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Decision

Eastern HVDC – Decision on the project's Initial Needs Case and initial thinking on its suitability for competition

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This document sets out our key findings and decisions from the Eastern HVDC project's Initial Needs Case following our consultation on 12 May 2021.

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Executive summary

The EHVDC project and what this document covers

In May 2021 we consulted on our findings on the Initial Needs Case for the proposed 'Eastern HVDC' (EHVDC) project. EHVDC is a proposed project from the three electricity transmission owners (TOs) that own and operate the transmission network in Great Britain[1]. It was submitted under our Large Onshore Transmission Investment (LOTI) mechanism[2].

EHVDC is an electricity transmission project to construct two High Voltage Direct Current (HVDC) links, each with capacity of 2GW, down the east coast of GB from Scotland to the north-east of England. The need for these HVDC links is triggered by the need to transmit electricity generated in Scotland down past the congested network around the border to England, closer to demand. At an estimated cost of £3.4bn for the two links, the EHVDC project would be the largest electricity transmission investment project in the recent history of GB.

Following consultation, this document summarises our confirmed decisions from our INC assessment.

Large Onshore Transmission Investment mechanism (LOTI) Initial Needs Case assessment

We are satisfied that there is a clear consumer benefit in the EHVDC project progressing. We have concluded that the TOs have made a clear case so far for the two proposed HVDC links that form the EHVDC project. We also note that analysis from the Electricity System Operator (ESO) has suggested that delays in delivering the links could cause a significant detriment to consumers in constraint costs.

A number of different technical options were considered within the project-specific cost benefit analysis presented within the Initial Needs Case (LOTI CBA). The results of the LOTI CBA are close in terms of the most economic and efficient landing points of some of the

[1] The TOs are National Grid Electricity Transmission (NGET), Scottish Power Transmission (SPT) and Scottish Hydro Electric Transmission (SHET).
[2] Special Condition 3.13 of the Electricity Transmission Licence

HVDC link options. However, in line with the view expressed in our consultation, we consider that based on the evidence available, the TOs have progressed the most economic and efficient options so far.

We have also considered the need for the two proposed EHVDC links in the context of the Offshore Transmission Network Review (OTNR) currently being undertaken by Ofgem, Government and other key parties. Based on current evidence, we do not consider that future offshore network co-ordination will have a material impact on the consumer benefit case for the TOs' proposals for the two HVDC links as part of the EHVDC project. We will consider during our Final Needs Case (FNC) assessment whether any significant additional evidence has come to light from the OTNR work that should be considered. Our consideration of any impact of the OTNR work on the EHVDC proposals will need to factor in the likely impact of any resulting delay to delivery of EHVDC.

The TOs intend to continue to progress their preferred options for EHVDC further and make a FNC submission in December 2021. As part of the FNC process, we expect to receive an updated CBA from the TOs. We will use this updated CBA, as well as any further information and evidence that becomes available during our assessment process, to assess whether the case for the proposed links remains economic and efficient relative to alternative options. Based on our assessment at this INC stage, we expect our focus at the FNC stage to be on asessesing whether a robust delivery plan is in place to deliver the project on time, and assessing whether any changes in technical scope, design, or cost estimates relative to the INC are fully understood and justified. Where the TOs propose any changes to the delivery dates of the proposed options, TOs can expect our FNC assessment to be more in depth.

The latest NOA report[3] sets out that a further two HVDC links between the east coast of Scotland and England may be required by 2031 in order to accommodate the expected further increase in renewables beyond 2030. We understand that the TOs are developing these two additional links to a later timescale, due to them not being needed as quickly. Our understanding is that the TOs will submit to us an INC for further HVDC links down the east coast within the next 12 months. Given the later timescale for the development of those further links, we expect the information provided within the INC for those additional links to clearly set out (a) whether and how the links relate to outcomes from the OTNR

[3] NOA Report, January 2021

and (b) form part of a coordinated plan for design of the network in that region. We have also asked the TOs, as part of the FNC for EHVDC, to provide analysis that explores the interaction with these potential additional links.

Assessment of suitability for late competition models

In line with our Final Determinations for the RIIO-2 period for Electricity Transmission, as EHVDC is being considered under the LOTI mechanism, we have assessed the suitability of the project for 'late model' competition[4]. Our view is that the project as a whole meets the criteria for late model competition (new, separable, and high value).

In line with the view expressed in our May consultation, we have not made a decision yet on whether to apply one of the late competition models to the project. This is because it is difficult to determine at this stage when the required legislation will be introduced to finalise the Competitively Appointed Transmission Owner (CATO) model and whether this would support timely delivery of the EHVDC project.

From our assessment we do not see that there is likely to be any meaningful consumer detriment in delaying our competition decision to the FNC stage when we will have more clarity on the timing of CATO legislation.

[4] 'late model' competition refers to the late models of competition (i.e. run for delivery once a project is sufficiently developed) identified for consideration for LOTI projects within the RIIO-2 Period (the Competitively Appointed Transmission Owner (CATO) model, the Special Purpose Vehicle (SPV) model and the Competition Proxy Model (CPM)).

1. Introduction

Context

1.1. The GB onshore electricity transmission network is currently planned, constructed, owned and operated by three transmission owners (TOs): National Grid Electricity Transmission (NGET) in England and Wales, SP Transmission in the south of Scotland, and Scottish Hydro Electric Transmission in the north of Scotland. We regulate these TOs through the RIIO (Revenue = Incentives + Innovation + Outputs) price control framework. For offshore transmission, we appoint offshore transmission owners (OFTOs) using competitive tenders.

1.2. The incumbent onshore TOs are currently regulated under the RIIO-T2 price control, which started on 1 April 2021 and will run for 5 years. Under this price control, we developed a mechanism for assessing the need for, and efficient cost of, large and uncertain electricity transmission reinforcement projects. This mechanism is called 'Large Onshore Transmission Investment' (LOTI). Once the need for and costs of projects have become more certain, the TOs bring forward construction proposals and seek funding for them. As explained in Chapter 9 of our RIIO-2 Final proposals – Core document, all projects that come forward for assessment via the LOTI reopener during the RIIO-2 period will be considered for their suitability for delivery through one of the late competition models.

Overview of the Large Onshore Transmission Investment (LOTI) reopener mechanism

1.3. The Large Onshore Transmission Investments (LOTI) re-opener mechanism is an uncertainty mechanism we have included within the RIIO-2 price control for the electricity transmission sector. It provides TOs with a route to apply for funding for large investment projects that can be shown to deliver benefits to consumers, but that were uncertain or not sufficiently developed at the time we set costs and outputs for the RIIO-2 price control period. The LOTI mechanism provides us with a robust assessment process through which we can ensure that TO proposals represent value for money for present and future consumers.

1.4. In order to qualify for the LOTI mechanism, TO proposals must meet the following criteria:

a) are expected to cost £100m or more of capital expenditure; and
b) are, in whole or in part, either;
   i. load-related; or
   ii. related to a shared-use or sole-use generator connection project.

1.5. We are satisfied that the EHVDC project meets these criteria, is eligible as a LOTI project and we are therefore assessing it in accordance with the LOTI process, which is detailed in the LOTI Guidance[5].

Stages of our LOTI assessment

1.6. Following the approval of eligibility, our LOTI assessment process is made up of three main stages:

1. **Initial Needs Case (INC)** – The usual focus of our assessment at this stage is to review the technical and/or economic requirement for the project, the technical options under consideration, and the TO's justification for taking forward its preferred option for further development.

2. **Final Needs Case (FNC)** – Following the securing of all material planning consents for its project (unless we specify alternative timing), the TO will then need to submit a FNC. The focus of our assessment at this stage is to confirm the need for the project, by checking that there have been no material changes in technical and/or economic drivers that were established at INC.

3. **Project Assessment** – If the FNC is approved, the TO will then need to apply for a Project Assessment Direction. The focus of our assessment at this stage is the assessment of the proposed costs and delivery plan that the TO has in place for the project, with a view to potentially specifying a new LOTI Output, a LOTI Delivery date, and setting the efficient cost allowances that can be recovered from consumers for delivery of the project.

[5] Large Onshore Transmission Investments (LOTI) Re-opener Guidance | Ofgem

Initial Needs Case for the EHVDC project

1.7. The Initial Needs Case (INC) for the EHVDC project was submitted by a joint project team from the three GB onshore Transmission Owners (TOs); namely, Scottish Hydro Electric Transmission (SHET), SP Transmission (SPT) and National Grid Electricity Transmission (NGET) in October 2020.

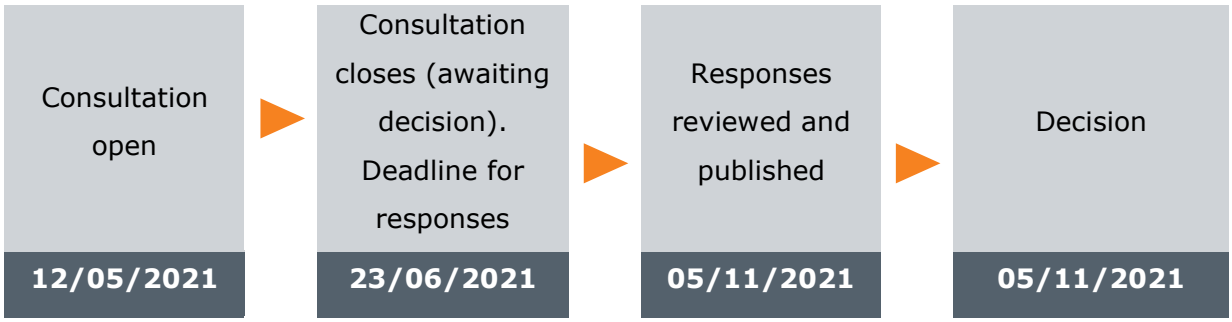
1.8. We consulted on our INC findings in May 2021. All non-confidential responses to our consultation are published on our website alongside the decision. Within Chapter 2 and 3 respondent views on the positions reached for consultation are summarised, along with our responses.

Related publications

EHVDC INC consultation: Eastern HVDC - Consultation on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem
RIIO-2 Final Determinations - Core Document: https://www.ofgem.gov.uk/publications-and-updates/riio-2-final-determinations-transmission-and-gas-distribution-network-companies-and-electricity-system-operator
LOTI Reopener Guidance document: https://www.ofgem.gov.uk/publications-and-updates/large-onshore-transmission-investments-loti-re-opener-guidance

Our decision making process

Figure 1: Decision-making stages



Your feedback

General feedback

1.9. Please send any general feedback comments to RIIOElectricityTransmission@ofgem.gov.uk.

2. Eastern HVDC Initial Needs Case Assessment

Section summary

This chapter summarises the key design decisions Transmission Owners (TOs) have made to date on the EHVDC project. It sets out our views on these as set out in our May consultation and summarises key responses to that consultation. Finally, it sets out our key findings and decisions on the Initial Needs Case.

Overview of the TOs' Proposal

2.1. The INC for the EHVDC project is supported by a cost benefit analysis (LOTI CBA) carried out by the Electricity System Operator (ESO) as well as recommendations from the annual Network Options Assessment (NOA) process and report.

2.2. The TOs' proposal is to progress the development of two subsea HVDC links with capacity of 2GW each, at a combined estimated cost of £3.4bn:

2.2.1. One from Torness in South-East Scotland to a connection point on the existing network at Hawthorn Pit in the North-East of England; and

2.2.2. One from Peterhead in North-East Scotland to a connection point on the existing network at Drax in North Yorkshire.

2.3. The TOs have started carrying out survey work in order to refine the exact route corridors of their proposed subsea cable solutions. They are refining their plans for the onshore works ahead of seeking planning approval in early 2022. They expect to engage further with interested suppliers and contractors this summer ahead of starting a full procurement process in 2022.

2.4. Appendix 1 of this document replicates the information provided in the consultation on why the project has been brought forward, and how the TOs selected the options that were considered in the LOTI CBA. It also explains the CBA process, the results and the justification provided for the TO proposed position.

2.5. The remainder of this chapter explains our consideration of these aspects as presented in our May consultation, the views presented by respondents and our consideration of these, and confirmation of our final INC decision.

Our views on the TO proposals

Our INC conclusions on why the project has been brought forward

Consultation position

2.6. In our May consultation we agreed that the EHVDC project is needed and that there is a need for at least two links. This was based on the following results from the LOTI CBA:

2.6.1. All combinations of options considered within the LOTI CBA, under all future demand/supply scenarios modelled, deliver a positive net present value (NPV) for consumers relative to the counterfactual of not investing.

2.6.2. Within the CBA the greatest benefits are found in the combinations that include two HVDC links, with these all having a net benefit of over £10bn.

2.7. We noted that a third and fourth link are included in the latest NOA recommended investments. We have asked the TOs to provide analysis that explores the interaction with these potential additional links, as part of the FNC for EHVDC. It should be noted however, that these additional projects are being developed to a later timescale and are ultimately outside of the scope of this INC decision for the EHVDC project.

Consultation responses and our consideration of them

2.8. The majority of respondents agreed with our assessment and supported the need for two links. One respondent felt that, relative to consultations on comparable projects, less information and evidence on the rationale for our assessment was included in our consultation on EHVDC.

2.9. We consider that all the information that was used to reach our position for consultation was included in our consultation. The EHVDC project is at the INC stage of assessment under LOTI. The scope of the INC assessment is summarised within the

published LOTI Guidance.[6] The INC submission for the EHVDC project has allowed us to reach conclusions on the considerations within the scope of this stage of the LOTI process. As the project evolves through the LOTI process, there will be additional evidence that will feed into our assessment. There are limited projects that have been subject to an INC to date, but we consider the level of detail provided in the consultation is proportionate to our assessment, and in line with the level of detail presented in previous INC consultations.

Our INC conclusion

2.10. We remain satisifed that the TOs have identified a valid technical requirement for the reinforcement. Having considered all representations made through the consultation responses, we have not changed our view that the EHVDC project is needed and that there is a need for at least two links.

Our views on how the TOs selected which options to include in the LOTI CBA

Consultation position

2.11. Our consultation concluded that the assessment process that was followed by the TOs to narrow down the options that were included in the CBA appeared to have been done in a logical manner. We did not find that any options had been inappropriately excluded from the CBA.

Consultation responses and our consideration of them

2.12. One respondent raised a concern that alternatives to network investment, such as long-term storage, are not appropriately considered within the NOA analysis and therefore excluded from consideration for addressing the network needs that EHVDC is designed to address. No other respondents raised concerns about the range of options considered. In terms of whether long-term storage is not appropriately considered in the NOA, as the respondent acknowledges, this is because this technology does not directly increase boundary transfer capacity[7], which is the main focus of the NOA analysis. Given

[6] Paragraph 4.12: large_onshore_transmission_investements_loti_re-opener_guidance_-_clean_0.pdf

[7] Boundary transfer capacity: To provide an overview of existing and future transmission requirements, and report the restrictions on the NETS, the concept of boundaries is used. The NETS is split by boundaries that cross critical circuit paths that carry power between the areas where power flow limitations may be encountered. Boundary transfer capacity is the maximum pre-fault power that the transmission system can carry from the region on one side of a boundary to the region on the other side of the boundary while ensuring acceptable transmission system operating conditions will

the level of boundary transfer uplifts required across the boundaries that EHVDC will address, it is highly unlikely that storage alone can provide an equivalent consumer benefit to the proposed investment in this case. Having said this, we do agree in general that there needs to be a stronger role for alternatives such as storage within the established network planning process. Recently the ESO introduced the Interested Persons process into the annual NOA process in order to provide an opportunity for third-parties to propose alternatives to traditional network investment. Also, as part of its recent five point plan to manage constraints on the system, the ESO is looking to carry out future system analysis to help identify potential commercial models for storage solutions to help manage constraints[8]. Through our work on both our Electricity Transmission Network Planning Review[9] and Early Competition[10], we are working with the ESO to ensure that the non-traditional alternatives to TO investment are considered within the network planning process and are also able to be delivered by parties other than the existing TOs.

Our INC conclusion

2.13. We remain satisfied that the TOs have considered a reasonable range of technically feasible options and/or operational measures to meet the network requirements. Having considered all representations made through the consultation responses, we do not consider that any feasible technical solutions able to address the network requirements have been excluded from consideration. For this reason we agree that the assessment process that was followed by the TOs to narrow down the options that were included in the CBA appears appropriate.

Our views on the CBA process and results

Consultation position

2.14. Our consultation explained that overall, across all evidence we considered, the TOs' preferred options for EHVDC are likely to represent the best value solution. In

exist following one of a range of different faults.

[8] https://www.nationalgrideso.com/news/our-5-point-plan-manage-constraints-system

[9] We are due to publish a consultation on this soon

[10] https://www.ofgem.gov.uk/publications/consultation-our-views-early-competition-onshore-electricity-transmission-networks

addition, we set out that the case for these links is only likely to strengthen over time due to the later Earliest in Service Dates (EISDs)[11] of alternative options.

2.15. Our consultation explained that within the LOTI CBA the optimum landing point of the HVDC cables appeared relatively finely balanced. This is because the LOTI CBA did not include the latest supply and demand assumptions within the Future Energy Scenarios (FES) and did not include latest updates to the EISDs. A key consideration for the EHVDC project is the trade-off between the benefits of links landing further south on the network, versus the consumer detriment of delays associated with the additional time needed for longer links. For this reason we set out in our consultation that the LOTI CBA could not be solely relied on to assess this trade-off. We therefore had to use additional evidence from engagement with the TOs and the 2021 NOA analysis to validate the results of the LOTI CBA.

2.16. The LOTI CBA used the 2017 FES, rather than the latest FES available at the time the INC submission was made, which would have been FES 2019 or FES 2020. Both these more recent versions of the FES reflect a higher level of renewable uptake within Scotland and the north of England than included in FES 2017. In follow up engagements with the TOs it also came to light that the EISD for some of the discounted options, in particular options going to Cottam, appeared to have been based on an accelerated delivery programme that did not fully capture the route-specific consenting challenges presented. Further review of the proposals by the TOs identified that the route would take longer to deliver due to the need to either cross the Humber estuary, or break land further south and then cross an Area of Outstanding Natural Beauty (AONB). Having reviewed the evidence presented, our consultation recognised that these updated EISDs appeared reasonable and therefore that this option was appropriately discounted by the TOs.

2.17. Given the limitations of the LOTI CBA, a key consideration in our assessment was that the subsequent NOA publications in 2019 and 2020, which maintained the same inputs and methodology as the LOTI CBA, but used more up-to-date FES projections and EISDs, favoured the TOs' preferred options. We consulted on our view that this indicates that the options progressed by the TOs are the likely to be the optimum options to take forward.

[11] EISD is used to show the year at which a network reinforcement option can be feasibly delivered.

Consultation responses and our consideration of them

2.18. Whilst the majority of respondents agreed with our assessment that the TO proposed solutions are likely to represent the optimum solution for consumers, a number of generator respondents raised a concern that they considered that the costs of the TO proposed solution would fall unfairly on generators in Scotland. Other generator respondents raised concerns that the TO proposed solution appeared to favour the timely connection of generators in Scotland over the connection of equivalent generation in northern England.

2.19. In terms of the specific charges faced by generators, this will depend on the exact nature of their connection and location. This is governed through the established charging arrangements, which fall outside of the scope of this assessment as they are not a relevant consideration for the Initial Needs Case.

2.20. It should be noted that the CBA that underpins this decision and the NOA process more generally uses the FES scenarios to identify the transmission boundaries into which different potential levels of generation are likely to connect, and when. The costs of transmission projects to address these system needs are compared to the benefits of estimated savings in avoiding future constraint costs[12]. This is always done on the basis of the total level of reduced constraints across the GB network, and specifically has not, and would not, be used to prioritise the connection of generation in Scotland over generation in England.

Our INC conclusion

2.21. We are satisfied with the quality of the TOs' optioneering and their justification for shortlisting options. We are satisfied that there is a strong economic case for proceeding with the TO's preferred solution. Having considered all representations made through the consultation responses, we consider there is sufficient evidence to support that the options

[12] Constraints on the network would lead to the ESO making constraint payments to generators that need to be switched off. The cost of this would ultimately feed into consumer bills.

progressed by the TOs are the most economical, efficient and coordinated solution relative to other options and in the interests of existing and future consumers overall.

Interactions with the Offshore Transmission Network Review

Consultation position

2.22. Our consultation explained that in July 2020, the Government launched the Offshore Transmission Network Review (OTNR)[13], a BEIS-led cross-industry project in which we provide leadership on specific areas. This was in light of the Government's offshore wind target of 40GW by 2030, and the expectation of more offshore wind beyond that to deliver net-zero by 2050. The review was started on the basis that constructing individual point to point connections for each offshore wind farm may not provide the most efficient approach and could become a barrier to delivery. The OTNR may result in significant change to how infrastructure connecting offshore wind to shore is delivered. These changes could impact upon projects like EHVDC.

2.23. The Pathway to 2030 workstream of the OTNR seeks to develop a more coordinated model for delivery of offshore transmission infrastructure. It will include a model for central offshore network planning and central delivery of offshore transmission infrastructure. Implementing this will require changes to the current regulatory framework for offshore connections. This workstream is therefore expected to have an impact on exactly where offshore generation connects to the wider network. This has the potential to impact on future power flows on the network and therefore may, in some specific locations, have an impact on the design of the onshore network.

2.24. The future impact of a more co-ordinated offshore network was not a consideration within the early design and development of the EHVDC options, as offshore co-ordination was not a key consideration of the onshore electricity transmission planning process. In the last two years the NOA has started to consider theoretical offshore links between a number of known locations of future offshore wind development. This work has not altered the proceed signal in the NOA that has continued to be given to the TOs' preferred options for EHVDC. Based on current evidence, there is therefore no reason to

[13] Offshore transmission network review - GOV.UK (www.gov.uk)

think that future offshore network co-ordination will have a material impact on the consumer benefit case for the TOs' preferred first two links for EHVDC.

2.25. Having said this, our consultation referenced the importance that all relevant factors are considered where possible at the FNC stage for EHVDC. We explained that we will monitor the continuing work of the OTNR project and at the FNC stage consider whether any significant additional evidence has come to light that should be considered when making our decision.

Consultation responses and our consideration of them

2.26. Each of the TO respondents were in general agreement with our position on EHVDC's interactions with the OTNR work. A number of generation developer respondents emphasised the importance of a co-ordinated approach to future offshore wider works, and disagreed with the perceived exclusion of the EHVDC project from this work.

2.27. As we explained in the consultation, the evidence available shows that one of the key factors in the INC for EHVDC is ensuring that it is delivered on time. We did not consider it would be sensible to put our INC assessment on hold until the OTNR work is able to fully consider the design of the EHVDC project. This would likely have caused delays to the delivery of the project and therefore additional constraint costs.

2.28. This does not mean that the project is to be excluded from consideration via the OTNR work. As referenced in the consultation, our intention is to sense check the design of the project against the latest development in the OTNR work as part of our FNC stage assessment to ensure that the option being progressed remains the optimum solution for consumers. This strikes the balance of allowing such a strategically important project to continue to be progressed to ensure timely delivery, while undertaking an appropriate check against the emerging findings of the OTNR work to ensure that the option being developed remains the optimum solution for consumers.

Our INC conclusion

2.29. Having considered all representations made through the consultation responses, we have not changed our view. We still see no reason to think that future offshore network co-ordination will have a material impact on the consumer benefit case for the TOs' preferred first two links for EHVDC.

2.30. We will monitor the continuing work of the OTNR project and at FNC consider whether any significant additional evidence has come to light that should be considered when making our decision. For example, in January 2022, the OTNR is due to finalise its Holistic Network Design (HND) as described in our consultation on "*Changes intended to bring about greater coordination in the development of offshore energy networks*"[14]. Where this gives an indication that the two links proposed by the TO (from Peterhead to Drax (E4D3) and from Torness to Hawthorn-Pit (E2DC)) no longer represent the optimum solution we will, as referenced in our consultation, consider any additional benefits from changing the route or timing of the two EHVDC links in order to align with the OTNR, against the costs to consumers of any associated delay to delivery of EHVDC.

2.31. Finally, we will also expect the TOs to carefully consider any interactions with the OTNR as part of any development of the two further east coast links recommended in this year's NOA. Given the later timescale for the development of those further links, we would expect the information provided within the INC for those additional links to clearly set out whether and how the links relate to outcomes from the OTNR and form part of a coordinated plan for design of the network in that region.

[14] https://www.ofgem.gov.uk/publications/consultation-changes-intended-bring-about-greater-coordination-development-offshore-energy-networks

3. Delivery model considerations

Background

3.1. Competition in the design and delivery of energy networks is a central aspect of our RIIO-2 price controls. Competition has a key role to play in driving innovative solutions and efficient delivery that can help us meet our decarbonisation targets at the lowest cost to consumers. We set out in our Final Determinations for RIIO-2 that during the RIIO-2 period all projects that meet the criteria for competition and are brought forward under an uncertainty mechanism will be considered for potential delivery through a late competition model. As explained in Chapter 1, EHVDC is being brought forward for assessment under the LOTI mechanism, which is an uncertainty mechanism within RIIO-2.

Whether EHVDC meets the criteria for competition

3.2. The criteria for late model competition are as follows:

3.2.1. New

3.2.2. Separable

3.2.3. High-value: projects of £100m or greater expected capital expenditure.

Consultation position

3.3. In appendix 2 we set out an explanation of our competition assessment from our May consultation. We summarise key elements of our consultation position below.

Assessment against the criteria for late competition

3.4. In our consultation we explained that we consider that the EHVDC project as proposed meets the criteria for late competition.

Delivery model considerations and timing of decision

3.5. Since we considered that the EHVDC project meets the criteria for late model competition, our consultation also considered whether it is the interest of consumers for it to be delivered through a late model of competition, rather than via the prevailing LOTI

mechanism under the RIIO-2 arrangements. It also considered whether a decision on the delivery model was necessary at the INC stage.

3.6. Our consultation explained that, in line with the LOTI Guidance, wherever possible we intend to decide whether to apply a late competition model to a project at the INC stage of our assessment. It also explained that we may, at the INC stage, give an initial view before confirming our view at the FNC stage of our assessment.

3.7. In the case of the EHVDC project, our consultation explained that the TOs expect to submit the FNC at the end of 2021. This comes ahead of the decision on major planning consents for EHVDC, which is expected to take place by the end of 2022. We would then expect to make our FNC decision soon after. Based on the delivery plan that has been provided by the TOs, we did not consider that any evidence had been provided by the TOs to demonstrate that there is likely to be any consumer detriment that would result from reaching a final decision on competition during the FNC stage.

3.8. We recognised that it is likely to be beneficial to provide the TOs with certainty of the delivery model ahead of the Invitation to tender (ITT) stage of the EHVDC procurement process in order to provide certainty to the market and minimise unnecessary costs incurred by the TOs ahead of any decision to apply the CATO model. For this reason, we proposed that once we have sight of the FNC submission, we will if necessary, prioritise our assessment of whether to apply a model of late competition in order to make our decision ahead of the ITT stage of the EHVDC procurement process.

Consultation responses and our consideration of them

3.9. The majority of respondents emphasised the importance of a decision being made on the delivery model as soon as possible given the international difficulties in securing offshore cables for this sort of project. All the TO respondents emphasised the importance of gaining certainty on whether they will deliver EHVDC in order to avoid project delays. Another respondent emphasised the importance of ensuring that competition remains under consideration for as long as possible. The same respondent suggested that the Competition Proxy Model (CPM) should be discounted as it is not a real form of competition.

3.10. We consider that the responses accurately reflect that there remains a need to balance providing sufficient certainty to allow the EHVDC project to continue to progress on time with the potential consumer savings that can be delivered through additional competitive pressures in its delivery. We consider that the proposed approach in our

consultation, ie prioritising the assessment of the delivery model assessment as part of our FNC assessment of EHVDC, and ahead of the ITT stage of procurement, strikes the appropriate balance between these factors.

Our INC conclusion

3.11. Having considered all representations to our consultation, we do not consider that a case has been made for us to move away from the position we proposed in our consultation. We intend to prioritise the assessment of the delivery model assessment as part of our FNC assessment of EHVDC, and ahead of the ITT stage of procurement.

Appendices

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Appendix 1 – Explanation of TO justification of EHVDC needs case from consultation document

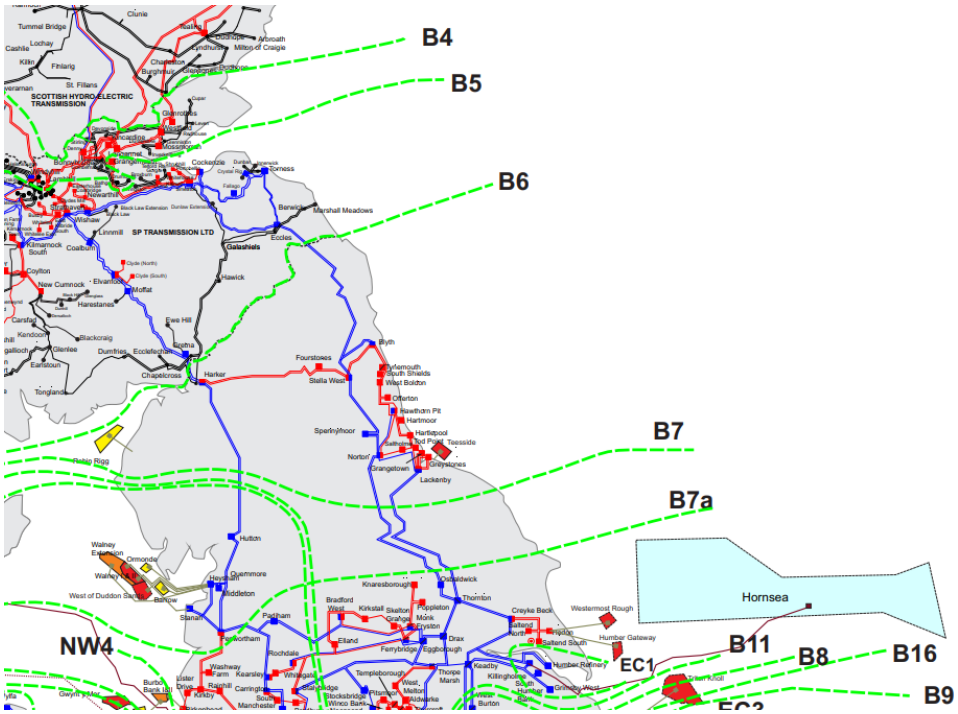
Why the project has been brought forward

1.1. A significant growth in renewable and low carbon electricity, including an expansion in offshore wind, in line with net zero targets, is expected in Scotland and along the North-East coast of England. Analysis from the ESO forecasts that unless the electricity transmission network is upgraded, this will lead to constraints across the network, and in particular across the Scottish – English border throughout the next decade. Constraints on the network would lead to the ESO making constraint payments to generators that need to be switched off. The cost of this would ultimately feed into consumer bills.

1.2. The ESO's annual Network Options Assessment (NOA) process, has consistently shown the need for investment across multiple northern transmission boundaries of the GB network. Specifically, this analysis shows that the current capability of network boundaries B6, B7, B7a and B8 are unlikely to be sufficient to accommodate the future network requirements as forecasted by the ESO. As can be seen in Figure 2 below, Boundary B6 runs along the England Scotland border which delineates the NGET area from the SPT area to the north of it. Boundary B4 delineates the SPT area from the SHET area.

1.3. To relieve these constraints on the effected boundaries, and reduce consequential constraint costs, the TOs put forward potential solutions to be compared within the ESO's NOA process, which is designed to give an indicative view of necessary investments across the network. The NOA compares investment options through a cost benefit analysis and makes recommendations on options to progress further, to pause, or to stop. In the case of those proposed investments that qualify for the LOTI mechanism, these projects are subject to further comparative CBA by the ESO that is used to support the TO LOTI submission to us. The LOTI CBA is able to consider options in a greater level of detail, including in terms of route location and timing, and local and wider supply and demand forecasts and trends.

Figure 2: GB Transmission System Boundaries B4 – B9 (from ETYS 2020)[15]



How the TOs selected which link options to compare in the LOTI CBA

1.4. As outlined in the LOTI guidance, we will assess the INC to determine whether the TO(s) has evaluated an appropriate range of options to meet the technical requirement of the project. The next few paragraphs describe this process for the EHVDC project.

1.5. The TOs explain that they have considered a range of options to address the system requirements set out above. They started with an initial list of 210 conceptual options by selecting 'start' and 'end' points[16] which would provide opportunities to provide an increase in boundary transfer capabilities over B6, B7, B7a and B8. These options consisted of both:

[15] The ESO's Electricity Ten Year Statement outlines the present capability and future requirements of the transmission system's boundaries: https://www.nationalgrideso.com/document/181711/download

[16] For the 'start' points in the Scottish TO's licence areas, SHET and SPT undertook studies and identified Peterhead (for SHET) and Torness (for SPT) as their preferred options.

- Conventional onshore reinforcements, via overhead lines (OHL) and/or underground cables, which typically use High Voltage Alternating Current (HVAC) technology; and alternatively

- Offshore reinforcements, via High Voltage Direct Current (HVDC) subsea cable technology and converter stations.

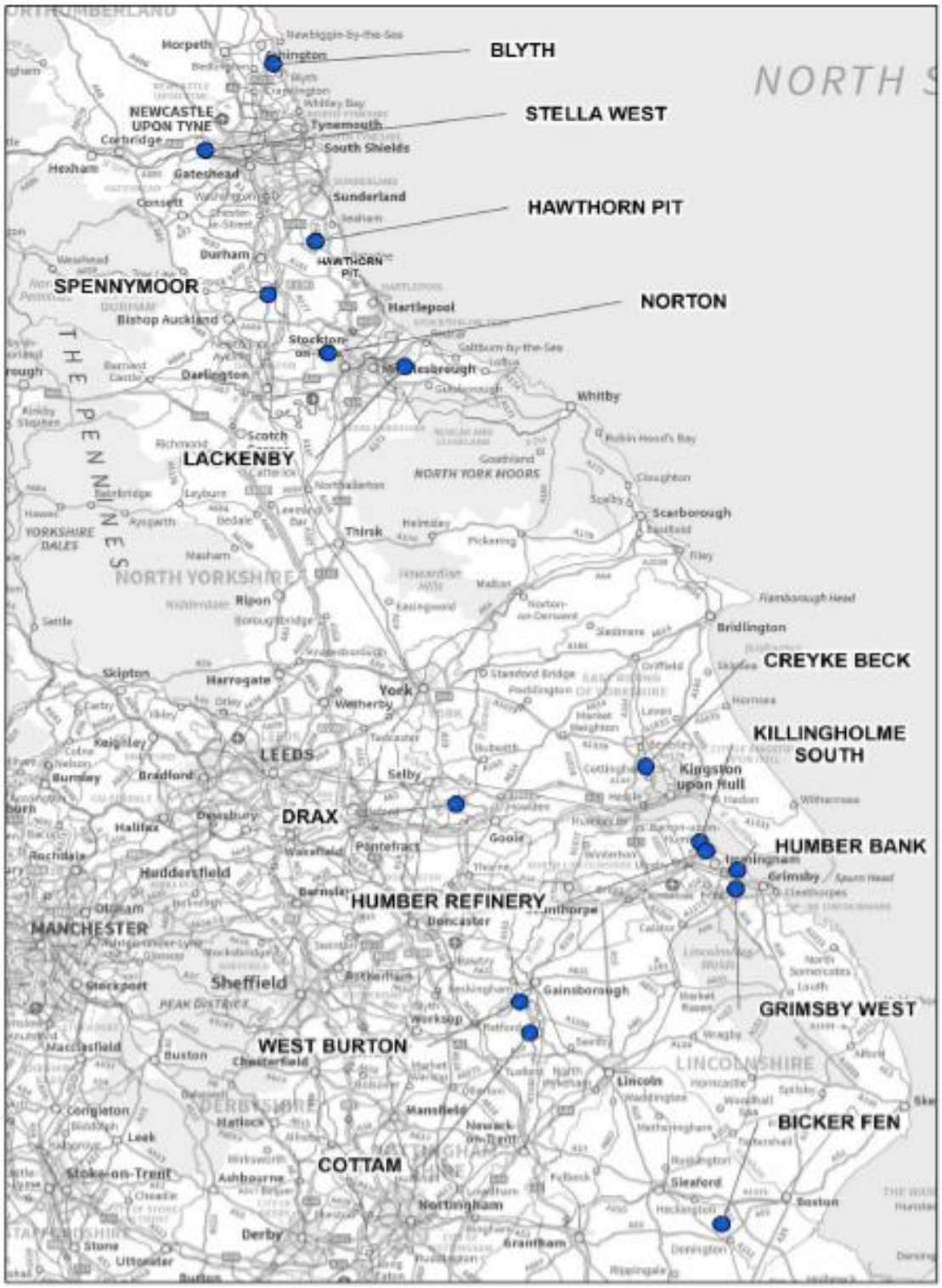
1.6. The TOs then identified a shortlist of 32 options for further scoping and progression to determine which should be considered via cost-benefit analysis to determine the most optimal economic combination of reinforcements. The shortlist of options comprised:

- Six OHL options from Torness to 'end' points in the North East of England as far south as boundary B7;

- Thirteen Subsea Links from Torness to 'end' points along the east coast as far south as boundary B9; and

- Thirteen Subsea Links from Peterhead to 'end' points along the east coast as far south as boundary B9.

Figure 3: Shortlist of 'End' Points



1.7. Offshore HVDC options can be more expensive to construct than onshore OHL options. However, HVDC options become more economic over longer distances and therefore can be more effective than onshore AC options at addressing the requirement for increased

capability across a large geographical area. In addition, the TOs deem offshore options typically reduce planning consent risk and delivery timescales; relative to onshore options involving new transmission circuits.

1.8. The additional time taken to meet the Earliest In Service Date (EISD)[17] of the onshore overhead options can result in higher constraints costs, offsetting the benefit of these options typically being cheaper to deliver than an offshore option. In the case of the EHVDC project, the onshore options were found to be unable to match the capability of the offshore equivalent. The TOs determined that Torness-Lackenby AC OHL (TLNO), the best performing onshore OHL option, should be the only onshore options to be included in the INC CBA alongside six 2GW capacity offshore HVDC options. The other onshore OHL options were not included in the CBA on the basis that:

- onshore alternatives will deliver later than their offshore equivalents; and
- a number of the possible options offer limited (or zero) boundary uplift over the B6 and/or B7 boundaries.

1.9. The TOs consider the inclusion of TLNO in the CBA as the best performing onshore alternative means that the TLNO acts as a proxy for other onshore options. Table 1 shows the options the TOs considered within the INC CBA:

Table 1: Options considered within INC CBA

NOA Code	Option	Onshore/Offshore
E2DC	Torness to Hawthorn Pit	Offshore
E2D2	Torness to Cottam	Offshore
E2D3	Torness to Drax	Offshore
E4DC	Peterhead to Hawthorn Pit	Offshore
E4D2	Peterhead to Cottam	Offshore
E4D3	Peterhead to Drax	Offshore
TLNO	Torness to Lackenby	Onshore

[17] The EISD is used to show the year at which a network reinforcement option can be feasibly delivered.

CBA process

1.10. Starting in early 2018, the TOs and ESO began developing the EHVDC LOTI CBA, a cost benefit analysis used to identify the optimal reinforcement pathway for the Scotland and the North of England region. The TOs provided the ESO with a set of inputs, for the CBA, that included:

- option descriptions,
- base boundary capability,
- option combinations,
- boundary capability uplifts,
- cost profiles and
- earliest in service dates (EISDs), i.e. the earliest date a project can be operational.

1.11. The LOTI CBA compares the likely benefits (in terms of reductions in future constraints costs) versus the costs of the shortlisted investment options (in terms of estimated capital costs to build these options) across a range of future scenarios for supply and demand. In line with the NOA analysis, the LOTI CBA uses the ESO's Future Energy Scenarios (FES) to determine the benefits of each option across a range of future scenarios.

1.12. The FES scenarios are updated annually each summer. This allows the most up to date FES to be used for the following NOA, which is published each January. The scenarios used in the EHVDC LOTI CBA were the four FES scenarios from 2017. This was because the work on the CBA was started by the TOs in early 2018, at which point the FES from 2017 was the most up-to-date version available. Each shortlisted option was considered on its own, as well as in combination with other options. The options were combined with a range of smaller enabling works that will be completed before the proposed EHVDC links are built but were not finalised at the time the CBA was carried out by the ESO.

LOTI CBA results

1.13. The LOTI CBA results clearly demonstrate that transmission reinforcement works between Scotland and the North of England region would result in significantly reduced constraints costs, bringing large savings to GB consumers. The CBA show that there is a clear and significant benefit from delivering two HVDC links on the east coast between Scotland and north-east England. Within the context of such a large project, the results suggest that the selection of the optimum landing points for HVDC links is relatively finely balanced. Within the LOTI CBA, the anticipated impact of each option on forecast constraint savings is calculated for each of the scenarios. A regret value is calculated for each option in each scenario. This regret value is calculated as the difference between the outcome of a specific option relative to the best performing option under that scenario (meaning that the best performing option in each scenario has a regret of zero). The worst level of regret across the scenarios for each option are then compared, with the lowest value indicating the highest ranking option.

1.14. Table 2 below shows a summary of CBA results for the top 5 performing options (Appendix 2 in our May consultation) contains a more detailed summary table of the CBA results for the best performing shortlisted option combinations.

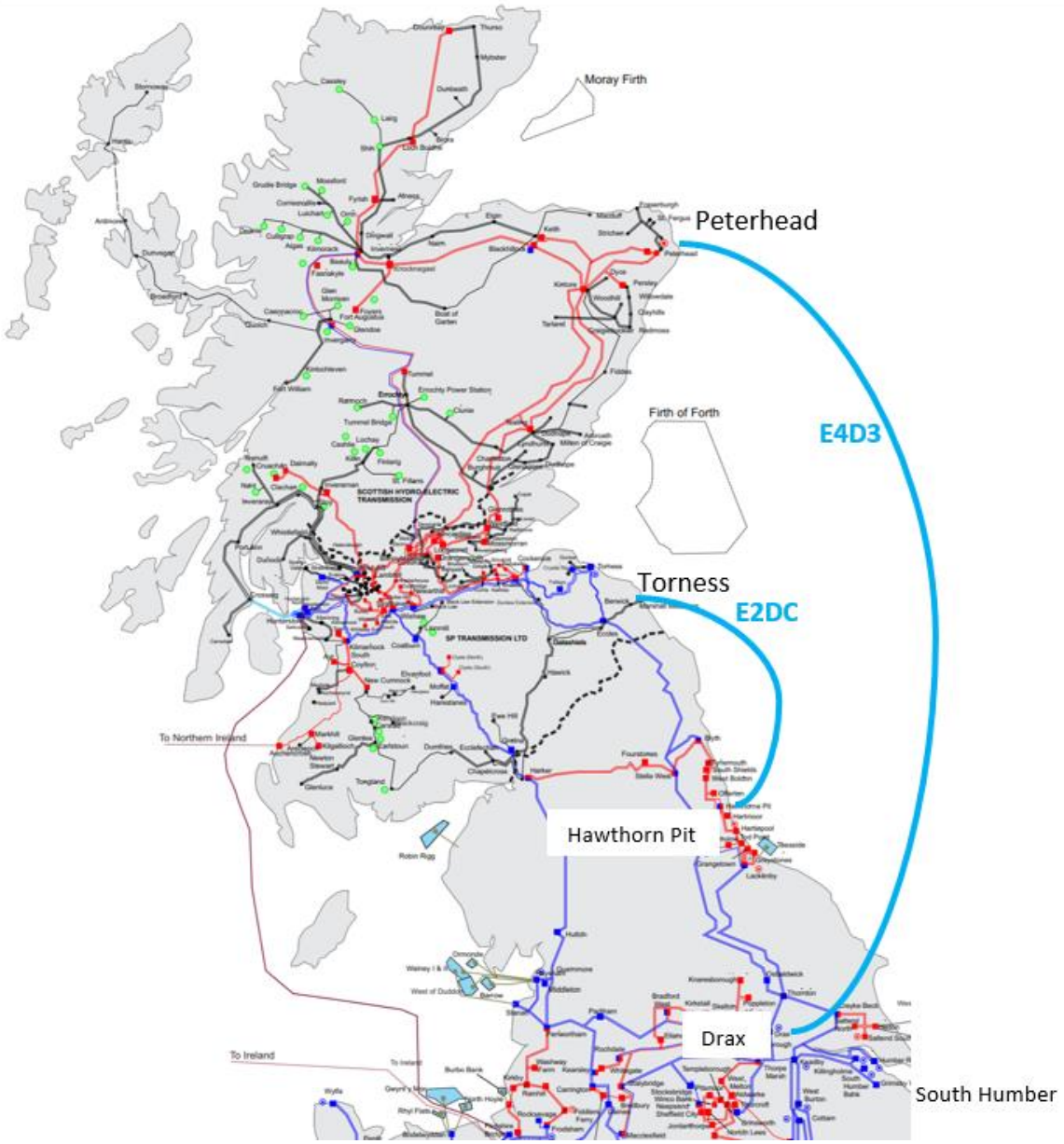
Table 2: Summary CBA results

Option	CBA ranking	Benefit gap (£m)
Peterhead - Hawthorn Pit (E4DC) and Torness - Drax (E2D3)	1	
Peterhead - Drax (E4D3) and Torness - Hawthorn Pit (E2DC)	2	-68
Peterhead - Hawthorn Pit (E4DC) and Torness - Cottam (E2D2)	3	-102
Peterhead - Cottam (E4D2) and Torness - Hawthorn Pit (E2DC)	4	-152
Peterhead - Cottam (E4D2) and Hawthorn Pit (E2DC)	5	-527

1.15. As part of its economic analysis, the ESO assessed the impact of a one-year delay to this transmission investment. For a single year delay of one HVDC link, it estimated that

£330m of additional constraint cost could be incurred. If both HVDC links are delayed by one year, the ESO indicated that £665m of additional constraint cost could be incurred.

Figure 4: Indication of TO preferred schemes



1.16. The TOs' preferred option is the progression of two HVDC links through the LOTI process as the EHVDC project:

- a c£1.3bn subsea link of 2GW capacity from Torness to a connection point on the existing network at Hawthorn Pit (E2DC), to be delivered by 2027; and

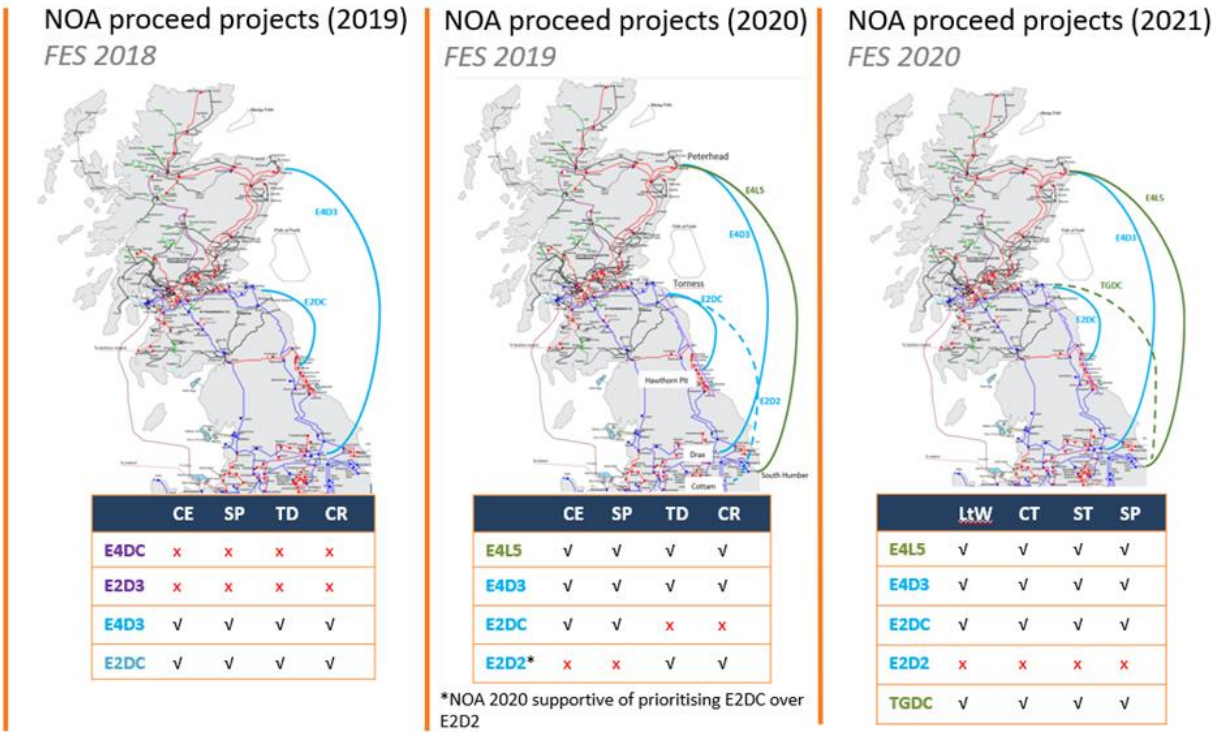
- a c£2.1bn subsea link of 2GW capacity from Peterhead to a connection point on the existing network at Drax (E4D3), to be delivered by 2029.

Justification for TOs' preferred option

1.17. The TOs argue that the ESO analysis shows that difference between the best ranked option combinations at the time of the CBA was marginal, demonstrating that, against an uncertain future, the financial regret of not selecting the optimal combination would be significantly outweighed by any cost associated with project delay. They also highlight that all subsequent NOA reports since the LOTI CBA was started have indicated that the TO proposed options (ie E4D3 and E2DC) should be prioritised. They have emphasised that any delay in confirming their proposed solution could lead to delays that, as referenced in paragraph 0, would be costly to the consumer.

1.18. They add that the analysis undertaken at this stage of the development of the links clearly demonstrates progressing with two links to their EISDs is vital to optimise the range of benefits these projects will bring to customers.

Figure 5: showing the evolving NOA recommendations



	CE	SP	TD	CR
E4DC	x	x	x	x
E2D3	x	x	x	x
E4D3	√	√	√	√
E2DC	√	√	√	√

	CE	SP	TD	CR
E4L5	√	√	√	√
E4D3	√	√	√	√
E2DC	√	√	x	x
E2D2*	x	x	√	√

*NOA 2020 supportive of prioritising E2DC over E2D2

	LtW	CT	ST	SP
E4L5	√	√	√	√
E4D3	√	√	√	√
E2DC	√	√	√	√
E2D2	x	x	x	x
TGDC	√	√	√	√

Appendix 2 – Explanation of competition assessment from consultation document

Relevant consideration of models

1.19. The late competition models that are available for consideration for the EHVDC project are:

- CATO Model
- SPV Model
- Competition Proxy Model (CPM)

1.20. Below we set out details of each of these models, and our initial views on how applicable each might be to the EHVDC project.

CATO model

1.21. CATO stands for Competitively Appointed Transmission Owner. Under the CATO model a competitive tender would be run for the financing, construction, and operation of the proposed assets that make up the EHVDC project, with a transmission licence provided to the winning bidder setting out the outputs, obligations and incentives associated with delivering the project. The CATO model requires legislative changes to allow for new parties to be able to be awarded a transmission licence following a competition.

1.22. The high-level delivery plan for EHVDC presented by the TOs in their submission indicates an expectation that construction on the two proposed links will need to commence in early 2024 in order to meet the required delivery dates. The government has set out its intention to introduce the required legislation[18] but it is currently difficult to determine when the required legislation will be in place and whether this would support timely delivery of the EHVDC project by a CATO.

[18] Page 77, Energy White Paper (publishing.service.gov.uk) (Powering our Net Zero Future, December 2020)

1.23. As set out earlier, analysis from the ESO's LOTI CBA included within the INC submission indicates that a one year delay to both EHVDC links would cost, on average £665m across the FES scenarios. For this reason, we consider that any delay resulting from the application of the CATO model on EHVDC would not be in the interests of consumers. Having said this, we do not consider that it is appropriate at this point in time to rule out the use of the CATO model for the EHVDC project.

SPV Model

1.24. Under the Special Purpose Vehicle (SPV) model, the incumbent network licensee would run a tender to appoint an SPV to finance, deliver and operate a new, separable and high value project on the licensee's behalf through a contract in effect for a specified revenue period. The allowed revenue for delivering the project would be set over the period of its construction and a long-term operational period (currently expected to be 25 years). The SPV model was originally developed for consideration for projects where the CATO model had been discounted due to a clear expectation that underpinning legislation would not be in place in time to allow the delivery of specific projects. The model was considered in detail during the RIIO-1 period, but we recognise that there would be significant work needed to finalise that model for the EHVDC project. Given that we are not ruling out the CATO model at this point, and given the indication from Government that it intends to bring forward the legislation required for the CATO model, we do not consider that it is proportionate to progress the work required to allow the SPV model to be applied to the EHVDC project in a manner that delivers benefits to consumers without impacting on the delivery dates of the links.

CPM

1.25. The CPM involves setting a largely project-specific set of regulatory arrangements to cover the construction period and a 25-year operational period for an asset (in contrast with setting arrangements for a portfolio of assets under a price control settlement). It is intended to replicate the efficient project finance structure that tends to be used in competitive tender bids for the delivery and operation of infrastructure projects.

1.26. Importantly, the project would remain delivered by the TOs under CPM. This means that there is not the requirement to allow for the running of a full tender for delivery of the project in the same way as the CATO or SPV models, and the CPM assessment stages follow the same process as the LOTI mechanism. This means that there is sufficient time to make a decision on whether to apply CPM to the EHVDC project at the FNC assessment stage, without risking delay to delivery of the links. We consider that it is beneficial for

consumers and the TOs to make this decision at the FNC stage as we will have a better understanding of the likely counterfactual financing costs under future RIIO price controls at that point in time.