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

Consultation

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Contact: Stuart Borland

Team: Electricity Transmission Investment

Tel: 020 7901 7134

Email: Cap.Floor@ofgem.gov.uk

Overview:

We are consulting on our minded-to position on our Initial Project Assessment of the NSN interconnector to Norway. It considers the need for the interconnector and interactions between this project and other potential near-term projects. We have decided to consult on the NSN project before other eligible projects as it is the most advanced project and is close to taking an investment decision. Our Initial Project Assessment for the four other interconnector projects will be published in early 2015. This consultation also gives our views on some aspects of the Final Project Assessment of NSN.

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, building on our work on the cap and floor regime for the proposed new interconnector to Belgium (the Nemo project). Our August 2014 decision confirmed this approach and established our cap and floor assessment process. Five projects applied for cap and floor regulation in our first application window and we decided in October 2014 that all five projects were eligible for our Initial Project Assessment (IPA) stage.

This consultation provides our minded-to position on our IPA of the NSN project, a proposed 1.4GW interconnector between GB and Norway. We have prioritised assessment of the NSN project as the project is close to taking an investment decision. We will consult on our IPA for the other four eligible projects in early 2015.

Associated documents

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

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

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

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Executive Summary

Electricity interconnectors can offer significant benefits to existing and future consumers, but interconnection between GB and other markets remains limited. This is why we have put in place our cap and floor regime for new electricity interconnectors. We want to facilitate the delivery of more interconnection in a way that's economic, efficient and timely.

We think developing the NSN interconnector under the cap and floor regime would be in the interest of existing and future consumers.

We are therefore minded to award NSN a cap and floor regime in principle and subject to no material escalation in costs. We are now seeking views on this minded-to position.

About the NSN project

Our first cap and floor application window closed in September 2014. We received five eligible project applications. We have finished our Initial Project Assessment (IPA) of the NSN project, which is being developed by National Grid Interconnector Holdings Limited (NGIH) and Statnett. This interconnector would link the GB and Norwegian electricity systems via a subsea cable, allowing GB and Norway to trade power. At just over 700km, it would be the longest subsea interconnector in the world. It is scheduled to start operating in 2020 and would have a capacity of 1.4GW. Project costs and revenues would be split 50:50 between GB and Norway, so half of these would be covered by the GB cap and floor regime.

What our assessment shows

Our assessment suggests that NSN will bring benefits to GB consumers by reducing the wholesale price of electricity, improving the operation of the GB transmission system, and increasing security of supply. Under the Base case scenario that we have modelled, the interconnector would deliver benefits to GB consumers of around £3.5 billion over the 25-year cap and floor regime. The benefits to GB consumers remain positive even in the Low scenario (which represents a downside case for the value of the interconnector).

Our analysis shows that in 2020 under the Base case scenario, the average annual GB domestic consumer bill would fall by around £2 due to NSN. This is primarily driven by the wholesale price reductions that trade with Norway is expected to deliver.

The modelling suggests benefits to overall GB welfare of around £490 million under the Base scenario. If the impact of GB capacity market payments to NSN is taken into account, the measured impact on GB welfare is slightly worsened, but likely to remain positive. Overall GB welfare is even higher in the High scenario, whereas in the Low scenario the overall GB welfare impact becomes negative. The project is likely to deliver overall benefits to Norway as well (around £330 million in the Base case).

This total quantifiable GB consumer benefit above includes the impacts of wholesale price reductions, cap and floor payments, onshore reinforcement costs and system operation impacts. In addition to these factors there are also more qualitative benefits that we think NSN will deliver.

In particular, we expect reductions in long-term GB carbon emissions through more efficient renewables dispatch (ie making better use of GB wind and Norwegian hydro resources). NSN can also help to maintain security of supply by increasing generation mix diversity, and increasing system flexibility and resilience to extreme events. It should also help to reduce wholesale price volatility.

Our initial assessment is that NSN's choice of GB connection point, cable route, and technology choice appear sensible and justified. Analysis provided by the system operator shows that NSN can bring a number of benefits for GB system operation (such as black start capability and frequency response).

About this consultation

The IPA stage assesses the five projects' impacts on GB consumers and GB welfare, including how the projects interact. As the most advanced project, NSN has been progressed ahead of other projects because we don't want to delay its investment decision. We will consult on our IPA of the other four projects in early 2015.

This consultation document forms our impact assessment for the NSN project. Subject to consultation responses, we expect to publish our decision in March 2015.

We have also started our final project assessment (FPA) for the NSN project where information was provided as part of the September submission. The FPA is where we assess the efficiency of project costs, finalise the regulatory regime and set the provisional level of the cap and floor. NSN's procurement process is ongoing and NGIH (the GB developer behind NSN) plans to submit its detailed cost information once this is complete. So far, our analysis covers three areas which are included in this consultation. These are:

- Development costs
- Technical design – The choice of converter and cable technology, and the capacity
- Tendering strategy and process.

We will consult on our detailed cost assessment next year and our decision will be used to set a provisional cap and floor for NSN. When the project is near the end of construction (about 2019) we will finalise our cost assessment to take into account efficient expenditure needed to address risks arising and also to set the opex allowance.

1. Introduction

Chapter Summary
This chapter includes background on our cap and floor regime, an overview of the NSN project and the scope of this consultation.

Background

1.1. Electricity interconnectors are the physical links which allow for the transfer of electricity across borders.[1] 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, but the amount of interconnection between GB and other markets remains limited. This is why we consulted on proposals to extend our cap and floor regime to new near-term electricity interconnectors in May 2014.[2] We want to facilitate the delivery of more interconnection in a way that's economic, efficient and timely.

1.3. In August 2014 we published our decision to extend the cap and floor regime to near-term electricity interconnectors, and opened an eight-week application window.[3] This application window closed on 30 September 2014. Five projects applied to be assessed and regulated under our cap and floor regime. We published our decision in October 2014 noting that all five projects met our minimum eligibility criteria, and so were eligible for the Initial Project Assessment (IPA) stage of our cap and floor assessment process.

NSN project overview

1.4. NSN was submitted to us for assessment under our cap and floor framework by National Grid Interconnector Holdings (NGIH) Limited. The project is a 1.4GW interconnector between Blyth, Northumberland and Kvilldal, Norway. It is being jointly developed by NGIH and Statnett, the Norwegian transmission system operator (TSO).

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[1] For ease, we will refer to electricity interconnectors as 'interconnectors' in the remainder of this document.
[2] Read our May 2014 consultation on our proposals for our cap and floor regime at: https://www.ofgem.gov.uk/publications-and-updates/regulation-future-electricity-interconnection-proposal-roll-out-cap-and-floor-regime-near-term-projects
[3] Read our August 2014 decision letter at: https://www.ofgem.gov.uk/publications-and-updates/decision-roll-out-cap-and-floor-regime-near-term-electricity-interconnectors

1.5. NGIH has suggested that the economic case for NSN is primarily driven by the difference in generation mix in the two markets. The Norwegian generation mix is primarily hydro-based, which complements the thermal and wind-based GB market.

1.6. If the NSN project goes ahead it would represent a substantial increase in GB electricity interconnector capacity, which is currently just under 4GW.[4] The total (without NSN) would increase to just under 6GW with the Nemo and ElecLink projects, which are 1GW each in capacity.[5]

Scope of this consultation

1.7. This consultation contains our minded-to position on the IPA stage and parts of our Final Project Assessment (FPA) stage for NSN.

IPA

1.8. This consultation contains our minded-to position on our IPA of the NSN interconnector only. The reason we are consulting on the NSN interconnector ahead of the other four projects is that NSN is a more advanced project, which is expected to take a Final Investment Decision (FID) in spring 2015. In addition, NSN provided more information relevant to the Final Project Assessment (FPA) stage than other projects. Our August 2014 decision letter noted that 'we encourage developers to submit complete FPA information together with the IPA where possible, and may prioritise consideration of projects that are able to do this.' Whilst NSN has not submitted complete FPA information at this stage, we consider it beneficial to assess the information NSN has been able to submit.

1.9. This document is also our Impact Assessment (IA) for NSN.[6] We have embedded the impacts of NSN throughout the analysis in this document. Areas relating to our IA guidance which are not embedded in the main body of the document are included in Appendix 2.

1.10. While NSN is being consulted on ahead of the other projects, we have considered interactions between projects where relevant. Additionally, a delay in our

[4] GB is currently connected to other electricity grids by the BritNed, East-West, IFA and Moyle interconnectors.
[5] We published our final decision on ElecLink's exemption request in September 2014 and our final decision on Nemo's cap and floor regime in December 2014. For more information see: https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors
[6] We consider the impacts of NSN against a baseline whereby NSN is not granted a cap and floor and the project doesn't go ahead. As a result, the impacts are those of an interconnector to Norway against a counterfactual of no interconnector to Norway. We assess the impacts of NSN in line with our IA guidance, available here: https://www.ofgem.gov.uk/publications-and-updates/impact-assessment-guidance

decision-making could lead to a delay in investment, which could be detrimental to GB consumers.

1.11. We will consult on the needs case for the remaining four projects in early 2015. We will also open a second cap and floor application window in September 2015 if there is sufficient interest from developers.

FPA

1.12. This document also contains part of our Final Project Assessment (FPA) for NSN. We have assessed those project areas where we have enough information at this point in time.

1.13. The FPA stage is where we assess how efficient the project costs are and finalise the regulatory regime design (for example by setting the availability target and finalising return parameters) for NGIH's share of the NSN interconnector.

1.14. For the FPA, we are seeking views on:

- our assessment of the project's development costs
- our initial analysis of NSN's technical design
- our initial view on NSN's tendering strategy and process.

1.15. We intend to make a final decision on the project's development costs in March 2015 following this consultation. We expect NGIH to submit detailed costs for our assessment in mid-2015. We plan to finalise our assessment of the efficiency of these costs following consultation in late 2015. For NSN's technical design, we will consider whether our initial assessment needs to be reassessed once the cost information becomes available. We will consider NSN's tendering strategy and process more fully during our cost assessment, when we will have more information on the procurement process. We may revisit our initial assessment if costs appear materially higher than our expectations (eg in comparison to similar project benchmarks).

2. Structure of our Initial Project Assessment

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

2.2. We have considered the impact on GB primarily through our analysis relating to social welfare impacts. When discussing total GB social welfare we consider a number of different factors:

- impacts of projected flows between the connecting markets (Chapter 3)
- impacts on the operation of GB's transmission system (Chapter 4)
- the costs of onshore transmission reinforcements needed to accommodate NSN (Chapter 4)
- qualitative assessment of hard-to-monetise impacts (Chapter 5).

2.3. In addition, we have assessed a number of areas to ensure that the NSN project is sensible, efficient and well-justified:

- assessment of NSN's connection location and route (Chapter 6)
- assessment of NSN's project plan (Chapter 7).

2.4. Our IPA for NSN has been undertaken based on a submission received from NGIH as the GB project developer. Our assessment is informed by input from Pöyry and Fichtner consultants and National Grid Electricity Transmission (NGET) in its role as system operator (SO). Supporting reports (published alongside this consultation) have been prepared independently and not in consultation with the developers of the five projects that are being assessed under the first cap and floor window.

2.5. We have assessed NSN in line with our principal objective, which is to protect the interests of current and future GB consumers. Where relevant, we have also taken into account the expected overall impact of the project on GB and the EU as a whole, in line with the objectives of the Electricity Directive.[7]

[7] The Electricity Directive refers to Directive 2009/72/EC, available at: http://ec.europa.eu/energy/gas_electricity/legislation/legislation_en.htm

3. Economic market modelling of NSN's impact

Chapter Summary
This chapter summarises the economic modelling carried out by Pöyry consultants. This shows that NSN is likely to provide significant benefit to GB consumers and GB as a whole due to flows across the interconnector resulting in changes in wholesale market prices. We also compare the results to NGIH's modelling.

Question box

Question 1: What are your views on the approach Pöyry has taken to modelling the impact of cross-border interconnector flows?
Question 2: Do you agree with the modelling results for NSN and our conclusion that NSN is likely to provide benefits to GB consumers?

Introduction

3.1. In this chapter we summarise the key findings from an independent economic analysis of the NSN project, which we commissioned from Pöyry. We have used this analysis to inform our decision-making on NSN.

3.2. In particular, we present the following information:

- the social welfare impacts as a result of electricity transfers across the interconnector and associated changes in wholesale market prices
- expected revenues for NSN and the potential impact on consumer bills
- quantified security of supply impacts of NSN
- a high level comparison of Pöyry and developer modelling assumptions and results.

3.3. This chapter does not include the GB social welfare impacts of onshore reinforcements or of system operation costs. These are explored in the following chapters, and the overall social welfare impacts are summarised in Chapter 8.

3.4. While in this chapter we focus on the NSN project only, we asked Pöyry to conduct its analysis of the five projects assessed in the first cap and floor window together, so that we could consider NSN's economic needs case in relation to the other projects. We have published Pöyry's social welfare modelling results for the other four projects alongside this consultation. We expect to consult on our IPA for these projects in early 2015.

Summary of modelling methodology

Estimating social welfare impact

3.5. A key element of Pöyry's economic modelling is the calculation of 'social welfare'. This is a common approach taken to evaluate the possible benefits of a new infrastructure investment.

3.6. Pöyry's social welfare modelling captures:

- impacts on consumers through changes in wholesale market prices ('consumer surplus')
- the additional profit or loss for generators resulting from changes to wholesale prices and dispatch ('producer surplus')
- the revenue generated for interconnector owners through sale of capacity on their links ('interconnector surplus')[8], and
- the total welfare value as a result of NSN which is calculated as a sum of consumer, producer and interconnector surpluses.

3.7. The welfare modelling results for each group (consumers, producers and interconnector owners) represent the sum of the change in welfare due to NSN.[9] Unless otherwise stated, impacts are measured in net present value (NPV) terms over the duration of the cap and floor regime (25 years).

3.8. The detailed methodology for calculating social welfare impacts is presented in Chapter 2 of Pöyry's report.

Scenarios

3.9. Pöyry has designed three scenarios for assessing the cap and floor projects. The scenarios aim to reflect a wide range of potential outcomes for interconnectors broadly consistent with Pöyry's view of future interconnector value drivers:

- The **Base case** is designed by Pöyry to represent a reasonable baseline against which interconnector projects can be assessed.

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[8] Please note that interconnector surplus includes impacts on all the interconnectors assumed in the analysis.
[9] In this chapter, the terms 'surplus' and 'welfare' are used interchangeably when discussing consumers, producers and interconnectors.

- The **Low scenario** is based on assumptions designed to result in unfavourable circumstances for interconnectors, to test the potential downside of each project.

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

3.10. Pöyry developed these scenarios using recognised and publicly available sources of information such as National Grid Future Energy Scenarios (FES)[10] and DECC energy and emissions projections.[11]

3.11. For detailed description of each scenario, please refer to the Chapter 3 of Pöyry's report.

Assessment of project interactions

3.12. To ensure we treat the five projects equally we asked Pöyry to conduct its social welfare analysis using two modelling approaches:

- First additional (FA) approach – where a project is the only project connecting in 2020 out of the five cap and floor projects. This, in theory, represents the best case for an interconnector project as there is no additional interconnection connecting in 2020 which would reduce ('cannibalise') the project's congestion revenue. Under the FA analysis Pöyry still assumes additional interconnection in the future in line with the FES.

- Marginal additional (MA) approach – where a project is commissioning at the same time as the remaining four cap and floor projects. This in theory represents the worst case for an interconnector project as there are additional projects connecting in 2020 which would reduce the project's congestion revenue.

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

[10] More information on National Grid's Future Energy Scenarios is available at: http://www2.nationalgrid.com/uk/industry-information/future-of-energy/future-energy-scenarios/
[11] More information on DECC's energy and emissions projections is available at: https://www.gov.uk/government/collections/energy-and-emissions-projections

3.14. In both the FA and MA approaches, the Nemo and ElecLink projects are assumed to come online before 2020.

Modelling results

3.15. This section sets out results of the analysis of:

- the social welfare impacts of NSN
- congestion revenues and impact on consumer bills
- impact of Capacity Market policy for interconnectors
- comparison of Ofgem and NSN's economic modelling.

3.16. This analysis is supported by the conclusions in Pöyry's report.[12]

Social welfare impacts of NSN

Consumer welfare

3.17. The modelling results suggest that NSN would increase social welfare for GB consumers across all three scenarios modelled (see Table 3.1). This is largely driven by the modelled wholesale price differences between GB and Norway. By connecting the two markets, NSN is expected to flow cheaper power from Norway to GB which should drive the GB wholesale price down, resulting in savings for GB consumers.

Total GB welfare

3.18. The modelling suggests that NSN would result in an increase in total GB welfare under Base case and High scenarios, as the increases in GB consumer and interconnector welfares offsets any loss in GB producer welfare. Under the Low scenario, modelling suggests total GB welfare would be negative.

Interactions with other projects

3.19. The comparative analysis between the FA and MA modelling results suggests that NSN's social welfare benefits are not very sensitive to the other four projects

[12] Please note that the results presented in the Pöyry report are in Euros. In this document, we converted these results to GB pounds using an exchange rate of 1.186.

connecting in 2020, as the difference in the results is relatively minor. This indicates that NSN's case would not be materially affected by our decisions on other projects, which we expect to take later.

Table 3.1: NSN's social welfare impacts on GB (£m, 2013 prices)

	£m	NSN FA	NSN MA
Base	GB consumers	3539	3280
	GB producers	-3281	-2947
	GB interconnectors	43	-24
	GB total	**301**	**309**
Low	GB consumers	935	664
	GB producers	-1641	-1374
	GB interconnectors	-74	-80
	GB total	**-780**	**-789**
High	GB consumers	4030	3618
	GB producers	-3757	-3247
	GB interconnectors	739	667
	GB total	**1012**	**1037**

NB. Numbers are rounded

Total welfare

3.20. As a whole, modelling suggests that under the Base case and High scenario NSN would have a positive impact on overall welfare (see Table 3.2). Under the Low scenario, the overall project welfare is negative. Under all scenarios modelled, the distribution of benefits between GB and Norway is broadly proportional.

Table 3.2: NSN's overall total welfare[13] (£m, 2013 prices)

	NSN FA	NSN MA
Base	705	641
Low	-1507	-1540
High	2238	2145

[13] Total overall welfare is a sum of total GB and Norway welfares.

Sensitivities

3.21. We also asked Pöyry to test how sensitive NSN is to certain changes in assumptions in the Base case scenario. In particular, Pöyry ran sensitivities to changes in renewable generation share, removal of carbon price support in GB and decrease in gas prices. For a detailed description of each sensitivity please refer to Chapter 3 of Pöyry's report.

3.22. The analysis suggests that NSN would still result in positive GB consumer benefits in each sensitivity (see Table 3.3). In terms of total GB welfare, only under the low gas price sensitivity would NSN result in a slightly negative GB impact.

Table 3.3: Results of sensitivity analysis for NSN (£m, 2013 prices)

	GB consumers	GB producers	GB interconnectors	GB total
Base case	3280	-2974	-24	309
High GB RES	2633	-2385	266	514
No CPS	2920	-2693	-137	91
Low gas price	2017	-1974	-174	-131

Congestion revenues and impact on consumer bills

3.23. As part of the analysis, Pöyry estimated potential congestion revenues for each project. The purpose of this analysis is to test if the projects are commercially viable and compare revenues to the cap and floor levels.

3.24. These revenue projections fed into the social welfare analysis as an element of interconnector welfare. Likewise, the cap and floor payments are accounted for in GB social welfare figures as they act as transfers between interconnector and consumer surpluses.

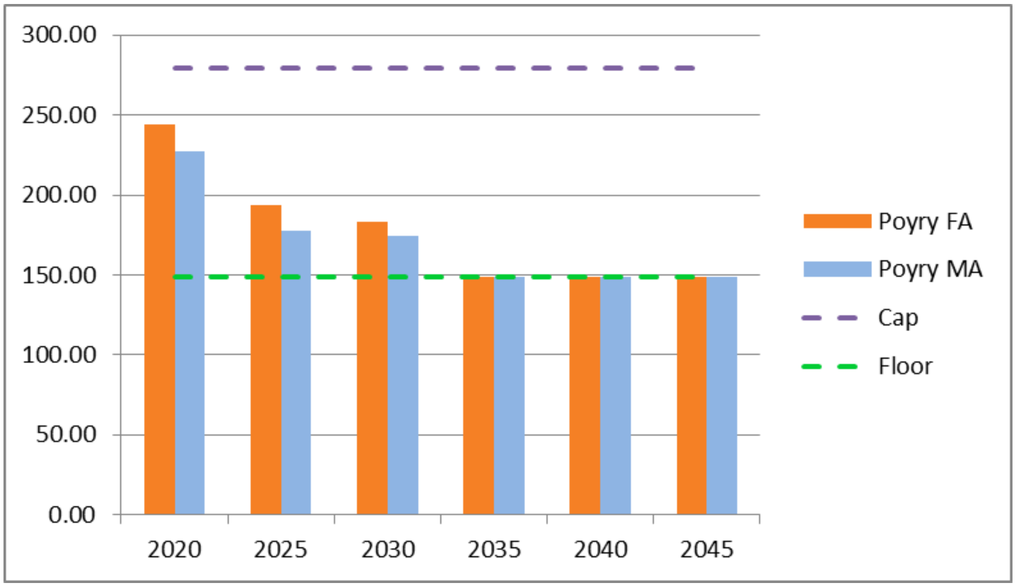
NSN congestion revenues

3.25. Under the Base case scenario, NSN's projected revenues are mostly in between the cap and floor (see Chart 3.1). The revenues fall slightly below the floor on few occasions, but the total value of estimated floor payments from GB consumers is around £100,000 over the course of the cap and floor regime (25 years). This is equivalent to an estimated increase of less than £0.01 on an average annual domestic GB consumer bill.[14] The analysis suggests this would be significantly

[14] This and the following bill impact calculations are based on average annual demand in 2012.

outweighed by the wholesale price savings to GB consumers that NSN is estimated to bring.[15]

Chart 3.1: NSN projected congestion revenues[16], Base case (£m, 2013 prices)



3.26. Under the Low scenario NSN revenues modelled are constantly below the floor. This would trigger floor payments from GB consumers of an estimated total value of £790m over the course of the cap and floor regime. This is equivalent to an estimated increase of £0.49 to an average annual domestic GB consumer bill. However, it is still outweighed by the wholesale price savings to GB consumers that NSN is estimated to result in.

3.27. Under the High scenario, projected NSN revenues are close to or above the cap. In total, this would trigger cap payments to GB consumers of a total value of around £73m over the course of the cap and floor regime (for detail, see Chapter 4 of Pöyry report). This is equivalent to a reduction of an average domestic GB consumer bill by around £0.40.

[15] Social welfare modelling results presented account for the cap and floor payments.
[16] For presentation purposes, the chart shows total projected congestion revenues for NSN and indicative levels of cap and floor based on estimated total project costs. However, this should not suggest that the cap and floor regime will be applied on both sides of the link. In the modelling study of NSN's social welfare impacts, including cap and floor payments to/from consumers, Pöyry assumed that the cap and floor regime is applied to GB share of the project only.

Security of supply impacts

3.28. We asked Pöyry to estimate some of the potential impacts of NSN on security of supply as part of its modelling work. In particular, Pöyry assessed NSN's potential contribution to GB capacity adequacy by looking into NSN's projected flows and impact on peak power prices. We present these potential security of supply benefits below.

3.29. We did not account for any of these potential security of supply benefits discussed in this section in the social welfare analysis presented above (as these are additional impacts of the flow of electricity across NSN).

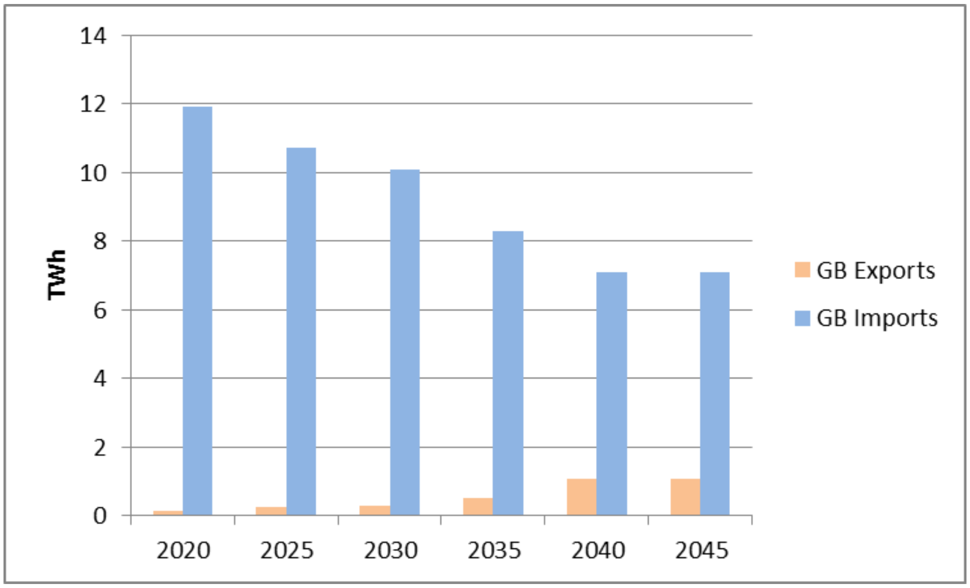
3.30. NSN is also expected to deliver various other security of supply benefits to GB such as diversification of capacity mix and provision of ancillary services. As these are difficult to quantify, they are explored qualitatively in Chapter 4 of this consultation.

Interconnector flows

3.31. Under all scenarios modelled, NSN's projected flows are mainly from Norway to GB, meaning that NSN should make an overall positive contribution to capacity adequacy in GB. As presented in Chart 3.2, the exports from GB are projected to increase from 2035 onwards, but still remain significantly lower than the imports from Norway in the Base case. We also observe a similar trend in the Low and High scenarios (see Chapter 4 of Pöyry's report).

3.32. The flows are mainly driven by modelled price differentials between Norway and GB and increased market volatility due to a relatively high share of renewable generation assumed in GB post-2030.

Chart 3.2: Projected NSN flows (in TWh), Base case, MA analysis

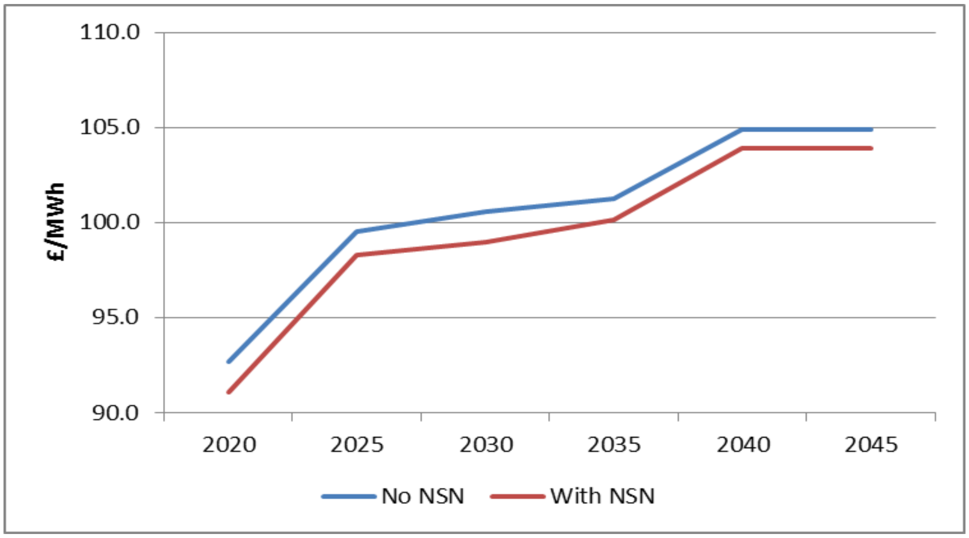


Peak prices

3.33. The modelling results suggest that NSN would also have a positive impact on security of supply in GB at times of system stress. We estimate that NSN would reduce peak prices on average by slightly over one per cent[17] which suggests that NSN will be flowing into GB at times when prices are highest (ie when there is greater system stress). This, in turn, shows that NSN is also likely to provide security of supply value to GB by increasing capacity adequacy at times of system stress.

[17] Based on the wholesale prices modelled for the Base case scenario (MA analysis).

Chart 3.3: NSN impact on peak power prices in GB (£/MWh, 2013)



Impact of Capacity Market policy for interconnectors

3.34. In December 2014 the government published a decision that interconnectors will be allowed to participate in the Capacity Market (CM) directly under the same obligations as domestic generation and DSR.[18] The detailed policy for interconnectors has not been finalised yet, but we have considered the impacts that it might have.

3.35. We have assessed the expected impacts of the CM policy for interconnectors (as it currently stands) on NSN and found that it would:

- make NSN more commercially viable as it provides an additional revenue stream, making it less likely to fall below the floor. For example, Pöyry's analysis suggests this could be £37m annually.
- displace expensive GB generation from the CM, potentially reducing CM clearing prices, and reduce GB producer surplus (ie generator profits).
- cause a reduction in overall GB welfare as half of the CM revenues (£18.5 million annually) will accrue to Statnett and therefore increase social welfare in Norway.

3.36. This analysis is indicative only as it remains uncertain how long the CM policy for interconnectors will remain in place (DECC has indicated it sees it as a transitional

[18] Please see: https://www.gov.uk/government/news/interconnectors-to-participate-in-the-capacity-market-from-2015

measure[19]), what the clearing price of the auctions will be, and how interconnectors will be de-rated. It should be recognised that our analysis has not included any of NSN's contributions to the benefits provided by the CM.

3.37. CM policy impacts on interconnectors are also explored in Annex D of Pöyry report.[20]

Comparison of Ofgem and NGIH's economic modelling

3.38. As part of the cap and floor application, we asked developers to submit their economic modelling analysis to us. When assessing the projects, we compared NGIH's and Pöyry's results and considered the key differences.[21] We cannot publish the information submitted to us by the developer as it is commercially sensitive, so we provide a high level comparison of our and NGIH's modelling assumptions instead.

3.39. We found that for the Base case, NGIH assumed higher levels of renewables and level of demand in GB, whereas Pöyry assumed slightly higher fuel prices. Despite some differences, NGIH's Base case was broadly comparable to Pöyry's. As a result, the Base case results of both studies are relatively similar – both suggest positive impacts on GB consumer and total GB welfare resulting from NSN.

3.40. The assumptions for the Low and High scenarios that the developer made were narrower in range compared to our consultant's scenarios, which were designed to reflect an extreme downside and upside case for interconnectors. In terms of social welfare modelling results, we found that NGIH's analysis shows a lower potential downside in the Low scenario. Likewise, NGIH's modelling suggests a lower potential upside in the High scenario compared to Pöyry's modelling.

3.41. In summary, we found the differences in modelling results broadly align with the differences in the assumptions made by Pöyry and NGIH. This suggests that the results of modelling studies done by both parties reinforce each other.

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[19] See DECC consultation: https://www.gov.uk/government/consultations/consultation-on-capacity-market-supplementary-design-proposals-and-transitional-arrangements
[20] Please note that Pöyry's report was drafted before 2 December 2014 when the government confirmed it will allow interconnectors to participate in the 2015 Capacity Market auction.
[21] This consultation focuses on the modelling provided to us as part of NGIH's submission for NSN. We will assess the modelling provided by the other four eligible projects, and aim to consult on this in early 2015.

4. Impacts on the GB transmission system

Chapter Summary
This chapter discusses the impacts of NSN on the operation of the national electricity transmission system (NETS).

It also provides our view on the cost of onshore works required to connect NSN to the NETS.

Question box

Question 3: Do you have any comments on the system operation impacts of NSN?
Question 4: Do you have any views on the onshore connection information?

4.1. As part of our IPA we have considered the impact NSN could have on the operation of the national electricity transmission system (NETS). Our May 2014 consultation said we would ask NGET to assess the value of interconnector projects for system operation. This section is informed by NGET's analysis which is undertaken for 2020 as a single spot year, using NGET's Gone Green scenario projection. This section concludes with the cost of onshore works required to connect NSN to the NETS.

System operation impacts of NSN

4.2. NGET's 'Benefits of Interconnectors to GB Transmission System' paper (published alongside this consultation) says that existing and future interconnectors could help provide new services needed for future system operability. Such services include:

- **Frequency response** – The real-time difference between system demand and total generation results in changes to the system frequency. NGET uses frequency response to ensure system frequency can be maintained.

- **Black start** – This is the process of restoring power stations to operation following a total or partial shutdown of the transmission system. It requires isolated power stations to be started individually and then used to gradually reenergise the system.

- **Reactive response** - Reactive power availability on the transmission system affects voltage level. NGET must manage voltage levels so that voltage is maintained within the limits in the System Security and Quality of Supply Standard.[22]

[22] The SQSS establishes the criteria and methodology that transmission licensees use in the planning and operation of the NETS. http://www2.nationalgrid.com/UK/Industry-

- **Boundary capability** - The transmission system is split by boundaries that cross key power flow paths where additional transmission capacity may be required. The transmission network is designed so that there is sufficient capacity to send power from generation to demand.

- **Constraint management** - A constraint happens where the electricity transmission system is unable to transmit electricity to where it is needed due to congestion at one or more parts of the transmission network. NGET take actions in the market to increase and decrease the amount of electricity at different locations to ensure network boundary limitations are not exceeded.

4.3. Detail of the analysis of the system operation impacts of NSN connecting is in Table 4.1. This is taken from NGET's 'SO Submission to Cap and Floor' paper, published alongside this consultation.

Table 4.1: System operation impacts of NSN connecting

Service	Impact of NSN connecting
Frequency response	Interconnectors using voltage source converter (VSC) technology should be able to rapidly change their power output. This benefit from NSN is also increased due to hydro generation in Norway having faster response (eg pump storage facilities). NGET suggests there is a potential benefit to GB consumers if NSN were to provide fast response. When all other projects (except Greenlink[23]) are in service the potential benefit is even greater.
Black start	If NSN was to provide black start this could help to lower the overall cost of black start services.
Reactive Response	If NSN could contribute to reactive power services, this could provide cost savings when compared to investment in reactive response in the form of shunt reactors and STATCOMs.[24] NSN in combination with other interconnectors does not change the benefits highlighted as voltage is a local issue.

information/Electricity-codes/SQSS/The-SQSS/

[23] NGET has not studied the Greenlink interconnector as the Irish network is a smaller system and the potential effects it would have on system stability of the Irish network, due to much lower level of inertia on the Irish system.

[24] Shunt reactors and STATCOMs are examples of static reactive devices which help to ensure voltage stability on the electricity network.

Boundary capability	For boundary B6, studies suggested that from 2020, NSN could increase boundary capability by 350MW and increase the B7 boundary by 160MW. This additional capability has the potential to reduce the need for future investment across these boundaries. NGET suggests the cost of displaced investment could be up to £2.3m per annum.
Constraint management	NSN could increase the costs of operating the GB network in 2020. However, a change in the assumptions used in NGET's modelling identifies a potential reduction in total operational costs.

4.4. Table 4.2 illustrates the combined monetised benefits for the ancillary services described above. This shows results for the NSN interconnector and all five interconnectors assessed under the first cap and floor window.[25]

4.5. The analysis has been performed for a range of price forecasts for European markets and considers a price range for constraining interconnector flows. The upper, mid and lower limits include sensitivities on these prices and costs.

4.6. NGET's analysis focuses on potential consumer benefits and doesn't consider how developers could extract value in delivering these benefits. It should be noted that further discussions would be required with adjacent TSOs to ensure that neighbouring networks can support the provisions of the services described below.

4.7. This analysis doesn't take account of changes which may be imposed by the implementation of the European Network Codes. Further information on the methodology can be found in NGET's report, published alongside this consultation.

Table 4.2: Combined monetised benefits for the ancillary services considered by NGET (£m, 2014 prices)

	NSN only			All Interconnectors		
Total	Lower	Mid	Upper	Lower	Mid	Upper
	31.4	46.9	62.4	116.5	136.1	155.7

4.8. Table 4.3 presents the annual operational cost implications for NGET to operate the system. A negative figure implies an increase in constraint costs while a positive figure denotes a reduction.

[25] Values in £m (2014 prices) for each service and operational cost.

Table 4.3: Annual operational cost implications (£m, 2014 prices)

	NSN only			All Interconnectors		
Total	Lower	Mid	Upper	Lower	Mid	Upper
	-42	-23.5	5	-56	-38.5	21

Our view of system operation impacts of NSN

4.9. NGET's analysis highlights that system operation will get more challenging towards 2030 (particularly managing frequency response and power oscillations). As a result, future interconnector projects, such as NSN, are expected to provide increasing benefit.

4.10. Analysis indicates that NSN could help NGET manage system operation and alleviate some of the challenges it faces. The costs of operating the system are typically passed on to consumers, so if NSN can help contribute to more efficient services then there is the potential to displace existing costly resources. If NSN provides the ancillary services listed above, we think the annual benefits of between £31.4m and £62.4m could deliver savings for GB consumers.

4.11. NGET's analysis suggests the impact of NSN on constraint management could range from costs of £42m to a saving of £5m in 2020. We note that a change in assumptions used in the modelling (including European market prices and constraint costs for interconnectors) could result in a reduction in modelled operational costs. We therefore consider that constraint management costs could reduce as a result of interconnection with markets outside GB, including as a result of NSN.

Cost of onshore reinforcements

4.12. As well as assessing the system operation impacts of NSN connecting and associated benefits to GB consumers, it is important to consider the costs that NGET will incur to connect NSN to the NETS. This is because these costs will be passed on to GB consumers. Combined costs of local and wider works required to connect NSN to the GB network are around £277m.[26]

4.13. This cost is incorporated into our summary of the potential GB consumer benefit of NSN, which is discussed later in Chapter 8.

[26] In 2013 prices.

5. Qualitative assessment of NSN

Chapter Summary
This chapter includes our assessment of the qualitative impacts of NSN link. This assessment has been carried out against key benefits we identified in our May consultation document and hard-to-monetise aspects. We have concluded that there are net positive impacts of NSN.

Question box

Question 5: Have we appropriately assessed the qualitative impacts of NSN link?
Question 6: Are there any additional impacts of NSN link that we should consider qualitatively?

5.1. Our qualitative assessment of NSN has considered information received from developers as well as our own analysis, including hard-to-monetise factors.

Assessment against identified benefits of interconnection

5.2. In our May consultation, we identified interconnector benefits which we have assessed NSN against. We acknowledge that there is some overlap between drivers of the different benefits, but consider the benefits valid as standalone considerations.

5.3. **Benefit 1:** Lowering electricity bills through allowing **access to cheaper sources of electricity** generation (this is covered in Chapter 3);

- Norway has a relatively cheaper generation mix than GB, with ~94% of generation capacity being hydro.[27] This results in a Norwegian price that is approximately €25/MWh lower than GB in 2020.[28]

5.4. **Benefit 2:** Lowering electricity bills through providing **alternative, cheaper ways to achieve secure electricity supplies**[29], for example by connecting new providers of short-term balancing services.[30]

- Interconnection increases security of supply by increasing the capacity available to the GB market. This is particularly relevant with NSN, as

[27] See Norwegian Water Sources and Energy Directorate Report: http://www.nve.no/en/Energy/Energy-in-Norway---a-brief-annual-presentation/
[28] This price differential is taken from Pöyry's supporting report, based on 2020 as an indicative year.
[29] Some aspects of security of supply are covered in Chapters 3 and 4.
[30] The benefits of NSN to the system operator are captured in Chapter 4.

there is difference in generation mix between the countries, hence low sensitivity to supply side shocks (by increasing fuel diversity).

5.5. **Benefit 3: Supporting the decarbonisation of energy supplies** by allowing efficient sharing of intermittent renewable generation between two systems.

- NSN identified in their submission that the Norway and GB demand and supply profiles differ in shape. A link between the two markets should allow for efficient sharing of renewables, eg when wind output is high and demand is low, then GB can export energy to Norway. This can contribute to further regional specialisation in low carbon generation.

Hard-to-monetise assessment

5.6. As part of our qualitative assessment, we have considered hard-to-monetise impacts of NSN, in line with our Impact Assessment guidance.[31] These hard-to-monetise impacts have not been captured as part of Pöyry's social welfare modelling. However this assessment does highlight additional benefits NSN may provide to consumers.

5.7. This assessment is concerned with more long-term sustainability and strategic issues, such as: optionality; diversity and resilience; pathways and lock-in; and natural asset and sustainability implications.[32] There is a summary of this in Table 5.1.

5.8. The overall conclusion of the assessment is that there are positive impacts in all the assessed areas. These positive impacts are driven by a number of factors including increased "system meshing"; connection to alternative renewables sources; and the building of infrastructure.

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

[32] See explanation of terms in Appendix 3.

Table 5.1: Hard-to-monetise assessment – Impact of NSN

<table>
<tr><th colspan="3">Optionality</th></tr>
<tr><td colspan="3">Dampening effect on wholesale prices reduces price signals for investment in generation and demand side response. The government’s Capacity Market should ensure sufficient capacity on the system.

Greater interconnection allows for the possible development of projects into Multi-Purpose Projects (MPPs) in the future (eg by connecting offshore renewables).</td></tr>
<tr><th colspan="3">Diversity and resilience</th></tr>
<tr><td colspan="3">Diversity of supply will be increased.

Generation mix in Norway is significantly different to GB: 94% of the generation in Norway is hydro, compared to mostly thermal in GB.

NSN should increase system resilience against high-impact, low-probability events. The increased diversity and supply should guard against technical equipment failure, weather-related risks, volatility in global energy prices and attacks on energy infrastructure.

NSN does not increase the diversity of interconnector owners in GB.</td></tr>
<tr><th colspan="3">Stress and security implications</th></tr>
<tr><td>Security of supply: Interconnection has a positive impact on security of supply through system meshing and increased supply sources. Even more so when connecting to systems that have significantly different energy mixes.</td><td>Potential for extreme price and/or volatility: Lowers the potential for extreme prices and/or volatility. Interconnectors have a dampening effect on peak prices. Particularly with Norway, as connection to new market with a system where stress events are relatively uncorrelated.</td><td>UK’s legally binding energy targets: Imported electricity is assumed to have zero carbon impacts as the accounting is based on production. Therefore the expected high level of imports from Norway would have a positive effect on the UK meeting its targets. Norway has a low carbon energy mix compared to GB, therefore imports will have positive net impact.</td></tr>
<tr><th colspan="3">Learning by doing and supply chain development</th></tr>
<tr><td colspan="3">There can be lessons learnt from the construction of NSN that can be applied to similar projects, as at 714km+ long, it would be the longest subsea interconnector in the world.

There is potential for supply chain congestion as the cap and floor process could result in up to five additional interconnectors attempting to construct at similar times. The timing of this process also coincides with other DC cable/converter projects such as building marine cables for connecting offshore renewables. We would expect the supply chain to respond to the upcoming demand for assets by adding output capacity where possible.</td></tr>
<tr><th colspan="3">Pathways and lock-in</th></tr>
<tr><td colspan="3">Building interconnectors allows additional flexibility in our system and market arrangements. An increasingly meshed transmission network has greater ability to cope with a range of future pathways and energy system developments.</td></tr>
</table>

Natural asset and sustainability implications		
Consistency with UK 2050 targets: Positive, as discussed for UK's legally binding energy targets (above). It is generally accepted by government that a high level of interconnection is required to achieve long-term carbon targets.[33] The positive carbon impact has been quantified using an indicative volume for carbon savings from the Pöyry modelling output. See below.	**Cumulative carbon impacts:** This proposal will have minimal impacts on cumulative GB carbon emissions on top of those already discussed.	**Natural asset impacts:** Development of NSN might be less disruptive than alternative options for electricity supply (such as additional power stations), and should have a small offshore impact (post-construction) as the cable will be buried. In GB, the landing point is at Blyth, with the length of the onshore route being around 11.5km, of which 7km is a buried cable. This reduces the visual impacts of the onshore portion of the cable.

Indicative monetised carbon impacts

5.9. Part of Pöyry's model generated an indicative value of carbon savings for GB. This was calculated based on the assumed volume of displaced domestic thermal generation with the importing of carbon neutral electricity from hydro plants in Norway.[34]

5.10. If we take the spot year of 2020, Pöyry's model outlines a displacement of approximately 11.4TWh of thermal plant in GB (mainly gas), which results in an annual carbon saving of 2759.5 $KtCO_2$.

5.11. We can attribute a value to this carbon saving using DECC's traded carbon value projections.[35] Using a 2020 price of £5350/$KtCO_2e$[36] we have calculated an indicative value of carbon savings in 2020 of £14.76m.

5.12. The overall trend of these carbon savings will depend upon both the volume of imports (ie the amount of carbon-intensive thermal plant that is displaced)

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[33] For example, see DECC's report on the benefits of more interconnection: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266460/More_interconnection_-_improving_energy_security_and_lowering_bills.pdf
[34] Plant type is dependent upon the price of imported energy. Each plant type has an assumed carbon intensity per MW of output.
[35] See DECC Updated short-term traded carbon values used for modelling purposes: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360276/Updated_short-term_traded_carbon_values_used_for_modelling_purposes__2014_.pdf
[36] Price of £5.35/tCO_2e multiplied by 1000 to convert to Kilotons.

and the price of carbon. The Pöyry report outlines that GB imports over the interconnector will fall throughout the modelling period, from approximately 11.4TWh (net) in 2020 to approximately 5.2TWh (net) in 2045.

5.13. We expect that the traded price of carbon will increase significantly in line with both the Carbon Price Floor and the EU Emissions Trading System (EU ETS).[37] The increase or decrease in the value of carbon traded depends upon the size and timing in change of these two factors.

[37] See European Commission website: http://ec.europa.eu/clima/policies/ets/index_en.htm

6. Assessment of NSN's connection location and route

Chapter Summary
This chapter describes NSN's justification for, and our assessment of, its chosen connection location and cable route.

Question box

Question 7: Do you have any comments on our assessment of NSN's chosen connection location or cable routes?

6.1. This chapter contains our assessment of the connection location and cable route of the NSN project. Justification for capacity and technical design is discussed in Chapter 9.

6.2. We focus entirely on the GB connection location as the Norwegian ministry has already assessed efficiency of the Norwegian components of the project.

6.3. Our assessment of connection location and cable routes is informed by support from our technical consultants, Fichtner.

Connection locations

6.4. NSN has considered various connection locations and identified its optimal connection locations as Blyth in the North East of England and Kvilldal in Norway, as illustrated in Figure 6.1.

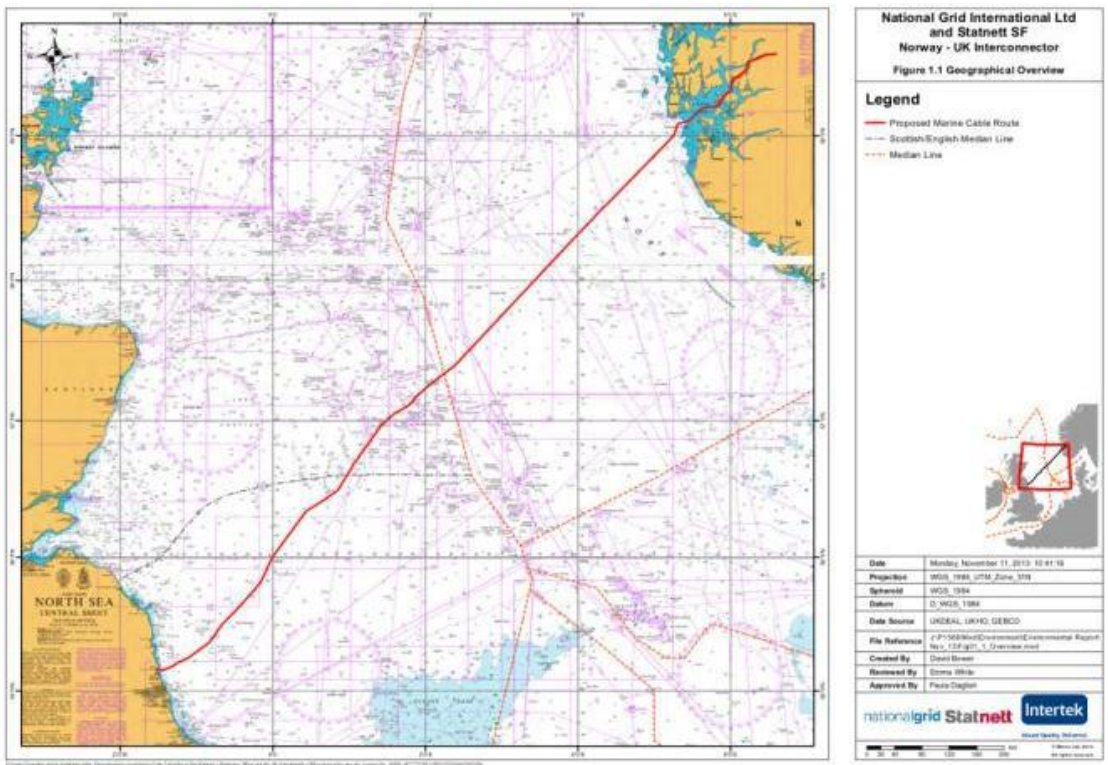
6.5. For the GB connection location, initially NSN considered possible locations from Norfolk to the north of Scotland. A connection point in Scotland would have minimised the DC cable length. However NSN has indicated (supported by system studies from NGET) that connection to Scotland was not economical. This is because of the extensive reinforcements that would be needed to accommodate NSN (ie to transmit the power to demand in the south).

6.6. Connection opportunities to the south of the Humber were limited by numerous environmental constraints (particularly around the Wash[38]) and the scale of necessary network reinforcements. System studies by NGET in 2011 concluded

[38] The Wash is the bay and estuary off the East Anglian coast - a Special Protection Area under EU legislation. Cable installation in the Wash may have required strict consenting arrangements. This was the case for the cable installation of the offshore transmission cable for Lincs wind farm which passed through the Wash.

that connection to the North East of England offered the best trade-off between onshore reinforcement costs and NSN's own costs (ie the length of the cable). After further optioneering, NGET offered Blyth as the most economic and efficient connection point. This is because it was adjacent to a demolished coal fired power station which would reduce risks relating to planning permission and close to a planned NGET substation (2.4km).

Figure 6.1: Location of the NSN connection points



6.7. We agree with our consultant's assessment that Blyth represents an appropriate connection point based on the evidence. We consider that this connection location reflects the optimal solution for capacity, distance and limited need for additional reinforcement.

GB shore landing location

6.8. The shore landing locations (called landfall sites) for each end of the interconnector are predominantly determined by their proximity to the respective connection locations.

6.9. Two landfall sites close to Blyth were identified, Cambois South and Cambois North. Cambois North was chosen as the preferred landfall site because it was ideal for burying the cable directly through an existing slipway. This made it the preferred location on technical, economic and environmental grounds.

6.10. Our view is that the reasons for selecting the landfall site are adequately justified. NSN has demonstrated that reasonable options were considered and describes why each of these options was rejected.

Onshore cable route

6.11. The onshore cable route is the route that the cable will take from the landfall site to the grid connection location.

6.12. NSN identified three possible onshore cable routes from the landfall site at Cambois North to the convertor station at East Sleekburn. Of these three routes, NSN chose a route through agricultural land which would limit environmental and technical constraints. Other options were constrained due to existing housing at Wembley Gardens and the former Blyth Power Station coal stocking area and associated landfill site.

6.13. Our view is that justification for the onshore cable route is satisfactory based on the options available.

Offshore cable route

6.14. To identify the optimal cable route NSN employed a straight-line method between the landfall sites in Cambois North and Hylsfjorden in Norway. Deviation from the straight line route would take account of factors including safety, hazards, water depth and offshore geology.

6.15. NSN has confirmed that if a straight-line route were adopted, the cable length would be 700km. Environmental assessments identified constraints and risks which resulted in a cable length of 714km, an approximate 2% deviation from the straight-line approach.

6.16. Our view is that a straight-line offshore cable route is the most appropriate, with any deviations well justified and reasonable. Given our view that the connection points are appropriate, we agree that the cable route is also satisfactory.

6.17. As set out in our May consultation we will only re-examine NSN’s connection location or cable route at the FPA stage if there have been significant changes to the information provided at the IPA stage.

7. Assessment of NSN's project plan

Chapter Summary
This chapter includes our analysis of NSN's project plan to connect in 2020.

Question box

Question 8: Do you have any comments on our assessment of NSN's project plan?

7.1. We outlined in our May consultation that we would require clear evidence that any project would be able to meet their planned connection date. Part of this was a project plan including milestones for consenting, procurement, financing, investment decisions and construction.

7.2. Table 7.1 outlines our assessment against criteria for an appropriate project plan. We think that NSN's project plan identifies the key milestones, and that appropriate mitigation has been identified for risks that arise.

7.3. As part of our assessment, we considered at a high level the timing and strategy for consenting, procurement and construction of NSN. We then considered NSN's strategy to be suitable for a 2020 connection date.

Table 7.1: High level assessment of NSN link's project plan to 2020

Required Information	Identified criteria	Our assessment
Key milestones from early stage of development to operation	All the key milestones are included. Plan is robust and achievable. Contingencies are identified and addressed.	Necessary milestones are included. Plan appears achievable. High level risks identified and are outlined to be in NSN's control.
Detail on discussions held with NRAs and governments (including in Norway)	Discussions with relevant stakeholders included Summary demonstrates clear understanding of connecting market process.	Extensive list of previous and ongoing stakeholder engagement. Secured Interconnector licence in Norway since submission following detailed CBA carried out by Norwegian Government.
Description of how C&F is	Description is clear, logical and reasonable.	Outline of regime in Norway provided.

expected to interact with the regulatory regime in Norway	Potential problems identified with solutions offered.	Possible misalignment and solutions provided, eg incentives after 25 years (duration of the cap and floor regime)
Overview of developers' procurement plans	Robust and achievable. Contingencies identified and addressed.	NSN has allowed extra time for cable tendering, militating against 'supply chain pinch point'.
Assessment of supply chain availability and engagement so far	Engagement so far is sufficient level. Contingencies identified and addressed.	Far progressed at this stage. Have invited companies to tender.
FID date	Realistic given any dependencies.	FID expected in early 2015, following our IPA consultation.

8. Conclusions on our IPA for NSN

Chapter Summary
This chapter contains our conclusions on the IPA for NSN and the next steps for the IPA.

Question box

Question 9: Do you agree with our conclusions on the IPA for NSN?

Our view on the IPA for NSN

8.1. Our assessment of NSN shows that the project is likely to deliver significant benefits to GB consumers.

8.2. Our market modelling analysis, done by Pöyry, shows that there are likely to be strong benefits to GB consumers, and GB and Norway as a whole, due to the flow of electricity across the link. This is consistent with conclusions of the modelling undertaken by NGIH. Even in a pessimistic scenario, the link is likely to lead to an increase in GB consumer welfare.

8.3. Analysis from NGET has indicated that the benefits that NSN could provide for GB system operation are likely to outweigh any additional operating costs. This is expected to contribute to an additional increase in GB consumer welfare.

8.4. We think that the cable connection location, route, capacity and technical design appear sensible and justified. We have also identified a number of hard-to-monetise benefits that NSN could provide. Further, NSN's project plan seems appropriate and realistic in order to deliver the interconnector by the end of 2020.

8.5. Table 8.1 below summarises the potential GB consumer benefit as a result of NSN under the three modelled scenarios.

Table 8.1: Estimated GB consumer benefit of NSN (£m, 2013 prices)

	Base	**High**	**Low**
GB wholesale price savings[39] (£m NPV)	£3280m	£3542m	£1468m
Impact of cap and floor payments (£m NPV)	-£0.1m	£76m	-£804m
Onshore reinforcements costs (£m – these are one off cost, not discounted over 25yrs)	-£277m	-£277m	-£277m
System operation impacts (£m NPV)	£461m	£1104m	-£181m
Total consumer benefit	**£3464m**	**£4445m**	**£206m**

8.6. Table 8.2 summarises the estimated total GB welfare impact of NSN.

Table 8.2: Estimated total GB welfare impact of NSN (£m, 2013 prices)

	Base	**High**	**Low**
GB consumer welfare	3464	4445	206
Total GB welfare (sum of consumer, producer and interconnector welfare)	**£493m**	**£1864m**	**-£1247m**

8.7. As noted in Chapter 3, NSN's participation in the CM may cause a reduction in overall GB welfare as half of the CM revenues (estimated at £18.5 million annually) will accrue to Statnett. This analysis is indicative only, for the reasons set out in Chapter 3. It should be noted that our analysis has not included any of NSN's contributions to the benefits provided by the CM.

8.8. We have reached our minded to position on the IPA for NSN based on the positive conclusions from each part of our assessment. Overall we consider that the project has a strong needs case. **We are consulting on awarding NSN a cap and floor regime in principle.** This is subject to no material escalation in costs (ie as long as the resulting prices from the tender process are broadly in line with estimates from NSN) or changes in project specifications between now and the conclusion of our FPA stage.

[39] This is the savings from the reduction in GB wholesale prices as a result of NSN. These benefits, minus the impact the cap and floor payments generate the GB consumer welfare benefit shown in Chapter 3.

Next steps

8.9. Our consultation on our IPA conclusion, and on our progress with the FPA to date (covered in Chapter 9), closes on 3 February 2015. Subject to consultation responses, we then aim to reach a decision on the IPA for NSN in March 2015.

9. Progress on the Final Project Assessment (FPA) for NSN

Chapter Summary

In this chapter we set out the regulation of the GB half of the NSN interconnector under the cap and floor regime. We present our assessment of the development costs for the GB half of the interconnector. We also provide our initial views on NSN's technology choice and tendering strategy and process.

We conclude this chapter by explaining the process for completing our cost assessment following NSN's investment decision.

Question box

Question 10: Do you have any comments on our application of the regime to NSN?
Question 11: Do you have any comments on our assessment of the development costs?
Question 12: Do you have any comments on our initial assessment of technology choice or tendering strategy for the NSN interconnector?

9.1. The objective of the FPA is to assess the efficiency of detailed project costs to set the cap and floor levels, and to finalise the regime design for NGIH's share of the NSN interconnector. It is important to ensure that the cap and floor are set on the basis of an efficient and appropriate level of costs. This is because if revenue falls below the floor then consumers will top up developers' revenue to the level of the floor. Equally, if revenues exceed the cap the surplus will be returned to consumers.

9.2. We have assessed some cost areas now, where information was provided in NGIH's September 2014 submission. The majority of detailed costs will be assessed in mid-2015 when NSN's procurement process has concluded and NGIH has submitted detailed cost information. We will then set the provisional cap and floor levels for the NSN interconnector following consultation.

9.3. We will monitor spending during project construction. When the project is near the end of construction (in approximately 2019) we will finalise our cost assessment to take into account efficient expenditure needed to address risks arising and also to set the final opex allowance. Following this, the final cap and floor levels (fixed in real terms) will be set for 25 years.

9.4. So far we have undertaken analysis in three areas: development costs, technical design, and tendering strategy and process. We think it is beneficial to assess these areas now as they relate to items where costs have already been incurred (ie development costs) and where decisions have already been made by NSN's developers[40] (eg high-level technical design). This will also give NGIH useful information to allow it to make a well informed investment decision.

9.5. Our assessment and analysis are based on information submitted to us by NGIH and informed by work from our technical consultants, Fichtner. Alongside this consultation we are publishing the conclusions of Fichtner's report, which are redacted in places for confidentiality reasons.

9.6. We plan to take our decision on development costs in March 2015 following this consultation. We may revisit our assessment of NSN's technology design if issues are raised through consultation or if NGIH's final cost submission has costs materially above our expectations (eg in comparison with other benchmarks). For the tendering strategy and process we have provided our initial views here and we will provide our full assessment at later stage when the tendering process is finalised.

9.7. The rest of this chapter is structured as follows:

- clarifying the regulatory design for the NSN interconnector
- results from our cost assessment so far
- the process for finalising the cap and floor cost assessment.

Regulation of the NSN interconnector

9.8. The NSN interconnector is owned by NGIH on the GB side and Statnett on the Norwegian side. Since there is a different regulatory framework for interconnectors in Norway[41], the cap and floor regime will apply only to the GB side. The regime design for NGIH's share of NSN is in line with our May 2014 consultation and August 2014 decision.

9.9. As the cap and floor will only apply to the GB half of the interconnector we propose the following:

- Setting the cap and floor on the basis of revenues and future costs being split 50:50 between NGIH and Statnett. [42] Some costs may need to be

[40] Where we use the term 'the NSN developers', we are referring to Statnett and NGIH.
[41] The Norwegian side of NSN will be regulated by the Norwegian Water Resources and Energy Directorate (NVE): http://www.nordicenergyregulators.org/wp-content/uploads/2013/05/TSO_report1.pdf.
[42] Revenues from trading activities, capacity markets and trading of reserves are shared between the NSN developers, NGIH and Statnett, on a 50:50 basis. Revenues from payments to/from the cap and floor mechanism or Statnett regulated returns will not be shared.

treated on a case-by-case basis, eg country specific fees such as licence fees not being shared.

- Setting the regime based on GB tax arrangements only.
- Linking the cap and floor levels to the UK Retail Prices Index (RPI).
- Using specified GB parameters only for the return benchmarks (cost of debt and equity).

Development costs

9.10. All NGIH specific development costs[43] for the NSN interconnector project are funded exclusively by NGIH. The only exception is the cost of surveys, which is a significant part of development costs (about 39% of NGIH's total development costs for the NSN interconnector). Survey costs have been funded 50:50 by NGIH and Statnett.

9.11. Our consultants consider that NGIH's share of development costs are within a reasonable range for projects of this scale and nature. Our comparison with the Nemo interconnector also indicates that these costs are reasonable given the scale of the project.

9.12. We therefore propose to allow these in full. These costs will feed into the cap and floor levels. Subject to consultation responses, we propose to make a decision in March 2015 and not revisit it thereafter.

Technology choice

9.13. Based on our assessment of the information provided to us by NGIH, we believe that the choice of transmission capacity (1400MW) and voltage (525kV) are justified. In addition, based on information provided to us by NGIH, and taking into account the network limitations and land availability constraints at the Norwegian connection point, we consider NSN's choice of VSC technology to be rational and it offers operational flexibility and reduced requirement for onshore reinforcement. For cable technology we believe NSN choice is broadly justified, however our consultants have raised a question about why NSN did not consider an alternative cable technology, which we are discussing with NSN.

[43] Development costs consist mainly of: surveys such as geophysical, geotechnical and bathymetric surveys; environmental studies for different planning and consents applications; NGIH employee costs for staff working solely on development of the project; UK specific land costs; and UK legal costs.

9.14. Further details on technology choice are provided in Appendix 4 and our consultants' report which we have published with this consultation.

9.15. We will consider the specific costs of NSN's technology choice as part of our cost assessment in 2015. We do not intend to revisit our view of NSN's technology choice subject to responses to this consultation and resolving questions over the cable technology choice. However, we may revisit this if issues arise as part of our cost assessment, such as where NGIH's cost submission in mid-2015 has costs materially above our expectations (eg in comparison with other benchmarks).

Tendering strategy and process

9.16. Based on the information received from NGIH, we have assessed part of the tendering process carried out by NSN. This is a complex, commercially sensitive and still ongoing process. We are therefore unable to conclude an in-depth review of the tendering strategy and process and have only provided a high level assessment of the principles under which the tendering is being carried out. A full assessment of the tendering process can only be done when the outcome of the process is known. We will assess these in more detail during later stages of our cost assessment.

9.17. NSN has tendered for engineering, procurement, construction (EPC) contracts where a single contractor is responsible for the detailed design, manufacture and installation and commissioning of the works specified within the contract. We think that overall the choice of EPC contracts is sensible.

9.18. NSN has established a separate procurement process for the cable and converter contracts and a splitting strategy for subsea cable contracts. Suppliers have been invited to tender for three separate cable lots. We share our consultants' views that given the limited supplier marketplace and the volume of the cable (714km), such a process can be more cost-efficient but introduces interface risks between the contracts that NSN must manage. How these risks are mitigated or treated within the contracts is crucial to the project and we will assess these in greater depth during the cost assessment process.

9.19. Initially, NSN carried out a market assessment to identify the suitable suppliers and run an initial supplier engagement process. Then, it used a pre-qualification questionnaire (PQQ) to assess the suitability of potential bidder's commercial, technical and financial capabilities. Following this, the invitation to tender (ITT) documentation was developed and issued to pre-qualified suppliers. After tenders were returned by the bidders, the evaluation and negotiation process started. This is still ongoing.

9.20. We share the view of our consultants that the range of actions taken by NGIH is within common and desirable practice on contracts of such scale. This allows the client (ie the NSN developers) to provide invitation to tender documents only to suitable parties. The effectiveness of such a process depends on the client establishing that each prequalified party is capable to carry out its work at all levels.

Next steps on our FPA and the rest of our cost assessment

9.21. We will resume our cost assessment process when NSN has concluded commercial negotiations with its contractors and sufficiently detailed information is available for us to make a detailed cost assessment. We expect NGIH to submit detailed costs for our assessment in mid-2015. The broad cost areas that we will assess include:

- capital costs (including the EPC contracts)
- replacement costs
- decommissioning costs
- project management costs.

9.22. We will compare similar projects to help inform our assessment. We will consider the specifics of a project of this scale and nature to determine if costs are efficient and whether they should feed through to set the cap and floor. We plan to finalise our assessment of the efficiency of these costs following consultation in late 2015 and will not reopen these as part of the post construction review. To inform our assessment, we will require a well justified submission from NGIH as set out in our May 2014 consultation and August 2014 decision.

9.23. We will also review the risk sharing arrangements between NSN and its contractors to ensure that sensible arrangements are in place to protect consumers. We will set a baseline of the risk position to understand what risks are in and out of the contracts and what is re-measurable.[44] We will also seek to understand how NSN will mitigate and address risk. This will inform our later assessment of risk expenditure.

9.24. We also propose to set the availability target at the same time as setting the initial cap and floor in line with our May 2014 consultation and August 2014 decision.

Reporting during construction

9.25. We think that annual monitoring and reporting through the construction phase is proportionate to ensure that we are kept up to date on the project costs. This will provide auditable information that will help to validate costs in the final capital cost assessment. We expect NGIH to justify any deviation in spending from

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[44] Re-measurable items are where the employer has agreed unit rates for the contract item but holds responsibility for risks in the volume of items required. As such, the contract is re-measured, at the employer’s cost, to account for changes in the volume of works required.

the initial capex allowances in these reports (and in the final assessment). This will include what risks have emerged, the impact on costs, how NSN has addressed them, updates on re-measurable items, and any changes to the scope of the project.

Post-construction review

9.26. In 2019 we will do a post-construction review of costs before the interconnector starts operating. The exact timing of this will align with when NSN has sufficient information for us to do a full assessment (when project construction is 95 per cent complete). As part of this we will look at changes to the final HVDC contract costs, assess re-measurable items, set allowances for risk, insurance and operational expenditure. The assessment of risks will be informed by whether costs were (i) efficiently incurred, (ii) outside the company's control and (iii) appropriately mitigated. Following this final assessment we will set the final cap and floor levels for 25 years, subject to a potential re-opener to review operational costs after 10 years of the project lifetime.

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 3 February 2015 to:

- Stuart Borland
  Electricity Transmission Investment
  9 Millbank, London. SW1P 3GE.
  0207 901 7134
  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 NSN. Any questions on this document should, in the first instance, be directed to:

- Stuart Borland
  Electricity Transmission Investment
  9 Millbank, London. SW1P 3GE.
  0207 901 7134
  Cap.Floor@ofgem.gov.uk

Chapter Three

Question 1: What are your views on the approach Pöyry has taken to modelling the impact of cross-border interconnector flows?
Question 2: Do you agree with the modelling results for NSN and our conclusion that NSN is likely to provide benefits to GB consumers?

Chapter Four

Question 3: Do you have any comments on the system operation impacts of NSN?
Question 4: Do you have any views on the onshore connection information?

Chapter Five

Question 5: Have we appropriately assessed the qualitative impacts of NSN link?
Question 6: Are there any additional impacts of NSN link that we should consider qualitatively?

Chapter Six

Question 7: Do you have any comments on our assessment of NSN's chosen connection locations or cable routes?

Chapter Seven

Question 8: Do you have any comments on our assessment of NSN's project plan?

Chapter Eight

Question 9: Do you agree with our conclusions on the IPA for NSN?

Chapter Nine

Question 10: Do you have any comments on our application of the regime to NSN?
Question 11: Do you have any comments on our assessment of the development costs?
Question 12: Do you have any comments on our initial assessment of technology choice or tendering strategy for the NSN interconnector?

Appendix 2 – 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. We note that 'important' is defined 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 NSN being granted a cap and floor is embedded throughout the main body of this consultation.

1.3. This appendix includes consideration of additional items that are in our Impact Assessment guidance but not in the main body of our consultation. This appendix aims to ensure that we have fully considered the impacts of the project being granted a cap and floor, against a baseline whereby the project is not granted a cap and floor and is not progressed by the developers.

1.4. The areas covered in this appendix, to supplement the main consultation document, are as follows: impact on competition; impact on health and safety; impact on vulnerable customers; and impact on existing and future interconnectors.

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.[45]

1.6. Interconnection enables cross-border electricity flows and therefore results in larger electricity markets. This allows for increased number of market players to participate in both the generation and supply of electricity. Benefits of competition can be realised as new entrants participate across connected markets.

1.7. For the Nemo link project, the accompanying study included quantified competition tests in the form of concentration ratios and Herfindahl-Hirschmann

[45] See Nemo link IA: https://www.ofgem.gov.uk/publications-and-updates/cap-and-floor-regime-application-project-nemo-impact-assessment

Indices.[46] 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 on the impact of NSN on competition in the GB wholesale market as we consider that the analysis would give similar results. This would be driven by factors such as the technology and asset type, and the timing of connection to the GB market. Overall, we expect NSN 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 health and safety

1.9. 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.

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

1.11. We consider the potential negative impacts of the development of the cap and floor regime for NSN to be the normal health and safety risks 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.

Impact on vulnerable customers

1.12. Our expectation is that NSN will provide net benefits for GB welfare. Part of this benefit is the import of lower priced electricity from Norway, and hence the lowering of energy bills for consumers. In Pöyry's modelling, the Base case is assumed to provide up to £3.5bn net welfare for GB consumers.

1.13. We acknowledge that there is potential for bills to rise as a consequence of payments when the interconnector revenues fall below the floor. We expect any payments from the floor would be minimal, in line with the Pöyry report accompanying this consultation document. Pöyry's modelling estimates that wholesale price reductions are likely to significantly outweigh any floor payments, even in the Low scenario (leading to positive GB consumer welfare).

[46] 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.

1.14. The likelihood of NSN hitting the floor is reduced with the confirmation by government that interconnectors will be participating in the Capacity Market.[47] Overall, we think that NSN will be beneficial for vulnerable customers.

Impact on existing and future interconnectors

1.15. 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 "cannibalisation" of revenues that NSN would have upon existing interconnectors. We think there is a small impact on the needs case and revenues for other interconnectors.

1.16. It is our view that the impact and needs case of other interconnectors is relatively independent of the presence of NSN.[48]

[47] See Government press release: https://www.gov.uk/government/news/interconnectors-to-participate-in-the-capacity-market-from-2015
[48] This is driven by NSN connecting to a different market to the existing and potential future interconnectors.

Appendix 3 – Information on our assessment of hard-to-monetise impacts

1.1. Our chapter on qualitative impacts includes a summary of our assessment of hard-to-monetise impacts. Within this assessment there are a number of areas that together make up a strategic and sustainability assessment, in line with our Impact Assessment guidance.[49]

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.

- Stress and security implications: This concerns the effect on security of supply; potential for extreme price and/or volatility in the market; and the UK'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 decision or events can affect the likelihood of future decisions, ie 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 UK 2050 targets; natural asset implications; and longer-term greenhouse gas (GHG) considerations.

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

Appendix 4 – Further information on NSN's technology choice

1.1. This appendix summarises the findings of NSN's transmission capacity and voltage, converter and cable technologies. Our assessment and analysis are based on information submitted to us by NGIH and informed by work from our technical consultants, Fichtner. Along this consultation we are publishing conclusions of Fichtner's report which are redacted in places due to commercial confidentiality.

Transmission capacity and voltage

1.2. The NSN developers considered a transmission capacity between 1200MW and 1600MW.[50] The key determining factors for selecting a capacity of 1400MW was to ensure compliance with network and system security and quality of supply (SQSS) limitations imposed at both ends of the interconnector[51] and to limit network reinforcements.[52]

1.3. A voltage level of 525kV was selected. The narrow technology choice and market experience determined this voltage level.

1.4. Based on our assessment of the information provided to us by NGIH, we believe that the choice of transmission capacity and voltage is justified. We have however not been able to independently review the network studies that underpin the NSN technology capacity selection process at this point in time.

Converter technology

1.5. The NSN developers consider that HVDC technology would provide the most efficient option because of the length of the cable. We think this is a reasonable choice. It aligns with the findings of a study that we commissioned in March 2013[53] that HVDC is appropriate for distances longer than 60-70 km and/or capacities higher than 1000MW.

1.6. The two converter technologies currently available for HVDC applications are conventional current source converters (CSC) and voltage source converters (VSC).

[50] Operational experience from Skagerrak 4, the fourth HVDC interconnector between Norway and Denmark, was used to inform this range.
[51] System security requirements for connection in Norway limit capacity to 1400MW.
[52] Capability of the network at Blyth means that a capacity of 1400MW would not require noteworthy network reinforcement; NGET has advised us that this would be the case.
[53] Review of Worldwide Experience of Voltage Source Converter (VSC) High Voltage Direct Current Technology (HVDC) Installations, accessed online at: https://www.ofgem.gov.uk/ofgem-publications/52726/skmreviewofvschvdc.pdf

1.7. NSN will be built using VSC converter technology in a bipole configuration. This technology choice is predominantly based on concerns over network conditions (low short circuit levels) and land availability constraints at the connection point in Norway.[54] VSC will also provide additional benefits for GB system operation (for example black start and reactive power) that are not available with other technologies.

1.8. Given the information provided to us by NGIH, and taking into account the connection location and related short circuit level, converter station footprint constraints, added operational flexibility and reduced requirement for onshore reinforcement, we consider NSN's choice of VSC technology to be rational. We have however not been able to independently review the network studies that underpin the NSN VSC technology selection process at this point in time.

1.9. We will consider the specific costs of NSN's technology choice as part of our cost assessment in 2015.

Cable technology choice

1.10. The NSN developers have considered the two primary types of cables used in VSC-HVDC installations: cross-linked polyethylene (XLPE) and mass impregnated non-draining (MIND).

1.11. NGIH has confirmed that no submarine XLPE cable was in operation or in contract at the specified 525kV voltage level when NSN tendered for a submarine cable. To minimise the risk with new technology and increase competition benefits through procurement, MIND cable was selected.

1.12. On the choice of cable, our consultants believe that NSN's technical choice is broadly justified; they note though that the NSN developers could have considered an alternative option cable option, MIPPLP[55], which could reduce costs. However, this alternative cable option has higher cable losses, which can be mitigated through careful cable design.

1.13. We believe the choice of MIND over XLPE is justified. We will be requesting further justification from NGIH why MIPPLP has not been considered.

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[54] Short circuit levels determine the strength of an AC network. A VSC converter does not require a strong AC network and can be placed anywhere in an AC network, even at connection points with a low short circuit ratio. In addition, the footprint of a VSC converter station is much smaller than that of a CSC station.

[55] Our consultants have pointed out that mass-impregnated lapped paper polypropelyene laminate (MIPPLP) technology, which allows a higher operating temperature compared to MIND, has not been considered. This technology choice could have an impact on cable cost as the required cable cross section would have been much smaller with MIPPLP than with MIND.

Appendix 5 – 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.

C

Capital expenditure (capex)

Expenditure on investment in long-lived network assets, such as gas pipelines or electricity overhead lines.

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 regulators to determine the efficient levels of project expenditure.

Cost-benefit analysis

An evaluation of project costs against the upside benefits that such a project could provide. This is primarily discussed in the context of quantitative modelling.

Cost of debt

The effective interest rate that a company pays on its current debt. Ofgem calculates the cost of debt on a pre-tax basis.

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.

D

DC

Direct current.

DECC

Department of Energy and Climate Change.

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

500MW HVDC electricity interconnector between GB and Ireland.

ENTSO-E

European Network of Transmission System Operators for Electricity.

EU

European Union.

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 assessment of whether a project should be granted a cap and floor regulatory regime.

G

GB

Great Britain.

Greenlink

Proposed 500MW HVDC electricity interconnector between GB and Ireland.

GW

Giga Watt.

H

HVDC

High Voltage Direct Current.

I

IFA

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

IFA 2

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.

Interest during construction (IDC)

A tool used to capture the financing costs of the developer during construction.

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

Proposed 1000MW HVDC electricity interconnector between Belgium and Great Britain.

NSN

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.

Operating expenditure (Opex)

Expenditure on the day to day operation of a network such as staff costs, repairs and maintenance and business overheads.

S

System Operator (SO)

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

T

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 6 – Feedback questionnaire

1.1. We consider that consultation is at the heart of good policy development. We are keen to consider any comments or complaints about the manner in which this consultation has been conducted. In any case we would be keen to get your answers to the following questions:

1. Do you have any comments about the overall process adopted for this consultation?
2. Do you have any comments about the overall tone and content of the report?
3. Was the report easy to read and understand? Could it have been better written?
4. To what extent did the report's conclusions provide a balanced view?
5. To what extent did the report make reasoned recommendations for improvement?
6. Please add any further comments.

1.2. Please send your comments to:

Andrew MacFaul
Consultation Co-ordinator
Ofgem
9 Millbank
London
SW1P 3GE
andrew.macfaul@ofgem.gov.uk