, this is captured and consumer welfare is net of such changes.
[24] Where an interconnector may provide such services more cheaply, this difference is a benefit to consumers.

The scenarios are deterministic and drive a wide range of potential outcomes from additional interconnection by varying the assumptions that impact upon wholesale price differentials, and therefore interconnector value.

- The **Base scenario** is designed to represent a reasonable baseline against which interconnector projects can be assessed and is a 'best view' based on current information.

- The **Low value scenario** is based on extreme assumptions designed to result in unfavourable circumstances for interconnectors. We have used this scenario as a one-way stress test, whereby projects that show welfare benefits even in this scenario are likely to be particularly robust. However, the reverse does not hold: projects that fail to show positive benefits in the scenario are not necessarily bad, but indicative of requiring further consideration against other scenarios and sensitivities.

- The **High value scenario** is based on largely favourable assumptions for new interconnection, to test the potential overall upside of each project.

4.8. The data used by Pöyry in these scenarios comes from publicly available sources of information including NGET's GB Future Energy Scenarios (FES)[25] and DECC 2015 emissions projections,[26] the ENTSO-E visions developed for the TYNDP 2016 and additionally data from Pöyry's Q2 2016 pan-European Quarterly Update.

Table 9: Overview of primary scenarios and sensitivities

Scenario/Sensitivity	Description & purpose	Use of outputs
Base	• A best view of the future. • Assesses projects based on known market and policy trends.	Demonstrates IC value in a future based on best available known trends, with a conservative bias throughout.
Base - *capacity reduction sensitivity*	• Reduces domestic thermal generation capacity in the base scenario. • Takes into account the possibility that domestic generators invest less as interconnectors bring competitive wholesale price pressure.	Demonstrates IC value even if competing domestic generators come offline or develop less future generation.
Base - *policy sensitivity*	• Assumes **no carbon price** differential between GB and Europe and **removes BSUoS[27]**, in the base scenario. • Eliminates value from IC arbitrage based on policy differences on carbon pricing and balancing charges. Assesses resilience to policy risk.	Demonstrates IC robustness on basis of difference between energy systems only. Policy elements are removed.
High value	• Designed to generate the greatest benefits in an internally consistent scenario. • Designed to create a world where more interconnection is desirable.	Demonstrates the upper limit of total IC value. Tests welfare risk associated with increased GB export due to high domestic renewable investment.

[25]Data from FES July 2016. More information on NGET's GB Future Energy Scenarios is available at: http://fes.nationalgrid.com/
[26] https://www.gov.GB/government/collections/energy-and-emissions-projections
[27] Balancing System Use of System charge - recovers the cost of day-to-day operation of the transmission system. Generators and suppliers are liable for these charges.

Low value	• Designed to generate the lowest benefit in an internally consistent scenario, creating lowest possible price differentials. • Designed to test the bottom line for interconnectors in a world where more interconnection is not desirable.	A) Provides reassurance and demonstrates robustness where consumer welfare > 0. B) Provides limited decision-making support if welfare values are < 0, on the basis that the assumptions used to create the scenario have a low/no probability of occurring together for the period.

Additional sensitivities

- Window 1 delay – for this sensitivity we have assumed that the Window 1 projects (NSN, Viking Link, IFA2, FAB Link and Greenlink) face a delay in their progress. We have assumed that only the 50% of the capacity of the Window 1 projects are built by 2022, and the full capacity comes online over time until 2025.

- Window 2 delay – for this sensitivity we have assumed that the Window 2 projects are delayed until 2025.

- Connection firmness – for this sensitivity we have assumed that the NorthConnect and NeuConnect projects are connected under a non-firm arrangement for a period of time and therefore are subject to outages over the summer period. This has been reflected (as a worst-case sensitivity) by reducing cable availability accordingly over that period.

4.9. For a detailed description of each scenario and sensitivities, please refer to Chapter 3 of Pöyry's report.

Assessment of project interactions

4.10. In order to test project sensitivity to additional interconnection being built, for each project we asked Pöyry to conduct market modelling analysis using two approaches:

- **First additional (FA) approach** – where a project is the only new project connecting in 2022 and assumes no other window 2 interconnector projects become operational. All window 1 projects are assumed to be operational. This, in theory, represents the best case for an interconnector project as there is no additional interconnection connecting in 2022, which would reduce ('cannibalise') the project's congestion revenue. If any window 1 projects were to not develop, this would further increase the project's value.

- **Marginal additional (MA) approach** – where a project is commissioning at the same time as the other two cap and floor projects and the exempt project. This, in theory, represents the worst case for an interconnector project as there are additional projects connecting in 2022, which would reduce the project's congestion revenue.

4.11. This allows us to understand the social welfare impact each individual project would have on its own (FA approach), and to see how sensitive each project is to the remaining interconnector projects assumed to be commissioned at the same time (MA approach). This way we can also understand the interactions between projects and consider them when we make decisions.

Modelling results

4.12. This section sets out results of the analysis for each project. This analysis is supported by the conclusions in Pöyry's report. However, there are some differences between the numbers presented in the Pöyry report and our figures here, owing to updates that have been made to the underlying parameters of the cap and floor financial model for calculating the indicative cap and floor levels. These values are ultimately set at the Final Project Assessment (FPA) stage, and therefore are indicative during this (IPA) assessment.

4.13. The figures in the tables below do not assume projects earn CM revenue. However, to the extent that projects may earn CM revenue, this would reduce the likelihood of floor payments. This is modelled as a sensitivity only and shown in Table 18.

4.14. We have included the modelled results for the impacts on European social welfare in our base scenario in Table 10. This shows that all projects are expected to be beneficial from a wider societal perspective.

Table 10: European net social welfare in Base Scenario MA

NPV £m, real 2015	NorthConnect	NeuConnect	GridLink
EU net social welfare	1,326	322	723

GridLink

Social welfare impacts

4.15. The modelling results suggest that flows across GridLink would lead to significant consumer benefits in most cases. This is largely driven by lower modelled wholesale prices in France compared with GB and relatively low capital investment costs of the interconnector.

4.16. In terms of total GB welfare, modelling suggests that GridLink would result in positive to neutral impact in the base scenarios, where the FA case shows the highest benefits overall – the result of the fewest competing projects. In the low value scenario, there is downside welfare risk for GB total and GB consumers.

Table 11: GridLink's social welfare impacts on GB (£m, 2015 prices)

Scenarios	GB consumers	GB producers	GB interconnectors	GB total welfare
Base FA	3,878	-2,943	-697	237
Base MA	2,931	-1,959	-963	9
Low value MA	-163	-103	-464	-730
High value MA	1,299	272	-1,160	412

Sensitivities

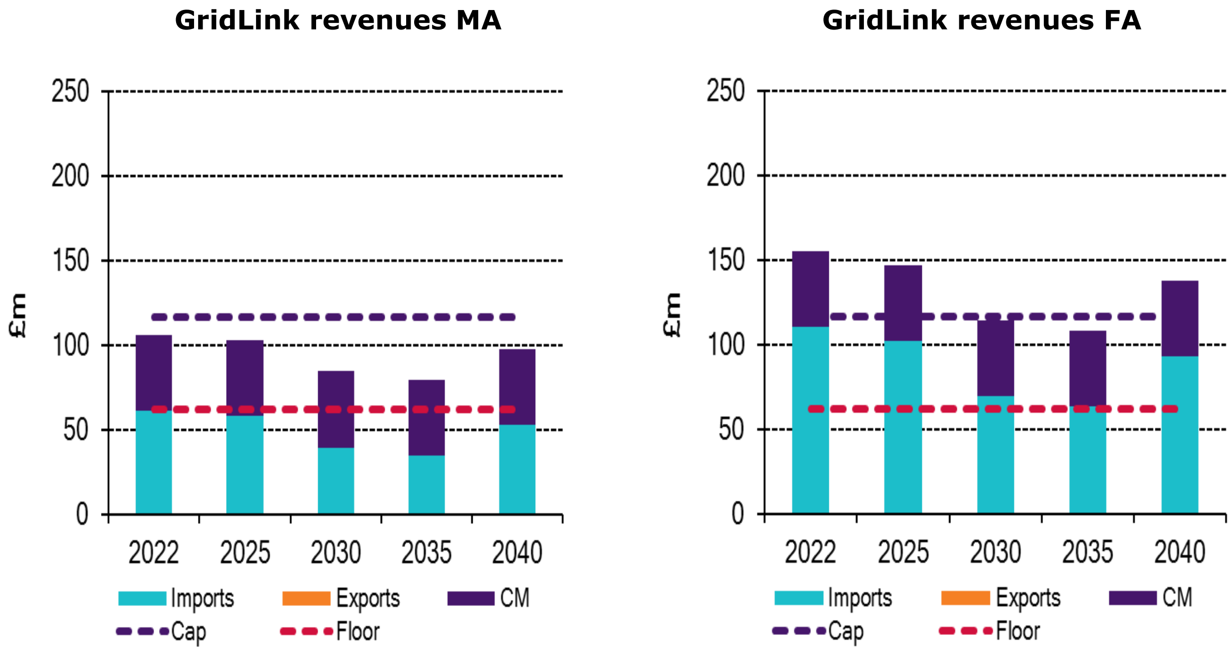
4.17. We tested a number of sensitivities on the base scenario MA (marginal additional approach) including the impact of delays to both W1 and W2 projects. In all sensitives, GridLink demonstrates robust consumer benefits.

Table 12: Results of sensitivity analysis for GridLink (£m, 2015 prices)

Base sensitivities	GB consumers	GB producers	GB interconnectors	GB total welfare
Capacity reduction MA	2,602	-1,536	-941	125
Policy MA	1,477	-1,224	-731	-478
W1 delay MA	3,007	-2,013	-954	41
W2 delay MA	2,311	-1,629	-845	-164

GridLink congestion revenues

Chart 1: GridLink's projected congestion revenues,[28] Base scenario (£m, 2015 prices)



4.18. We did not include capacity market (CM) revenue with the socio-economic welfare figures used to inform our decision as it is unclear how long the CM will be in place or if a project would win a contract. Chart 1 shows the modelled revenues from congestion rent, which for GridLink is primarily imports to GB. CM revenue (shown in

[28] For presentation purposes, the charts for each project show total projected congestion revenues and indicative levels of cap and floor based on estimated total project costs. Where the cap and floor regime would only apply to 50% of the project, the costs and revenues shown on the charts would be half.

dark blue) could make a significant impact to revenues, should it be available to interconnectors throughout the regime period. There are other revenue streams interconnectors could earn that are not modelled here, such as those from the provision of ancillary services. Any additional revenues earned would make floor payments less likely and cap payments more likely, therefore providing a potential upside to our modelling and increasing benefits for consumers.

4.19. With congestion revenue alone, in the FA case, the cap and floor regime has no impact on consumers. In the MA case, without CM or additional revenue, floor payments may be required. However, significant consumer benefits remain because the benefits of lower wholesale prices significantly outweigh the cost of floor payments.

NeuConnect

Social welfare impacts

4.20. The modelling results suggest that NeuConnect would bring significant consumer benefit in the base scenarios. The project demonstrates some risk to GB consumer welfare in both the low value and high value scenarios.

4.21. The negative welfare impact in the low value scenario is driven by low commodities pricing, no policy differences and negative economic growth with little investment in renewables. The scenario drives the lowest price differential over the entire regime period, hence why it is treated as a stress test.

4.22. In the high value scenario, the opposite drivers suggest GB could export power, benefiting GB producers and GB overall. The negative consumer welfare is due to a slight price rise in GB wholesale prices resulting from this export.

Table 13: NeuConnect's social welfare impacts on GB (£m, 2015 prices)

Scenarios	GB consumers	GB producers	GB interconnectors	GB total welfare
Base FA	3,043	-2,178	-712	153
Base MA	2,388	-1,532	-919	-63
Low value MA	-292	24	-564	-832
High value MA	-106	1,697	-1,007	585

Sensitivities

4.23. The range of sensitivities modelled suggest that NeuConnect would provide consumer benefit in all cases.

Table 14: Results of sensitivity analysis for NeuConnect (£m, 2015 prices)

Base sensitivities	GB consumers	GB producers	GB interconnectors	GB total welfare
Capacity reduction	2,059	-1,109	-897	53

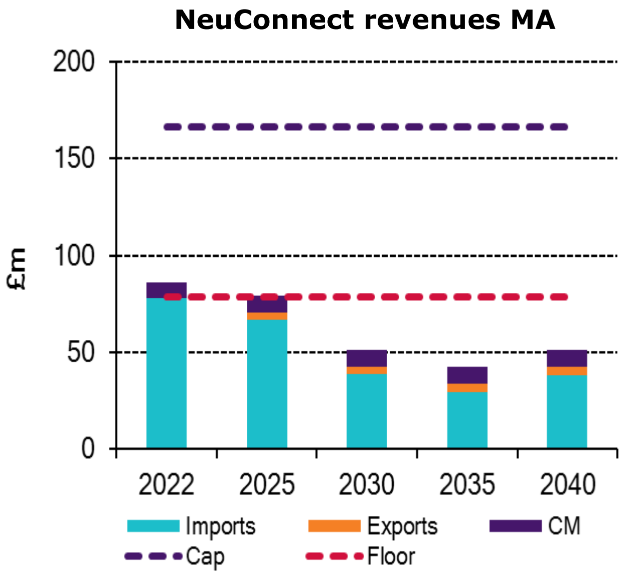
Policy MA	920	-772	-707	-558
W1 delay MA	2,438	-1,575	-904	-41
W2 delay MA	1,802	-1,181	-869	-248
Connection firmness	2,290	-1,478	-904	-93

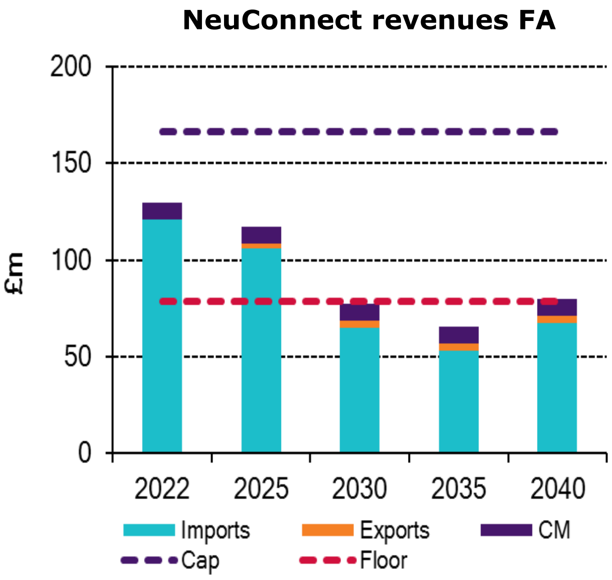
NeuConnect's congestion revenues

4.24. We did not include capacity market (CM) revenue with the socio-economic welfare figures used to inform our decision as it is unclear how long the CM will be in place or if a project would win annual contracts every year. Chart 2 shows the modelled revenues from congestion rent, which for NeuConnect is primarily imports to GB. CM revenue (shown in dark blue) would not make a significant impact to revenues as the de-rating factor for Germany is relatively low (21%)[29]. There are other revenue streams interconnectors could earn that are not modelled here, such as those from the provision of ancillary services. Any additional revenues earned would make floor payments less likely and cap payments more likely, therefore providing a potential upside to our modelling and increasing benefits for consumers.

4.25. With congestion revenue alone, in the FA case, some floor payments are required from the 2030's. In the MA case, without CM or additional revenue, floor payments may be required throughout the regime period. However, despite this, significant consumer benefits remain because the benefits of lower wholesale prices significantly outweigh the cost of floor payments.

Chart 2: NeuConnect's projected congestion revenues,[30] Base scenario (£m, 2015 prices)





[29] Further detail can be found in Pöyry's report, Annex D.
[30] For presentation purposes, the charts for each project show total projected congestion revenues and indicative levels of cap and floor based on estimated total project costs. Where the cap and floor regime would only apply to 50% of the project, the costs and revenues shown on the charts would be half.

NorthConnect

Social welfare impacts

4.26. The modelling results suggest that NorthConnect would deliver significant benefits to GB consumers in all scenarios as GB would be a net importer of cheaper Norwegian electricity.

4.27. The modelling suggests that GB total welfare in the base case would be near zero to slightly negative.

Table 15: NorthConnect's social welfare impacts on GB (£m, 2015 prices)

Scenarios	GB consumers	GB producers	GB interconnectors	GB total welfare
Base FA	3,723	-3,059	-659	5
Base MA	3,095	-2,332	-817	-54
Low value MA	1,648	-2,093	-543	-987
High value MA	975	641	-676	940

Sensitivities

4.28. The analysis for NorthConnect suggests that the project is highly resilient to a number of key sensitivities, including potential projects delays and potential lack of connection firmness in early years.

Table 16: Results of sensitivity analysis for NorthConnect (£m, 2015 prices)

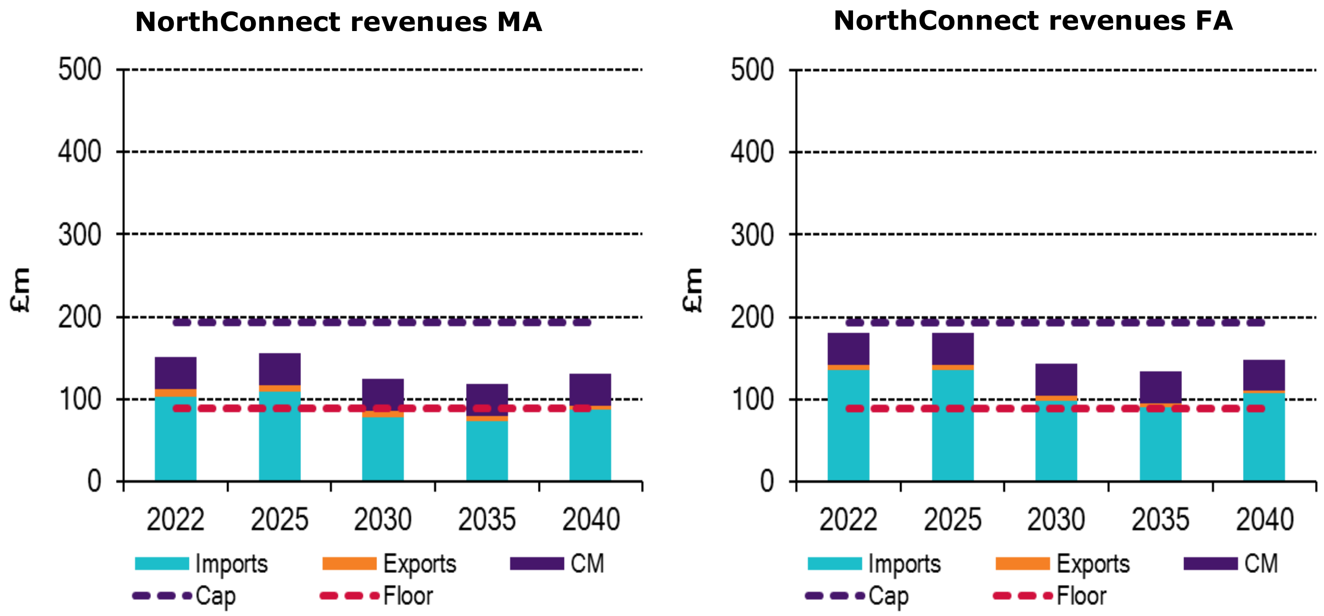
Base sensitivities	GB consumers	GB producers	GB interconnectors	GB total welfare
Capacity reduction	1,368	-169	-704	494
Policy MA	2,133	-1,866	-691	-424
W1 delay MA	3,184	-2,409	-787	-12
W2 delay MA	2,537	-1,953	-809	-225
Connection firmness	2,919	-2,229	-802	-111

NorthConnect's congestion revenues

4.29. We did not include capacity market (CM) revenue with the socio-economic welfare figures used to inform our decision as it is unclear how long the CM will be in place or if a project would win a contract. Chart 3 shows the modelled revenues from congestion rent, which for NorthConnect is primarily imports to GB. CM revenue (shown in dark blue) could make an impact to revenues, should it be available to interconnectors throughout the regime period. There are other revenue streams interconnectors could earn that are not modelled here, such as those from the provision of ancillary services. Any additional revenues earned would make floor payments less likely and cap payments more likely, therefore providing a potential upside to our modelling and increasing benefits for consumers.

4.30. With congestion revenue alone, in the FA case, no floor payments are required. In the MA case, without CM or additional revenue, some floor payments may be required in the 2030's (£16m NPV). However, despite this, significant consumer benefits remain because the benefits of lower wholesale prices significantly outweigh the cost of floor payments.

Chart 3: NorthConnect's projected congestion revenues,[31] Base scenario (£m, 2015 prices)



Impacts of capacity mechanisms on interconnectors

4.31. Since 2015, interconnectors have been allowed to participate in capacity market auctions in GB. However, interconnectors may only participate in auctions for 1-year contracts. The extent to which interconnectors may earn capacity market revenue in the future (beyond the 2020s) is unclear, as there is nothing to currently suggest that auctions will run throughout the projects' lifetimes[32]. For this reason, we have not included capacity market revenues in our primary assessment, but include them as a sensitivity.

[31] For presentation purposes, the charts for each project show total projected congestion revenues and indicative levels of cap and floor based on estimated total project costs. Where the cap and floor regime would only apply to 50% of the project, the costs and revenues shown on the charts would be half.
[32] Expectations from EMR: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/324176/Implementing_Electricity_Market_Reform.pdf

Table 17: Capacity Market modelling assumptions used[33]

Factor	Assumptions
Participation – eligibility to participate in GB and connecting country's capacity mechanisms.	Assumes that all interconnectors participate in auctions, held annually, for the entire duration of the regime period.
De-rating – percentage of the total interconnector capacity up to which it is allowed to bid into the CM auction.	GB – FR: 59% GB – DE: 21% GB – NO: 94%
Clearing price	GB base scenario: €35/kW
Duration of CM policy	25-year regime lifetime modelled from 2022 to 2046

4.32. Using the assumptions set out in Table , we have estimated the potential impacts that CM revenue might have on each of the four projects in the base scenario.

Table 18: Impact of capacity market revenue on welfare, Base scenario MA

GridLink	Base MA	Base MA with CM
GB consumer	**2,931**	**3,062**
GB total	**9**	**-122**

NorthConnect	Base MA	Base MA with CM
GB consumer	**3,095**	**3,115**
GB total	**-54**	**-364**

NeuConnect	Base MA	Base MA with CM
GB consumer	**2,388**	**2,514**
GB total	**-63**	**-72**

4.33. The impact on consumer welfare is not particularly significant. Consumers are liable to pay for the capacity market regardless and the benefits are primarily derived from less floor payment liability from projects. GB total welfare is reduced, owing to reduced welfare for domestic generators, which would lose out on capacity market revenues earned by interconnectors. As only 50% of the interconnector and related revenues are deemed part of GB welfare, the other 50% is 'exported' in terms of welfare and has a reducing effect on the total GB welfare position.

Comparison of Ofgem and developers' economic modelling

4.34. As part of the cap and floor application, we asked developers to submit their own economic modelling analysis. When assessing the projects, we compared each of the developers' and Pöyry's results and considered the key differences. We took both

[33] Detail regarding the de-rating factors and capacity market assumptions can be found in Pöyry's report Annex D and Chapter 3.3.2.

Pöyry and developers' economic modelling studies into account when considering each project.

4.35. Overall, developer modelling suggested a much more optimistic view of the commercial drivers for projects and the socio-economic benefits for consumers and GB. This was in part due to developer assumptions of fewer interconnectors being built and operational (Than we've assumed). Variations across assumptions also led to varied outcomes, as expected. Developers all assumed significant revenue from the Capacity Market, and did not necessarily take into account welfare impacts on low carbon support regimes such as Contract for Difference (CfDs) or impacts on the interconnectors' welfare.

4.36. We reviewed developer's modelling and agree each approach to be valid. However, even subtle differences on assumptions and method can lead to different outcomes. For our modelling, we aimed to take a prudent and conservative view throughout, on the basis of ensuring that projects demonstrate robustness given consumers' underwriting of the floor. Therefore, our modelling tends to suggest lower socio-economic benefits and less optimistic commercial outputs.

Input assumptions

4.37. On the whole, project assumptions were similar, with the greatest deviation seen with NorthConnect. Developers assumed a constant demand and supply capacity growth rate. Our base scenario assumes a flatter demand profile with less generation growth.

4.38. Fuel prices were generally similar, however NorthConnect assumed lower prices on the whole than we assumed. Carbon price differentials between GB and EU ETS were again similar between projects and our assumptions, however NorthConnect assumed much higher price differentials.

Outputs

NorthConnect

4.39. Developer modelled higher flows, which may stem from higher carbon price differentials. Developer modelled revenues are similar to Pöyry's FA modelling, which has much less interconnection included than the MA approach.

4.40. The developer also shows a significantly positive GB welfare, which is quite different to Pöyry's assessment. There are a number of elements that likely contribute to this. The developer did not reflect the impact to other project cap and floor regime changes and the cannibalisation of other interconnector revenues by NorthConnect (this effect was much smaller in developer modelling than Pöyry's). There are different assumptions in fuel price and GB renewable energy growth, which also led to a more optimistic outcome by the developer.

NeuConnect

4.41. The developer and Pöyry modelled similar consumer and GB welfare outcomes. The developer modelled higher price differentials and therefore higher revenues as compared to Pöyry. This may be due to greater price volatility in developer modelling.

4.42. Additionally, when considering Capacity Market revenue, the developer approximated a de-rating factor base on interconnectors to nearby countries. Pöyry modelled a de-rating factor for Germany, as noted in table 17, which is much lower than that assumed by the developer. As a result, Pöyry modelling suggests floor payments in the MA case, whereas the developer does not.

GridLink

4.43. The developers modelling is fairly comparable to Pöyry's FA outputs. Higher price differentials on the developers modelling lead to higher revenues than in Pöyry's.

5. Impacts on the GB transmission system

Chapter Summary

This chapter provides an overview of the impacts of the Window 2 projects on the operation of the national electricity transmission system.

Question box

Question 5: Do you have any views on the information presented in this chapter?
Question 6: Are there any additional factors that you think we should have considered?

5.1. This chapter summarises two main areas:

- the potential impact from the provision of ancillary services, by the GridLink, NeuConnect and NorthConnect projects, to the System Operator (SO); and
- the constraint cost implications of each interconnector connecting to the transmission system.

5.2. Our assessment is based on analysis provided to us by NGET and information contained within the each project's Connections Infrastructure Options Note (CION), which identifies the most economic and efficient connection location.

NGET's analysis

5.3. We have taken NGET's analysis of the potential impact of each of the Window 2 projects into consideration as part our IPA assessments. This includes monetary values (or range of values) that NGET projects, in its analysis, may be attributable to each Window 2 project.

5.4. These monetary values represent potential consumer benefits from the provision of ancillary services by each Window 2 project as well the operational cost (constraint cost) implications of each project.

5.5. NGET notes that the projected monetary values of costs and potential consumer benefits is based on commercially sensitive information. NGET considers new provisions inserted into its transmission licence, following the final conclusions of the Integrated Transmission Planning and Regulation (ITPR) project, prevent it from disclosing these values.[34]

5.6. Therefore, whilst we have taken these values into account in our Window 2 IPA assessments, the disaggregated costs and benefits have not been included in this

[34] Special condition 20 of NGET's electricity transmission licence. See: Decision on licence modifications to enhance the role of the System Operator

consultation and have also been omitted by NGET from the report it has provided for publication alongside this consultation[35]. A single figure for the total system impact of each project can be derived from tables in this consultation, but we do not include any further breakdown.

Impacts on GB system operation

5.7. NGET's analysis of the range of ancillary services that the Window 2 projects may provide, and the potential financial benefits for the end consumer this may represent, is based on scenarios taken from its Future Energy Scenarios (FES)[36].

5.8. NGET's analysis aims to examine the impact of the three projects in a world where interconnectors may provide the greatest benefit as well as, conversely, the least benefit, thereby considering the best and worst case in terms of potential benefit to the end consumer as a result of each project. To provide a trend of results, NGET analysed three different years[37] for both scenarios.

5.9. NGET notes that its analysis focuses on potential consumer benefits and does not consider how developers could extract value (as commercial revenues) in delivering these benefits.

Ancillary services and boundary capability

5.10. The extent to which interconnectors can provide ancillary services largely depends on the technology used by the interconnector, the need for the service in the locality of the interconnector connection, system conditions and arrangements at the other end of the interconnector to acquire such services.

5.11. We note that all three Window 2 projects intend to employ Voltage Source Converter (VSC) technology. We further note that NGET states that VSC is more capable of facilitating the delivery of ancillary services.

5.12. Further details on ancillary services and how interconnectors can generate potential consumer benefits by providing these services can be found in the qualitative and quantitative NGET reports published alongside this consultation.

Impact of each interconnector on ancillary services

Frequency Response

5.13. Interconnectors can contribute to frequency response by providing the ability for power to be rapidly delivered to/taken off the National Electricity Transmission System (NETS). The potential consumer benefit is quantified by assessing the potential cost

[35] NGET report on quantified interconnector impacts
[36] Further information regarding National Grid's FES: http://fes.nationalgrid.com/
[37] 2022, 2026 and 2032

savings of procuring this service from the interconnector instead of more costly commercial frequency response products.

5.14. We note NGET's analysis indicates that all three Window 2 projects potentially generate considerable consumer benefit from the provision of Frequency Response services.[38] We also note that this holds true across both the high and low scenarios used by NGET.

Black Start

5.15. Interconnectors using VSC technology can provide Black Start capability given their potential to access generation sources not affected by a black out. Interconnectors can also potentially offer the added benefit of quicker system restoration and enhanced system resilience.[39]

5.16. However, the ability of an interconnector to provide Black Start services is location dependent. This is due to NGET's contracting strategy for Black Start services, which divides GB into 6 zones and allows for only one interconnector providing Black Start services per zone.[40]

5.17. Both GridLink and NeuConnect propose to connect at locations located along the south coast of GB in an area (zone) where interconnectors with Black Start capability either already exist or are planned.[41] Based on NGET's current expectations, GridLink and NeuConnect therefore provide no additional benefit with respect to Black Start.

5.18. NGET confirms that only NorthConnect, with a proposed location at Peterhead, would be able to provide Black Start services.

Reactive Response

5.19. Interconnectors that use HVDC VSC technology can potentially provide Reactive Response services through use of their inherent reactive power compensation plant. This inherent capability can, if the interconnector is located appropriately, be used to generate or absorb reactive power as required and thereby reduce the need to procure Reactive Response services from other more costly sources.

5.20. Reactive power issues on the network are localised in nature and therefore the ability of interconnectors to provide this service is location-dependent. NGET carried out voltage studies focused on the areas that GridLink, NeuConnect and NorthConnect intend to connect in order to identify any potential reactive power issues in those areas.

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[38] The range of potential benefit is similar across all three Window 2 projects given the similar specifications.

[39] Quicker because there is no need to restore generation plant and improved resilience because the interconnector can potentially provide access to a more diverse energy sources.

[40] Section 6 of the NGET's 'SO submission to Cap and Floor' report provides more information on the Black Start services including a geographical illustration of the different zones.

[41] IFA and BritNed are operational, and Nemo, ElecLink and IFA2 are under construction or planned.

5.21. We note that NGET's analysis concludes that there were no reactive powers issues foreseen in the southeast region of the network (where GridLink and NeuConnect propose to connect) or around the Peterhead area (where NorthConnect intends to connect). Therefore, NGET has attributed no value to any of the Window 2 projects for Reactive Response services.

Boundary capability

5.22. NGET suggests that GridLink could increase the B15 boundary capability by 1528MW and NeuConnect by 716MW. However, NGET notes that it is not possible to quantify this into potential benefits to consumers that can be directly attributed to the interconnector.[42]

Constraint costs

5.23. The operational cost implication of each interconnector connecting to the NETS reflects either an increase or decrease in constraint management costs, which NGET incurs when balancing the NETS.

5.24. Interconnectors can potentially facilitate NGET, as the System Operator, to alleviate constraints on the NETS or help balance the system.

5.25. Generally, an interconnector importing electricity into GB results in an increase in constraint costs. Conversely, when exporting electricity out of GB the interconnector contributes to alleviating constraint costs.

5.26. NGET notes that 'the operational constraint cost implications of a certain interconnector is a function of the energy prices in the interconnected markets across Europe and the modelled system marginal price for GB.'

5.27. NGET's analysis uses a range of price forecasts across its high and low scenarios and also considers the impact on constraint costs when European electricity prices are ±10% than the base case.

Our view of the impacts of each project on constraint costs

5.28. We note that NGET's analysis indicates significant variations in the potential impact on constraint costs as a result of the Window 2 projects. The costs are primarily dependent on whether the interconnector is importing electricity into GB or exporting electricity out of GB.

[42] This is due to the nature of the network; increase in flows into the South East area could reduce North-South flows on the system which cannot be related to specific reinforcements not now required. Likewise, any reinforcements which are identified as wider works for a specific connection will be identified as a result of the overall level of generation in the area, not just the generation/interconnector under review

5.29. We also note NGET's analysis suggests that the price of electricity will generally be lower in GB than in the connecting countries[43] in the early years but higher in later years. This suggests that the projects are likely to be import electricity in the early years and switch to exporting electricity to the connecting countries in later years.

<u>NeuConnect</u>

5.30. Under its high scenarios, NGET analysis suggests prices differences between GB and Germany will alternate from around 2026 and that this alternating price difference dictates direction of flow on the interconnector. NGET's analysis projects NeuConnect exporting electricity to Germany in the later years of the regime (when German prices are higher than GB). We note that NeuConnect potentially generates consumer benefits across all sensitivities and most years in the high scenarios by contributing to alleviating constraints on the B15 system boundary.

5.31. Alternatively, under NGET's low scenario, the cost of electricity in GB never falls below the German electricity price. As a result, NeuConnect is projected to mainly be exporting power out of Germany and into GB. We note that this may result in NeuConnect increasing constraint costs.

<u>GridLink</u>

5.32. NGET's analysis indicates that GridLink is likely to generate consumer benefits under for the majority of years studied in its Gone Green and Consumer Power Scenarios. Nominal changes in constraint costs under the ±10% price sensitives is indicative of GridLink being quite resilient to French electricity prices.

5.33. NGET's analysis further suggests GridLink may generate consumer benefit by allowing for alternative, more expensive, generation plant to be bid off the system and in doing so reduce constraints costs.

5.34. As with NeuConnect, NGET's analysis envisages GridLink contributing to an increase in constraint costs given that GB electricity prices are consistently higher than in the connecting country (France) in the low scenarios.

<u>NorthConnect</u>

5.35. We note that NGET's analysis indicates that the impact of NorthConnect on constraints indicates is expected to be most acute when NorthConnect is exporting power into GB (when European electricity prices are lower than GB). The impact is projected to be less pronounced in later years when NorthConnect may be exporting to Norway.

[43] The connecting countries being France (GridLink) Germany (NeuConnect) and Norway (NorthConnect).

5.36. NGET’s analysis indicates that NorthConnect may generate consumer benefits by contributing to alleviating constraint costs under its Gone Green scenario in the base case.

5.37. Similarly, the analysis suggests that NorthConnect may generate consumer benefits by alleviating constraints in later years under NGET’s base case, Slow Progression scenario.

Onshore reinforcement costs

5.38. Onshore reinforcement costs reflect the investment that is required by NGET to connect each interconnector to the transmission system. The costs are recovered through Transmission Use of System (TNUoS) charges, which are paid by users of the transmission network. These costs have been considered as part of our quantitative assessment of GB welfare impacts.

6. Hard-to-monetise assessment of interconnectors

Chapter Summary

This chapter summarises our assessment of the hard-to-monetise impacts of the three interconnector projects. The focus of this chapter is on our strategic and sustainability assessment in line with our Impact Assessment guidance.

We have concluded that the key benefits from GridLink and NorthConnect are through accessing substantially different electricity generation mixes and lower prices in France and Norway. The benefits from NeuConnect are through connecting to a new, cheaper, and highly interconnected market, with a high level of renewable energy.

Question box

Question 7: Have we appropriately assessed the hard-to-monetise impacts of the interconnectors?

Question 8: Are there any additional impacts of the interconnectors that we should consider qualitatively?

6.1. Our hard-to-monetise assessment of the three interconnectors has considered information received from the developers as well as our own qualitative analysis, including mid-tem strategic and long-term sustainability factors, in line with our Impact Assessment guidance.[44] The benefits identified below are similar to those identified for Window 1 projects as we believe the underlying impacts of interconnection have not fundamentally changed.

6.2. This hard-to-monetise assessment is concerned with longer-term sustainability and strategic issues, such as: optionality; diversity and resilience; pathways and lock-in; and natural asset and sustainability implications. These are defined in Appendix 4.

6.3. The overall conclusion is that there are positive impacts in the mid and long-term in many of the assessed areas as a result of GridLink, NeuConnect and NorthConnect. These positive impacts are driven by a number of factors, including increased system meshing[45]; access to cheaper and more diverse sources of electricity generation; and more efficient wind dispatch.

[44] See our Impact Assessment Guidance: https://www.ofgem.gov.GB/publications-and-updates/impact-assessment-guidance

[45] 'System meshing' refers to increasing the strength of transmission systems from interconnection.

Table 19: Summary of strategic impacts

2050: Long-term sustainability

Learning by doing and supply chain development	Pathways and lock-in
Supply chain: there is a potential for supply chain constraints as the cap and floor process and the exempt route could result in up to four additional interconnectors attempting to construct at similar times in addition to W1 projects which are due to come online by 2020. We would expect the supply chain to respond to the upcoming demand for assets by adding output capacity where possible. We would expect project developers to engage with the supply chain early on and we note from their submissions that this is underway to some extent. Learning by doing: there could be lessons learnt from NeuConnect that can be applied to similar projects in the future, as this would be the first connection to Germany.	Building interconnectors provides additional flexibility to the GB system and market arrangements. An increasingly meshed transmission network has greater ability to cope with a range of future pathways and energy system developments.

Natural assets and sustainability implications

Consistency with GB 2050 targets	Cumulative carbon impacts	Natural asset impacts
The three projects expected to have a positive impact in the long-term: • A high level of interconnection facilitates the achievement of long-term carbon targets by providing additional system flexibility. • Interconnection also adds market value to renewables, making wind more competitive through more efficient dispatch across two markets. • Connecting to countries with as much or greater shares of renewable and low carbon energy, furthers the realisation of this goal.	Cumulative carbon refers to the impact in delaying of carbon reduction policies. This proposal will have minimal impacts on cumulative GB carbon emissions.	Development of interconnectors is likely to be less disruptive than alternative options for electricity supply (such as additional power stations). • Onshore: all three projects plan to use underground onshore lines and cables, reducing the visual impacts of the projects. The onshore visual impact of the converter stations is also considered to be moderate relative to other electricity infrastructure developments. The choice of VSC technology expected to be used by all projects for onshore converter stations and/or substations has a smaller footprint than conventional converter stations. We expect project developers to address localised construction-related impacts wherever possible, including through consultation with local stakeholders and communities. • Offshore: the projects should have a small offshore impact (post-construction) as the cables will be buried subsea.

Summary of hard-to-monetise assessment

GridLink

6.4. GridLink is expected to provide net positive strategic and sustainable impacts. These are brought about by increasing the level of connection to a market with a significantly different and low-carbon electricity mix (e.g. 78% of France's electricity generated from nuclear[46]) and a growing proportion of renewable energy. This would contribute to GB security of supply and the achievement of long-term carbon targets.

6.5. ENTSO-E's TYNDP 2030 scenarios[47] expect lower but significant levels of nuclear and an increase in generation from RES in France's electricity mix, showing consistent long-term benefits. These benefits are reinforced by good existing trading arrangements between the GB and French system operators.[48]

NeuConnect

6.6. By connecting to a new market, NeuConnect is likely to provide net positive strategic and sustainable impacts. While the electricity generation mix in Germany is similar to GB, they have higher shares of generation from renewables which are expected to continue to increase in all TYNDP 2030 scenarios.

6.7. NeuConnect is expected to maximise the value of GB and German renewables through efficient dispatch across the two markets, particularly wind. The flow of weather patterns, as well as time and daylight differentials, contributes to this.

NorthConnect

6.8. NorthConnect is likely to provide similar levels of positive strategic and sustainable impacts as GridLink, given the connection to a significantly different and low-carbon electricity mix (e.g. 96% of Norway's electricity is generated from hydropower[49]).

6.9. NorthConnect's connection to Scotland is also likely to increase the integration of renewable energy sources and facilitate efficient dispatch of renewables across the two markets.

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[46] See IEA 2016, Energy Policies of IEA Countries: France https://www.iea.org/publications/freepublications/publication/Energy_Policies_of_IEA_Countries_France_2016_Review.pdf
[47] See TYNDP 2016 Scenario Development Report: https://www.entsoe.eu/Documents/TYNDP%20documents/TYNDP%202016/150521_TYNDP2016_Scenario_Development_Report_for_consultationv2.pdf
[48] There is a current framework for cross-border trades (e.g. SO-SO balancing trades) between system operators over the IFA interconnector. We have assumed that these arrangements can be extended to GridLink.
[49] See IEA 2015, Norway - Energy System Overview: https://www.iea.org/media/countries/Norway.pdf

Table 20: Summary of hard-to-monetise assessment

Benefit	GridLink	NeuConnect	NorthConnect
Connecting new providers of balancing services to the GB SO	**(+):** NGET report shows GridLink can provide benefits through provision of ancillary services. Good balancing arrangements are currently in place between the GB and French TSOs, but existing connections with France may limit benefits.	**(+)**: NGET report shows NeuConnect can provide benefits through provision of ancillary services. Connection to a new market, currently no existing balancing arrangements between GB-German TSOs. However, both NG and TenneT DE actively involved in early implementation of the European Balancing Network Code.	**(++):** NGET report shows NorthConnect can provide benefits through provision of ancillary services (Frequency Response and Black Start). Currently no balancing arrangements between GB-Norway TSOs. However, both NG and Statnett actively involved in early implementation of the European Balancing Network Code.
Providing alternative solutions to increase GB security of supply	**(++)** given: - access to high levels of nuclear generation in France leads to increase in fuel diversity; - interconnector mostly expected to import to GB leads to increase in capacity of supply; and - the high level of availability of the interconnector provides additional system security to the GB system.	**(+)** given: - access to a new and highly interconnected market leads to increase in diversity of supply. However, benefits are slightly limited given similar electricity generation mixes; - interconnector mostly expected to import to GB leads to increase in capacity of supply; and - the high level of availability of the interconnector provides additional system security to the GB system.	**(++)** given: - access to high levels of hydro generation in Norway leads to increase in fuel diversity; - interconnector mostly expected to import to GB leads to increase in capacity of supply; and - the high level of availability of the interconnector provides additional system security to the GB system.
Supporting the decarbonisation of energy supplies	**(++)**: high mix of imported low-carbon generation will displace GB thermal.	**(++)**: Lower carbon intensity of German power will displace GB thermal.	**(++):** high level of imports of renewable hydro generation will displace GB thermal.
Strategic and sustainability framework areas	**Generally positive mid-term stress and security implications** expected based on positive impact on security of supply, reduced potential for extreme prices and volatility, lower net combined carbon output through less carbon-intensive electricity imports. **Generally positive long-term sustainability implications** expected for GB as an increasingly meshed transmission network has greater ability to cope with a range of future pathways and energy system developments and the development of interconnectors might be less environmentally disruptive than alternative options for electricity supply.		

(+) Slight positive impact
(++) Strongly positive impact

7. Assessment of connection location, capacity, cable routes and technical design

Chapter Summary

This chapter provides a summary of our review of the capacity, connection location, cable route and technical choices for GridLink, NeuConnect and NorthConnect.

Question box

Question 9: Do you have any views on the information presented in this chapter?

7.1. This chapter is a summary of our review of each project's choice of connection location, interconnector capacity, cable route and technical design (e.g. converter technology and cable type). There is more detail in Appendix 5.

7.2. We will only re-examine connection location, capacity, cable route and technical design at the FPA stage if there have been significant changes to the information provided at the IPA stage. If there has not been enough information for us to reach a conclusion at the IPA stage, we will examine these aspects at the FPA stage.

7.3. We focus on the GB site for connection location as we expect that the regulatory bodies in the respective connecting countries will do their own assessment of connection locations within their regulated areas. Our assessment is informed by information provided by NGET, the GB system operator, and the CION process.

Connection locations

7.4. Each of the developers have participated in the CION process with NGET. This process seeks to identify the most economic and efficient connection location for such projects. We note that, as part the CION process, a number of different connection locations were considered for each of the projects.

7.5. We further note that the proposed connection locations specified by each project in its IPA submission is in line with location identified by the CION process as being the most economic and efficient.

Capacity

7.6. All three projects have elected to develop their respective interconnectors with a transmission capacity of 1.4GW (1400MW).[50] We consider the choice of transmission capacity for all three projects to be reasonable.

Cable routes

7.7. We note that, for all three projects, the final cable routes are subject to further assessments and as such are yet to be finalised.

7.8. The projects have provided details of factors that have been taken into account in planning the cable routes thus far and outlined plans for additional assessment to determine the final routes.

7.9. Given that the projects are at an early stage of development we do not have any material concerns with respect to cable routes at this time.

Technology choices

7.10. All three projects propose to use Voltage Source Converter (VSC) technology and the reasons given appear justified and sensible.

7.11. GridLink has specified cross-linked polyethylene (XLPE) as its preferred cable type based on what it considers to be a number of advantages over alternative options including lower costs, smaller size and weight per unit length, higher operating temperature and requiring fewer/less complex cable jointing.

7.12. NorthConnect and NeuConnect have not specified a preferred cable type and kept options open at this stage. We note that either XLPE or mass impregnated (MI) cable is compatible with their VSC technology choice.

[50] In the case of GridLink, we note that the project was initially envisaged as a 1.5GW (1500MW) interconnector and that the transmission capacity has since been revised to 1.4GW (1400MW)

8. Risks and issues

Chapter Summary

This chapter outlines some of the risks and issues that may affect project development and our assessment of the interconnector projects going forward.

8.1. Interconnectors are subject to a number of risks including changes to costs, regulation, political will and markets. We also recognise the impact Brexit may have on project development and the regulatory framework in which they will operate including the Internal Energy Market (IEM).

Regulatory arrangements in connecting countries

8.2. The regulatory arrangements in the connecting countries for the three Window 2 projects are currently either unclear or still being developed. Therefore, whilst regulatory treatment of the interconnector in GB is based on a settled regulatory route, the regulatory arrangements in the connecting countries are subject to further discussion between the developer and the relevant authorities in the connecting country.

8.3. While all three Window 2 projects have indicated in their IPA submissions that they have had positive discussions to date with the relevant NRAs on potential regulatory arrangements, there is a risk that developers and relevant authorities fail to reach an agreement, which may ultimately result in projects not progressing further from the IPA stage.

Changes to markets and underlying assumptions

8.4. There are a number of risks and uncertainties associated with the UK leaving the EU and a range of possible outcomes.

8.5. To the extent possible our modelled sensitivities include a wide range of future impacts on interconnectors, however, the exact arrangements that would be in place once these projects are operational is unclear.

Sources of information

8.6. We are unable to quantify and model any revenues that the projects may earn in addition to congestion revenue. We've taken a basic view on potential revenues from CM but treat this as a sensitivity. We view any additional revenues that an interconnector earns as upside and therefore beneficial to the business case as well as GB consumer welfare.

8.7. Data used for our modelling is derived from publicly available data sets. The data and assumptions used in any modelling can have significant impact on the outputs. Therefore, we use a number of scenarios and sensitivities to provide robust analysis. We have assessed our modelling against that of the developers and found a number of similarities as well as differences in assumptions and subsequent outputs.

8.8. Modelling informs our decisions, but is an input amongst other non-quantitative considerations, as set out in this consultation.

Supply chain risks and need to secure requisite consents and approvals

8.1. We acknowledge the potential for supply chain congestion, resulting from competing projects attempting to construct along similar timescales, and note the developers' plans to mitigate this risk.

8.2. We note that, across all three Window 2 projects, development of the interconnector is subject to further assessments[51] being conducted by or on behalf of the developers.

8.3. Developers also need to secure a range of requisite consents, licences or other forms of approval at various stages of development in order to progress the projects.

8.4. We wish to highlight that some of the processes for securing such approvals will likely be lengthy. Developers should keep risk mitigation plans for these areas under review as any significant delays may adversely affect project development to anticipated timescales or, ultimately, jeopardise the project if any necessary approvals cannot be secured.

8.5. We have extended our FPA submission deadline[52] to recognise these risks around the projects and we expect developers to ensure that assessments, approval processes and supply chain engagement are largely complete to inform the FPA submission.

[51]For example, to finalise technology choices and cable routes
[52] Now 3 years from IPA decision (was previously 2 years)

9. Assessment of project submissions

Chapter Summary

This chapter contains our assessment of project, finance, and supply chain plans submitted to us by the three interconnector developers.

Question box

Question 10: Do you have any comments on our assessment of the project plans?

9.1. In November 2015, we published a letter[53] to inform stakeholders that we would hold a second interconnector window. We also detailed the submission requirements, including sections such as project, finance and supply chain plans.

9.2. The table below outlines our high-level assessment against criteria for each of these sections. We have assessed each project in a similar manner to Window 1 projects. A green marking indicates that we do not have any concerns on the criterion, based on the information received. A yellow marking indicates we have some minor concerns around how the project meets the criterion, but these risks could be managed by the developers and have a less material impact on the GB. A red marking indicates a criterion that we have serious concerns about the project meeting this criterion. We explain our reasons behind any amber or red markings below.

Table 21: Assessment of project plans to 2022[54]

Required information	Identified criteria	Our assessment		
		GridLink	NeuConnect	NorthConnect
Project plans	All the key milestones are included.			
	Plan is robust and achievable.			
	Contingencies are identified and addressed.			
Detail on discussions held with NRAs and governments incl. future plans (including in connecting country)	Discussions with relevant stakeholders included.			
	Summary demonstrates clear understanding of connecting market process.			

[53] Decision to open a second cap and floor application window for electricity interconnectors in 2016

[54] Any areas of concern (non-green) are noted for the relevant project below.

Supply chain and procurement plans	Engagement so far is sufficient level.			
	Contingencies identified and addressed.			
Financing plans	Description of plan with supporting evidence, funding sources and partners, terms and timelines.			
Risks and dependencies	Risks identified and mitigation measures included.			
Indication of FPA submission and FID	Planned timings and approach are realistic.			
Hard to monetize assessment (developer evidence)	Provides evidence for non-quantifiable impacts of project.			

GridLink

9.3. We note that the supply chain and financing plans are quite high level and contain limited detail. We further note that the submitted plans describe anticipated rather than actual engagement with relevant parties in a number of areas.

9.4. We recognise that this may be indicative of the project being in the early stages of development. We expect to receive more detailed information on project plans as part of GridLink's quarterly progress updates, post-IPA. We would also expect to see evidence of increased engagement with the supply chain and relevant stakeholders as the project develops.

NorthConnect

9.5. We have similar observations to that of GridLink with respect to the supply chain and financing plans provided by NorthConnect. We would expect to see more detailed information, as the project develops, as part of NorthConnect's quarterly progress updates, post-IPA.

9.6. We would also expect to see an increased level of engagement with relevant parties as the financing strategy and supply chain approach becomes clearer.

NeuConnect

9.7. NeuConnect notes discussions with relevant stakeholders including the German TSO TenneT and the German regulator. At the time of application this engagement is quite high level and we recognise that there is little clarity around the regulated approach in the connecting country.

9.8. We would expect to see an increased level of engagement and progress on the regulated route and connection.

General comments

9.9. We note that the proposed timescales for all three projects to conduct further assessments in order to finalise project parameters, secure necessary consents, and proceed to project completion are extremely tight. The timescales anticipated by the projects could be further compounded by potential supply chain constraints.

9.10. We also note that, for all three projects, the regulatory arrangements in the connecting countries are yet to be finalised and that this could potentially adversely impact delivery to projected timescales. Whilst challenging, the timescales at this point remain feasible in our view.

9.11. Further information regarding timings is provided in Chapter 10.

10. IPA conditions and next steps

Chapter Summary

This chapter sets out the conditions that any decision to award a cap and floor regime is contingent upon. It also describes the next steps following this consultation.

IPA conditions

10.1. Our minded-to position to award these projects a cap and floor regime in principle is contingent upon the following conditions (the 'IPA conditions').

1. **If any information given to us before making our FPA decision leads us to consider that the basis of our IPA decision has materially changed, then we may choose to require a new IPA stage.**

2. **We will also reconfirm at the FPA stage that the assumptions regarding connected country energy market access and electricity trading rules on which the IPA decision was based remain broadly correct at the time of the FPA.** Should this position change, Ofgem reserves the right to revisit the needs case in order to confirm whether or not the project continues to be in consumers' interests and should continue to be granted a cap and floor arrangement.

3. **Project progress is generally in line with the timelines, cost estimates and commercial arrangements provided in the project submissions**. For cost estimates, the condition is that the costs submitted by the project developers do not materially rise.

4. **Developers must also:**

    (a) **Submit sufficiently detailed information for our FPA to start within three years of an IPA decision.** This information will need to be informed by detailed discussions with the supply chain and tender returns to support cost estimates.

    (b) **Submit quarterly written reports on progress against a number of key development milestones**, including (but not limited to) development work, consenting and permitting, procurement, financing, operational management plans and costs, project management and other factors that had an impact on our IPA welfare assessment.

    (c) **Confirm the timing of FPA submission in writing to Ofgem at least two months before the expected submission date.**

    (d) **Give formal written notice of any material changes to the project's design, such as changes in capacity, connection location or connection date**. Following any such change, developers must explain the rationale for the change and the implications for project costs and delivery timescales.

10.2. It should be noted that, in reaching our IPA minded-to position, we have assumed project costs will be shared on a 50:50 basis[55] as per the default cap and floor regime.

Next steps

10.3. We are consulting on our minded-to position to grant these three projects a cap and floor in principle, for eight weeks. This consultation will close on 14 August 2017. Details on how to respond to this consultation are included in Appendix 1.

10.4. Following this consultation we will assess responses. Subject to these responses, we aim to make a decision on the IPA for these three projects in September 2017. Developers that pass the IPA stage will then need to submit detailed cost information at the FPA stage, nearer to an investment decision. The provisional cap and floor levels will be set at the FPA stage following our cost assessment.

10.5. We have further considered some parameters of the regime and these are discussed in detail in Appendix 6.

FPA timings

10.6. Projects will have 3 years from the date of the IPA decision, which follows this consultation, to submit the relevant information for the FPA.

Future windows

10.7. We have now run two cap and floor application windows, in 2014/15 and in 2016/17. As part of our Window 1 IPA decision, we committed to hold a Window 2.

10.8. **We will not open a third application window in 2017/18.** Looking further ahead, in 2018/19 we expect to conduct a review of the need for, and timing of, any future cap and floor application windows.

[55] Subject to any variation request that is approved and specfies otherwise. See chapter 10 for further details on regime variations.

Appendices

Index

Appendix 1 – Consultation response and questions

1.1. We would like to hear your views on anything in this document. We especially welcome responses to the specific questions at the beginning of each chapter and which are replicated below.

1.2. Please send responses by 14 August 2017 to:

- Ikbal Hussain
  Interconnectors, Networks
  9 Millbank, London SW1P 3GE
  0207 901 7049
  Cap.Floor@ofgem.gov.uk

1.3. Unless marked confidential, all responses will be published by placing them in our library and on our website www.ofgem.gov.uk. Respondents may request that their response is kept confidential. We shall respect this request, subject to any obligations to disclose information (for example under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004).

1.4. Respondents who wish to have their responses remain confidential should clearly mark the document(s) to that effect and include the reasons for confidentiality. It would be helpful if responses could be submitted both electronically and in writing. Respondents are asked to put any confidential material in the appendices to their responses.

1.5. Having considered the responses to this consultation, we intend to make a final decision on the IPA for GridLink, NeuConnect and NorthConnect. Any questions on this document should, in the first instance, be directed to:

- Ikbal Hussain
  Interconnectors, Networks
  9 Millbank, London SW1P 3GE
  0207 901 7049
  Cap.Floor@ofgem.gov.uk

Chapter Three

Question 1: Do you agree with our minded-to positions on the three projects considered in this consultation?

Question 2: Is there any additional information that you think we should take into account when reaching our decision on the IPA of the projects?

Chapter Four

Question 3: What are your views on the approach Pöyry has taken to modelling the impact of cross-border interconnector flows?

Question 4: Do you have any additional evidence in this area that we should take into account?

Chapter Five

Question 5: Do you have any views on the information presented in this chapter?

Question 6: Are there any additional factors that you think we should have considered?

Chapter Six

Question 7: Have we appropriately assessed the hard-to-monetise impacts of the interconnectors?

Question 8: Are there any additional impacts of the interconnectors that we should consider qualitatively?

Chapter Seven

Question 9: Do you have any views on the information presented in this chapter?

Chapter Nine

Question 10: Do you have any comments on our assessment of the project plans?

Appendix 2 –Impact Assessment form

Title: Cap and floor regime: Initial Project Assessment of the GridLink, NeuConnect and NorthConnect interconnectors	**Impact Assessment (IA)**
Division: Networks **Team:** Interconnectors	Type of measure: Specific incentives for Interconnectors
Associated documents: Pöyry Report, NGET Qualitative Report, NGET Quantitative Report	Type of IA: Qualified under Section 5A UA 2000
Coverage: Full coverage of policy decisions in the associated documents	Contact for enquires: Scott Laczay

Summary: Intervention and Options

Rationale for intervention, objectives and options

What is the problem under consideration? Why is Ofgem intervention necessary?

Benefits of interconnection

Interconnectors can offer significant benefits to existing and future consumers including lower electricity bills, supporting decarbonisation and enhancing security of supply.

Rationale for Cap and Floor

The cap and floor regime facilitates the delivery of more interconnection in a way that is economic, efficient and timely. The regime invites submissions from interconnector developers within a time-bound application ‘’window’.

Window 2 is the second opportunity for developers to bring forward plans. At this, the IPA Stage, Ofgem assesses which projects are in the interests of GB consumers and should be awarded a cap and floor regime in principle.

The IPA serves as a way for Ofgem to interrogate and assess the needs case for projects, the impacts they might have on current and future consumers as well as wider implications for GB and connecting countries.

For more information see Chapter 1.

What are the objectives and intended effects including the effect on Ofgem's Strategic Outcomes

The immediate objectives are to provide a regulatory route for interconnector projects that are in the interests of GB consumers. This is in line with our August 2014 decision to roll out the cap and floor regime to near-term electricity interconnectors.

The key strategic outcomes are to secure access to cheaper electricity supplies, enhance security of supply and resilience.

What are the options that have been considered? Please justify the preferred option

The interconnectors considered are identical in size (1,400MW) and assumed to be commissioned on 1 January 2022.

Project	Connected country
NeuConnect	Norway
GridLink	Germany
NorthConnect	France

The option for each interconnector is to:

- Reject
- Approve cap and floor

The preferred option is to approve the award of a cap and floor regime to NorthConnect GridLink and NeuConnect. GB welfare as modelled by Pöyry, indicates a downside risk to consumers in certain scenarios. Details of this can be found in table 7, Chapter 3.

Preferred option - Monetised Impacts (Euro million)

Business Impact Target Qualifying Provision	Not applicable
Business Impact Target (EANDCB)	Not applicable

For detailed analysis, see Chapter 3 and Chapter 4.

Explain how was the Net Benefit monetised, NPV or other
NPVs are in 2015 financial year prices discounted at 3.5% to 2022.
Appraisal period is from 2022 to 2046.
The approach is described in detail in Pöyry's report.

Preferred option - Hard to Monetised Impacts

Describe any hard to monetised impacts, including mid-tem strategic and long-term sustainability factors following Ofgem IA guidance

Connecting new providers of balancing services to the GB SO: All three interconnectors will create benefits.
Security of Supply: All three interconnectors will have benefits in terms of security of supply but these are most secure for GridLink and NorthConnect, which connect to nuclear based and hydro-based energy systems of France and Norway respectively.
Decarbonisation: Each interconnector will lead to low-carbon imports displacing thermal generation. The extent of this impact is difficult to model given wider system implications of cross border trading.
For more information, see Chapter 5 and Appendix 4.

Key Assumptions/sensitivities/risks

Assumptions
- Pöyry model is generally more conservative than that of developers'
- Energy Policy in connected countries not subject to dramatic change

Scenarios
- Considers what states of the world may generate high and low interconnector value.

Sensitivities
- Policy convergence (e.g. EU ETS and BSUoS).
- Project delays

Risks
- Assumptions taken, changes in the wider market and/or energy system, competition from other technologies

For more detail, see Chapter 8.

Will the projects be reviewed? Yes – at Final Project Assessment (FPA) stage and sooner as and when any significant project changes occur via our quarterly monitoring exercise.	**If applicable, set review date:** 3 years from the date of the IPA decision

Appendix 3 – Additional Impact Assessment considerations

Overview of appendix

1.1. Section 5A of the Utilities Act 2000 puts a duty on the Gas and Electricity Markets Authority (the Authority) to carry out an Impact Assessment (IA) for any proposal it believes to be important. Legislation defines 'important' by reference to a proposal which would involve a major change in our activities or significantly impact industry participants, the general public or the environment.

1.2. Our Impact Assessment (IA) of the three interconnector projects being considered for a cap and floor in principle is embedded throughout the main body of this consultation and summarised in Appendix 2.

1.3. This Appendix includes consideration of additional items required in our Impact Assessment guidance[56] but not covered in the main body of our consultation. The aim of this Appendix is to ensure that we have fully considered the impacts of the projects being granted a cap and floor in principle, against a baseline whereby the projects are not granted a cap and floor and do not go ahead.

1.4. The areas covered in this appendix, to supplement the main consultation document, are as follows: impact on competition; impact on existing and future interconnectors; impact on customers in vulnerable situations; and impact on health and safety. The impacts identified are similar to our Window 1 cap and floor assessment[57] as we believe the underlying considerations have not changed.

Impact on competition

1.5. Interconnectors can have a positive impact on competition in the generation of electricity, as we discussed in our IA for Nemo Link[58] and our NSN consultation document.[59]

1.6. Interconnection enables cross-border electricity flows and therefore results in larger electricity markets. This allows for increased numbers of market players to participate in both the generation and supply of electricity. Benefits of competition can

[56] Impact Assessment guidance: https://www.ofgem.gov.GB/publications-and-updates/impact-assessment-guidance
[57] See Initial Project Assessment for the FAB Link, IFA2, Viking Link and Greenlink interconnectors: https://www.ofgem.gov.GB/publications-and-updates/cap-and-floor-regime-initial-project-assessment-fab-link-ifa2-viking-link-and-greenlink-interconnectors
[58] See Nemo Link IA: https://www.ofgem.gov.GB/publications-and-updates/cap-and-floor-regime-application-project-nemo-impact-assessment
[59] See NSN Link consultation: https://www.ofgem.gov.GB/publications-and-updates/cap-and-floor-regime-initial-project-assessment-nsn-interconnector-norway-0

be realised as new entrants participate across connected markets and incumbents face increased pressures to reduce costs.

1.7. For the Nemo Link project, the accompanying study included quantified competition tests in the form of concentration ratios and Herfindahl-Hirschmann Indices.[60] The results outlined that Nemo Link would have a small but positive impact on competition when testing the effect by market share.

1.8. We have not carried out quantified analysis of the impact of the three eligible interconnectors on competition in the GB wholesale market. This is because we consider that the analysis would give similar results as for Nemo Link when assessed individually. This would similarity be driven by factors such as the technology and asset type, and the timing of connection to the GB market. Overall, we expect the three Window 2 interconnector projects to marginally increase competition in GB, but that this increase would be small in relation to the total size of the GB wholesale market.

Impact on existing and future interconnectors

1.9. The impact on existing and future interconnectors is related to the consideration of competition, as the impact is brought about by the competition between interconnectors.

1.10. The quantitative modelling in the Pöyry report published alongside this consultation document has assessed the effects on existing and future interconnectors. This can be seen in the values attributed to interconnector welfare. This includes the erosion impact that GridLink, NeuConnect and NorthConnect would have upon the revenue of existing interconnectors.

Impact on customers in vulnerable situations

1.11. In line with our IA guidance, we have considered the impact of our proposal on individuals who are disabled or chronically sick, of pensionable age, with low incomes, or residing in rural areas[61] and other customers in vulnerable situations.[62]

1.12. Our expectation is that GridLink, NeuConnect and NorthConnect will provide significant benefits for GB consumers. Part of this benefit is the import of lower priced electricity, hence the lowering of energy bills for energy consumers. Our modelling indicates that in the base scenario, GridLink, NeuConnect and NorthConnect combined provide greater than £7bn of net welfare benefit for GB consumers over the project lifetimes.

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[60] The Herfindahl-Hirschmann Index is the sum of the square of the market share of firms in a market. The HHI scale ranges from a complete monopoly to a theoretical fully competitive market.
[61] We have a specific duty to consider the interests of these consumers in section 4AA of the Gas Act 1986 and section 3A of the Electricity Act 1989.
[62] By 'vulnerable situations' we mean those situations described in our Consumer Vulnerability Strategy.

1.13. We acknowledge that there is potential for bills to rise, in relative terms, as a consequence of payments when the interconnector revenues fall below the floor. These price impacts may be felt more keenly by customers in vulnerable situations. However, in the base scenario and sensitivities we see significant benefits to consumers that outweigh any floor payments.

Impact on health and safety

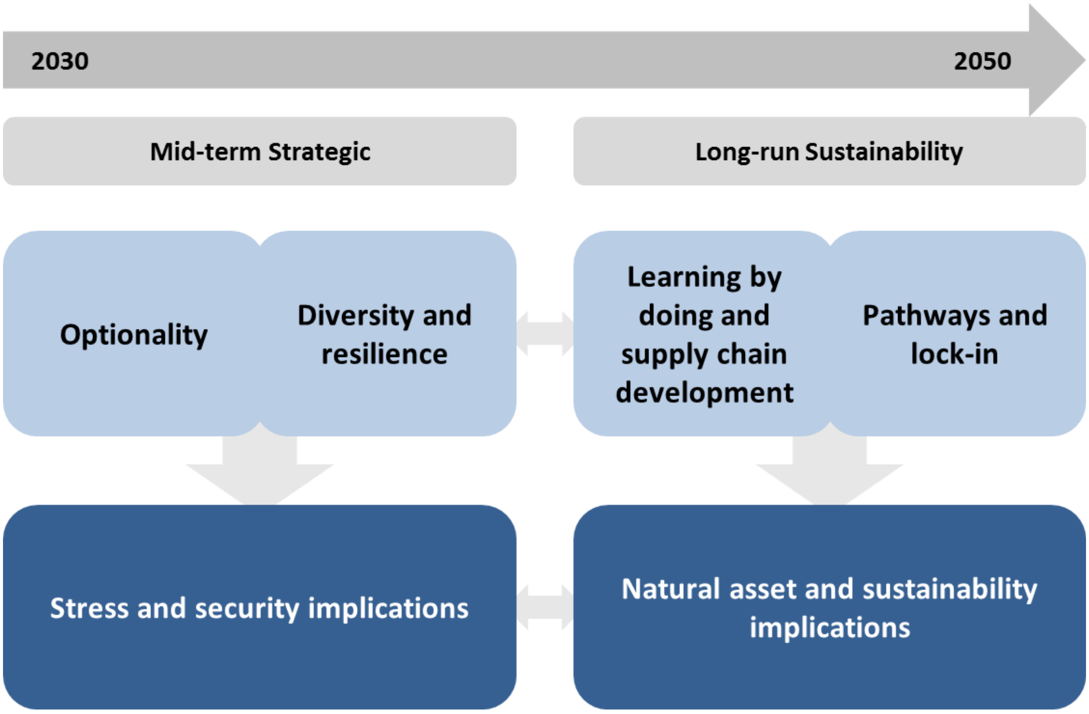
1.14. We recognise that the Health and Safety Executive (HSE) is the principal regulator of safety and believe it is important to support the functions that it performs.

1.15. It is our view that there are no additional risks resulting from the development of interconnectors than from the development other types of network infrastructure.

1.16. We consider the potential negative impacts of the development of the cap and floor regime for the three interconnectors to be normal health and safety risks. These normal risks are associated with the installation, operation and maintenance of the interconnector and associated equipment. We consider that these can be controlled by safe working practices and compliance with relevant legislation by the project developers.

Appendix 4 – Information on our assessment of hard-to-monetise impacts

1.1. Our chapter on hard-to-monetise impacts includes a summary of our assessment of strategic and sustainability impacts, in line with our Impact Assessment guidance.[63] The figure below provides a high-level overview of the evaluated areas.



1.2. We provide further detail on the issues considered below:

- Optionality: The evaluation of specific, realistic options that may be enabled or prevented by a decision. Optionality is about recognising the value of maintaining flexibility and keeping options open to help accommodate future uncertainty.

- Diversity and resilience: Resilience is defined as the energy system's capacity to tolerate disturbance and continue to deliver energy services to consumers. A resilient energy system can recover from shocks quickly and still meet energy needs even if external circumstances have changed. In general, diversity is considered to increase resilience.

[63] See our Impact Assessment guidance: https://www.ofgem.gov.GB/publications-and-updates/impact-assessment-guidance

- Stress and security implications: This concerns the effect on security of supply; potential for extreme price and/or volatility in the market; and the GB's legally binding energy targets.

- Learning by doing and supply chain development: This is the consideration that there can be potential savings in cost by one company/individual going through a process and passing that learning onto others. This can result in a more efficient process via sharing of 'learned efficiencies'.

- Pathways and lock-in: Pathways is the idea that past decisions or events can affect the likelihood of future decisions, e.g. one decision precludes another. Lock-in is where pathways make certain desirable options unachievable.

- Natural assets and sustainability implications: This concerns the effect on consistency with GB 2050 targets; natural asset implications; and longer-term greenhouse gas (GHG) considerations.

Appendix 5 – Connection location, cable routes and technical design

1.1. Chapter 7 provides an overview of each developer's justification for choice of connection location, cable route and technology. This Appendix provides further detail on these choices. Each developer, as part of its cap and floor application, provided us with the information below.

GridLink	
Connection location	• The CION process has identified Kingsnorth as the most economic and efficient connection location. Alternative connection points at Cleve Hill, Coryton, Grain, Kemsley, Northfleet East and Rayleigh Main were considered and discounted as part of the CION process.
Cable routes	• The proposed route seeks to minimise the crossing of international and national protected areas for nature conservation. • Negotiations related to the land acquisition and easements are in progress. • The final converter station location and cable routes are subject to further negotiations and yet to be finalised. • The offshore cable route has been defined taking into account a number of factors including, Water depths and tides, geological conditions and Third party cables and pipelines.
Technology choices	• GridLink intends to use VSC converter technology and considers it to have a number of advantages over alternative options. • Cross-linked polyethylene (XLPE) specified as preferred cable type based on what GridLink considers to be a number of advantages over alternative options including, lower costs, smaller size and weight per unit length, higher operating temperature and requiring fewer/less complex cable jointing.

NeuConnect	
Connection location	• NeuConnect conducted feasibility studies and options assessments with a view to identifying the most appropriate connection location. A number of potential connections locations were considered as part of this process, including Greystones, Creyke Beck and Cottam. The CION process ultimately identified Grain as the most economic and efficient connection location.
Cable routes	• NeuConnect intends to appoint marine consultants to further develop the offshore cable route. • Initial cable routes have been developed taking into account a number of factors including requirements to minimise the cable length and number of pipeline/cable crossings as well a range pf technical and environmental considerations.
Technology choices	• VSC technology is the preferred choice. NeuConnect cite a number of disadvantages of using Line Commutated Converter (LCC) compared to VSC. • Choice of cable type yet to be determined but note that both MI and XLPE are compatible with VSC technology choice.

NorthConnect	
Connection location	• NorthConnect's own assessment identified Peterhead as the optimum connection location. A feasibility study by NGET and the subsequent CION process confirmed Peterhead the most economic and efficient connection location.
Cable routes	• Cable routes options to be assessed and defined
Technology choices	• VSC is the preferred option • Cable choice kept open at this stage. Both XLPE and MI cable compatible with VSC technology

Appendix 6 - Regime Parameters

1.1. This Appendix sets out our position on some regime parameters, namely Interest During Construction (IDC), as well our position and the approach toward variations from default regime parameters.

Interest During Construction

1.2. We propose the following updates to IDC for interconnectors.

1.3. We consulted in October 2013 on the appropriate approach to IDC for Nemo Link, the first interconnector to participate in the cap and floor regime. In our consultation,[64] we proposed two uplifts to IDC for Nemo Link to reflect the specific nature of interconnector investment. We decided then that Nemo Link faced a greater degree of asymmetric development and cost assessment risk than comparable infrastructure projects. Therefore, we applied two uplifts; one for additional construction risk and one for additional project development risk.

1.4. In our decision, we stated that we would review the application of such uplifts for future projects. We no longer think providing an additional construction premium is either necessary or appropriate. As part of the NSL Final Project Assessment consultation and decision, we have provided clearer time, process and scope for the Post Construction Review (PCR) process. This will continue to develop further as projects in the pipeline advance.

1.5. **We are minded not to apply a construction risk premium uplift to the IDC for Window 2 projects**. We expect construction risk to be factored into project cash-flows rather than reflected in the IDC rate.

1.6. **We are minded not to apply a development risk premium uplift to the IDC for Window 2 projects**. We expect development risk to be factored into project cash-flows rather than reflected in the IDC rate.

1.7. **We are minded to apply the methodology for the calculation of IDC which is in use for the calculation of IDC for Offshore Transmission (OFTOs)**.

1.8. The IDC rate applied to any interconnector project will be the rate in force in the year of project FID.

[64] Proposed interest during construction approach for offshore transmission and Project NEMO

Requesting variations to the regime

1.9. In December 2015 we published an open letter[65] reiterating that developers may request regime variations provided they can demonstrate that these are in the interests of GB consumers. One of the reasons we adopted this policy was to reflect that certain aspects of the default regime may be less suitable for some types of financing solutions.

1.10. Indicative cap and floor levels for all Window 2 projects were established using the default cap and floor model parameters, as noted in our May 2016 letter.[66]

1.11. We will consider requests for adjustments to aspects of the cap and floor regime on a project-specific basis and project developers need to demonstrate that any regime variations are in the interests of consumers. Variations should be requested as a single package, and not before Ofgem publishes a decision on IPAs for Window 2 projects.

1.12. In making our determination of the impacts on consumers, we will include the impact of any regime changes on consumer welfare and liability (e.g. the floor). When assessing variations, we will base our decision on their cumulative impact.

1.13. Developers should refer to our December 2015 letter for further detail on the requirements of requesting variations.

[65] Enabling a range of financing solutions under the cap and floor regime
[66] Cap and floor regime summary for the second window

Appendix 7 – Glossary

A

Ancillary services

Contracted services (such as frequency response and black start) available to the System Operator in order to maintain balance and to ensure the security and quality of electricity supply across the system.

B

BritNed

1000MW electricity interconnector between Great Britain and Netherlands, operational since April 2011.

BEIS

Department of Business, Energy and Industrial Strategy

Black Start

The procedure to recover from a total or partial shutdown of the GB Transmission System. This entails isolated power stations being started individually and gradually being reconnected to each other in order to form an interconnected system again.

BSUoS

Balancing Services Use of System; a charge that recovers the cost of day to day operation of the transmission system. Generators and suppliers are liable for these charges, which are calculated daily as a flat tariff across all users.

C

Capital expenditure (capex)

Expenditure on investment in long-lived network assets, such as converter stations.

Connection date

The date from which a project developer has an agreement in place to allow for the transfer of electricity to and from the GB electricity transmission system.

Cost assessment

A process which enables us to determine the efficient levels of project expenditure.

Cost-benefit analysis (CBA)

An evaluation of project costs against the upside benefits that such a project could provide.

Constraint costs

A constraint occurs when the capacity of transmission assets is exceeded so that not all of the required generation can be transmitted to other parts of the network, or an area of demand cannot be supplied with all of the required generation. The associated cost are the actions to re-dispatch generators to correct these system issues.

Consumer Welfare

Is the economic wellbeing (welfare) of consumers as measured by Cost Benefit Analysis

D

DC

Direct current.

DECC

Department of Energy and Climate Change (now BEIS)

Developer-led cap and floor regime

An approach whereby private developers identify the need for new capacity and build, own and operate the assets, but where returns are bounded by a cap (maximum return) and floor (minimum return).

E

East-West Interconnector (EWIC)

500MW HVDC electricity interconnector between GB and Ireland.

ElecLink

1000MW HVDC interconnector between GB and France currently under construction.

ENTSO-E

European Network of Transmission System Operators for Electricity.

EU

European Union.

European Network Codes

A European process to develop detailed legislation that establish common technical and commercial rules governing access to energy networks, and remove barriers to trade between EU Member States.

F

FAB Link

France-Alderney-Britain. Proposed 1400MW HVDC electricity interconnector between GB and France (Via Alderney).

Final Project Assessment (FPA)

The stage at which we propose to examine detailed cost information for projects that apply for a cap and floor regulatory regime and have been recommended at the initial project assessment stage. At this stage we propose to make our final decision on granting a cap and floor regulatory regime to projects.

Frequency Response

Frequency Response is a continuously provided service used by NGET to manage the normal second by second changes on the national system transmission system

G

GB

Great Britain.

Greenlink

Proposed 500MW HVDC electricity interconnector between GB and Ireland.

GW

Giga Watt.

GridLink

Proposed 1400MW HVDC electricity interconnector between GB and France.

H

HVDC

High Voltage Direct Current.

I

IFA

Interconnexion France-Angleterre. 2000MW HVDC electricity interconnector between France and GB.

IFA2

Interconnexion France-Angleterre 2. Proposed 1000MW HVDC electricity interconnector between France and GB.

Initial Project Assessment (IPA)

Our proposed initial project assessment will be our first assessment of the needs case of eligible interconnector projects. At this stage we will assess whether there is a case for the project based on projected costs and benefits.

Integrated Transmission Planning and Regulation Project (ITPR)

A project to review the GB electricity transmission arrangements for system planning and delivery that currently apply to onshore, offshore and interconnector assets.

Interconnector

Physical links which allow for the transfer of electricity across borders.

Interconnector Welfare

Is the economic wellbeing (welfare) of interconnector owners as measured by Cost Benefit Analysis

M

Moyle

450MW Interconnector between GB (Scotland) and Ireland.

Multiple Purpose Project (MPP)

A project that features some combination of onshore transmission, offshore transmission or interconnection. For example, a project that combines connection of offshore generation with interconnection to a different market.

MW

Mega Watt.

N

National Electricity Transmission System Operator (NETSO)

The entity responsible for operating the GB electricity transmission system and for entering into contracts with those who want to connect to and/or use the electricity transmission system, currently NGET.

National Grid Electricity Transmission (NGET)

NGET owns and maintains the onshore high-voltage electricity transmission system in England and Wales. It also acts as the National Electricity Transmission System Operator for GB.

Nemo Link

1000MW HVDC electricity interconnector between Belgium and Great Britain currently under construction.

NeuConnect

Proposed 1400MW HVDC electricity interconnector between GB and Germany.

NorthConnect

Proposed 1400MW HVDC electricity interconnector between GB and Norway.

NSN/NSL

Proposed 1400MW HVDC electricity interconnector between GB and Norway.

NRA

National Regulatory Authority.

O

Ofgem

Office of Gas and Electricity Markets. Ofgem supports the Gas and Electricity Markets Authority (GEMA) in its day to day work.

P

Producers

Term used for electricity generators.

Producer Welfare

Is the economic wellbeing (welfare) of producers (generators) as measured by Cost Benefit Analysis

R

Reactive Response

The ancillary service used by NGET to manage voltage levels locally and ensure the voltage profile of the transmission system stay within statutory limits.

S

System Operator (SO)

The entity charged with operating the GB high voltage electricity transmission system, currently NGET.

System Operator – System Operator (SO-SO) Trades

Actions taken between system operators following gate closure, either to elevate constraints or to manage system margins via interconnectors.

T

TNUoS

Transmission Network Use of System; charges recover the cost of installing and maintaining the transmission system in England, Wales, Scotland and offshore.

Transmission Owner (TO)

An owner of a high-voltage transmission network or asset.

Transmission System Operator (TSO)

Entity in charge of operating transmission assets, either for electricity or gas.

V

Viking Link

Proposed 1400MW HVDC electricity interconnector between GB and Denmark.

Appendix 8 – Feedback Questionnaire

We want to hear from anyone interested in this document. Send your response to the person or team named at the top of the front page.

We have asked for your feedback in each of the questions throughout it. Please respond to each one as fully as you can.

Unless you mark your response confidential, we'll publish it on our website, www.ofgem.gov.GB, and put it in our library. You can ask us to keep your response confidential, and we'll respect this, subject to obligations to disclose information, for example, under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004. If you want us to keep your response confidential, you should clearly mark your response to that effect and include reasons.

If the information you give in your response contains personal data under the Data Protection Act 1998, the Gas and Electricity Markets Authority will be the data controller. Ofgem uses the information in responses in performing its statutory functions and in accordance with section 105 of the Utilities Act 2000. If you are including any confidential material in your response, please put it in the appendices.

General feedback

We believe that consultation is at the heart of good policy development. We are keen to hear your comments about how we've conducted this consultation. We'd also like to get your answers to these questions:

1. Do you have any comments about the overall process of this consultation?
2. Do you have any comments about its tone and content?
3. Was it easy to read and understand? Or could it have been better written?
4. Were its conclusions balanced?
5. Did it make reasoned recommendations for improvement?
6. Any further comments?

Please send your comments to stakeholders@ofgem.gov.uk