Consultation

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Eastern HVDC – Consultation on the project's Final Needs Case	
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Response deadline:	4 May 2022 **(5 weeks)**
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We are consulting on our views on the Eastern High Voltage Direct Current (Eastern HVDC) electricity transmission projects. We would like views from people with an interest in new transmission infrastructure, meeting the net zero challenge and competition in onshore transmission networks. We particularly welcome responses from consumer groups, stakeholders impacted by the project, stakeholders with an interest in the costs of electricity transmission infrastructure and the transmission owners. We would also welcome responses from other stakeholders and the public.

This document outlines the scope, purpose and questions of the consultation and how you can get involved. Once the consultation is closed, we will consider all responses. We want to be transparent in our consultations. We will publish the non-confidential responses we receive alongside a decision on next steps on our website at Ofgem.gov.uk/consultations. If you want your response – in whole or in part – to be considered confidential, please tell us in your response and explain why. Please clearly mark the parts of your response that you consider to be confidential, and if possible, put the confidential material in separate appendices to your response.

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Contents

Executive summary

Needs Case

In December 2021, National Grid Electricity Transmission, SP Transmission and Scottish Hydro Electric Transmission plc (the three electricity transmission owners that own and operate the transmission network in Great Britain) submitted two Final Needs Case submissions for the proposed 'Eastern High Voltage Direct Current' Link (Eastern HVDC)

We have been assessing the need for the proposed projects under our Large Onshore Transmission Investment (LOTI) mechanism[1] and assessing their suitability for the competition models identified within our RIIO-2 price control arrangements.

The Eastern HVDC projects are proposed electricity transmission projects to construct two high voltage direct current links, with capacity of 2GW each, down the east coast from Scotland to the north-east of England. The purpose of the Eastern HVDC projects is the transmission of electricity generated in Scotland down past the congested network around the border to England. At an estimated cost of £3.4bn for the two links, the Eastern HVDC projects would be the largest electricity transmission investment project in the recent history of Great Britain.

The proposal for the Eastern HVDC projects consists of two separate reinforcement projects;

- **Torness to Hawthorn Pit subsea HVDC link**, Network Options Assessment (NOA) code E2DC, prepared by a joint project team from SP Transmission (SPT) and National Grid Electricity Transmission (NGET), expected to be operational from 2027; and

- **Peterhead to Drax subsea HVDC link,** NOA code E4D3, prepared by a joint project team from Scottish Hydro Electric Transmission plc (SSEN Transmission) and National Grid Electricity Transmission (NGET), expected to be operational from 2029.

This consultation seeks stakeholder views at the Final Needs Case stage of the Eastern HVDC projects. It is also intended to provide clarity for the Transmission Owners and wider

stakeholders on our view on the progress of the project following the Initial Needs Case (INC) assessment.[2]

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

We consider there is a clear consumer benefit in the Eastern HVDC projects progressing and that a clear case has been made for the two proposed HVDC links that form the Eastern HVDC projects. We continue to appreciate the risk that not delivering substantial reinforcements in this area could cause a significant detriment to consumers in terms of constraint costs.

We consider that the different technical options considered within the Electricity System Operator's cost benefit analysis (CBA) are appropriate and reflect the outcome of the Network Options Assessment 2020/21 analysis. We consider that the CBA supports the need for investment on this part of the network and justifies NGET, SPT and SSENT's progression of E2DC and E4D3 as the preferred options for major reinforcement of the Scotland and the North of England region.

We have also considered the need for the two proposed Eastern HVDC projects in the context of the Offshore Transmission Network Review currently being undertaken by Ofgem, Government and other key parties. Our view is that based on current evidence, there is no reason to think 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 that are part of the Eastern HVDC project. However, before making our decision on the Final Needs Case for Eastern HVDC projects, we will check whether any alternative route options or other material changes are recommended to E2DC or E4D3 as a result of the Holistic Network Design.

One of the areas of focus of this Final Needs Case (FNC) assessment is to assess whether a robust delivery plan is in place to deliver the Eastern HVDC projects on time. Throughout our assessment of the Eastern HVDC projects the impact of delay has been highlighted by both

[2] EHVDC Initial Needs Case Decision: Eastern HVDC - Decision on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

the Electricity System Operator (ESO) and NGET, SPT and SSENT as extremely costly to the consumer. The FNC submission for E2DC highlights a risk analysis exercise that demonstrates that some delay beyond the currently estimated December 2027 delivery date is fairly probable. The impact of any delay is assessed in full through the CBA, however we will continue to monitor the delivery programme for both Eastern HVDC projects.

Delivery Model

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

From our assessment we cannot envisage implementing either the Competitively Appointed Transmission Owner (CATO) model or Special Purpose Vehicle (SPV) model for the Eastern HVDC project without causing material delay to these critical investments, and given the indicative results of the analysis carried out for the Competition Proxy model (CPM), our minded-to position is to retain the E2DC and E4D3 links within the LOTI mechanism within the RIIO-2 framework.

Next Steps

We welcome responses to our consultation, both generally, and in particular on the specific questions we have included in Chapters 2, 3 and 4. If you would like to respond to this document please send your responses to: RIIOElectricityTransmission@ofgem.gov.uk. The deadline for responses is 4 May 2022. We expect to publish ourdecision on the FNC for the Eastern HVDC projects in early summer 2022. This decision will be conditional on the outcome of the planning consent process for the Eastern HVDC projects until after the outcome of the planning consent process for the projects.

1. Introduction

Scope of this consultation

1.1. This consultation covers three broad areas:

- Our assessment of the Final Needs Case for the Eastern HVDC projects.
- Our updated assessment of and minded-to position on the delivery model for the Eastern HVDC projects.
- Our position on any Large Project Delivery (LPD) mechanisms applying to the Eastern HVDC projects.

1.2. Our assessments and position as set out in this document are subject to consultation and we invite stakeholders to respond using the contact details set out on the front of this document. We have indicated questions for stakeholders on particular areas at the start of each chapter, but stakeholders should not feel constrained by those questions in their response.

1.3. We have taken account of responses to our consultation and decision on the Initial Needs Case for the Eastern HVDC projects[3] in coming to our position.

This document consists of 6 chapters and is set out as follows:

- **Introduction** - **Chapter 1** provides an overview of the context surrounding the Eastern HVDC projects and an introduction to our assessment process.

[3] EHVDC Initial Needs Case Consultation: Eastern HVDC - Consultation on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

EHVDC Initial Needs Case Decision: Eastern HVDC - Decision on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

- **Final Needs Case - Assessment - Chapter 2** provides an overview of the proposals for the Eastern HVDC projects and summarises the inputs and assumptions made in the Final Needs Case submissions.

- **Final Needs Case - Cost Benefit Analysis** - **Chapter 3** summarises the proposed findings and proposed conclusions of the cost benefit analysis.

- **Delivery model considerations** - **Chapter 4** summarises our proposed late competition assessment.

- **Large Project Delivery** - **Chapter 5** summarises our position on Large Project Delivery

- **Next Steps** - **Chapter 6** summarises next steps for the Eastern HVDC projects.

Context

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

1.5. NGET, SPT and SSENT are currently regulated under the RIIO-ET2 price control, which took effect from 1 April 2021 and will run for 5 years. Under the TOs' licence conditions, there is a mechanism for us to assess the need for, and efficient cost of, large and uncertain electricity transmission reinforcement projects. This mechanism is termed 'Large Onshore Transmission Investment' (LOTI). All projects that are submitted for assessment via LOTI during the RIIO-T2 period will be considered for their suitability for delivery through one of the late competition models.

1.6. Network investment is informed by the Future Energy Scenarios (FES), and the NOA, which are developed and published annually by the Electricity System Operator (ESO)[4]. A key focus of the FES 2020 is the inclusion of the legally binding[5] UK Government Net Zero targets,

[4] In April 2019 National Grid ESO became a legally separate business within National Grid PLC.
[5] https://www.legislation.gov.uk/uksi/2019/1056/contents/made

to be achieved by 2050. The transition to a Net Zero economy will see increased demand on transmission boundary capability, which need to be facilitated by critical network reinforcements.

1.7. The joint project teams of NGET, SPT and SSENT submitted the Eastern HVDC Initial Needs Case in October 2020. We published our Decision in November 2021. In that Decision we confirmed that we were satisfied that there was a clear and demonstrable consumer benefit in the Eastern HVDC projects progressing and we were satisfied that NGET, SPT and SSENT had made a clear and demonstrable case for their approach to date on the two proposed HVDC links (E2DC and E4D3) that form the Eastern HVDC project.

Interactions with the Offshore Transmission Network Review

1.8. In light of the UK Government's offshore wind target of 40GW by 2030, and the expectation of more offshore wind beyond that to deliver net-zero by 2050, 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. In July 2020, the UK Government launched the Offshore Transmission Network Review (OTNR),[6] a Department of Business Energy & Industrial Strategy-led cross-industry project in which we provide leadership on specific areas. The OTNR may result in significant change to how infrastructure connecting offshore wind to shore is delivered. These changes could impact upon projects like Eastern HVDC.

1.9. 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. A key output of the Pathway to 2030 workstream will be publication in summer 2022[7] of a 'Holistic Network Design' (HND) for the offshore network and associated onshore network.

[6] Offshore transmission network review - GOV.UK (www.gov.uk)
[7] Slide 35 sets out a high level plan, Offshore Transmission Network Review: December 2021 Webinar (publishing.service.gov.uk)

1.13. You can ask us to keep your response, or parts of your response, confidential. We'll respect this, subject to obligations to disclose information, for example, under the Freedom of Information Act 2000, the Environmental Information Regulations 2004, statutory directions, court orders, government regulations or where you give us explicit permission to disclose. If you do want us to keep your response confidential, please clearly mark this on your response and explain why.

1.14. If you wish us to keep part of your response confidential, please clearly mark those parts of your response that you *do* wish to be kept confidential and those that you *do not* wish to be kept confidential. Please put the confidential material in a separate appendix to your response. If necessary, we'll get in touch with you to discuss which parts of the information in your response should be kept confidential, and which can be published. We might ask for reasons why.

1.15. If the information you give in your response contains personal data under the General Data Protection Regulation (Regulation (EU) 2016/679) as retained in domestic law following the UK's withdrawal from the European Union ("UK GDPR"), the Gas and Electricity Markets Authority will be the data controller for the purposes of GDPR. Ofgem uses the information in responses in performing its statutory functions and in accordance with section 105 of the Utilities Act 2000. Please refer to our Privacy Notice on consultations, see Appendix 6.

1.16. If you wish to respond confidentially, we'll keep your response itself confidential, but we will publish the number (but not the names) of confidential responses we receive. We won't link responses to respondents if we publish a summary of responses, and we will evaluate each response on its own merits without undermining your right to confidentiality.

General feedback

1.17. We believe that consultation is at the heart of good policy development. We welcome any comments about how we've run this consultation. We'd also like to get your answers to these questions:

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

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

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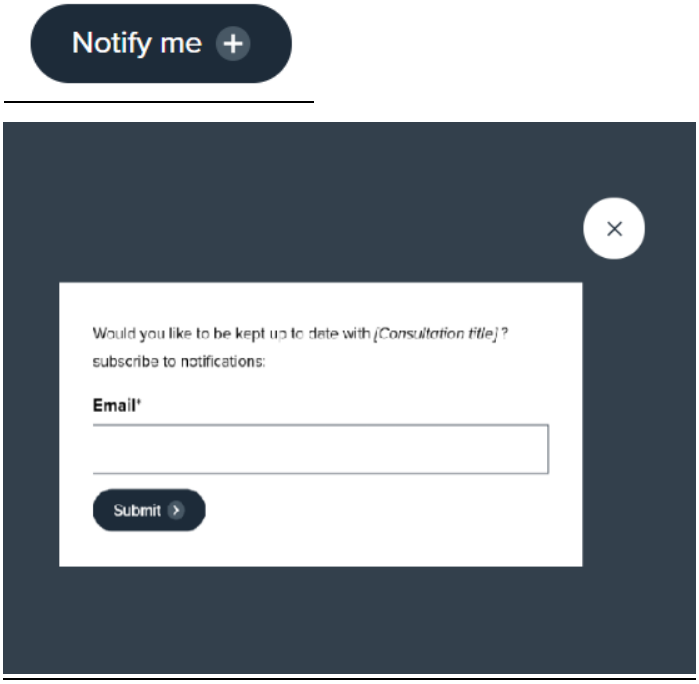
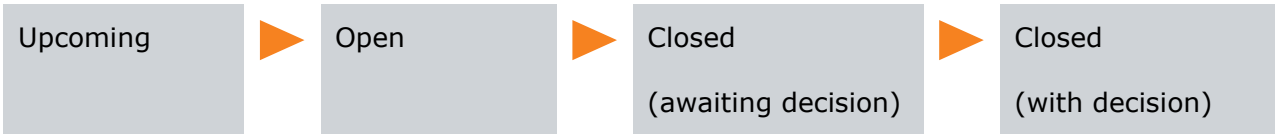


Once subscribed to the notifications for a particular consultation, you will receive an email to notify you when it has changed status. Our consultation stages are:



2. Final Needs Case – Assessment

Section summary

This chapter sets out the key design decisions made to date on the Eastern HVDC projects. It also sets out our consideration of this approach and explains our findings, including on the reinforcement options and the technical design of the Eastern HVDC projects and costs.

Questions

Question 1: Do you agree that meeting the technical requirement with the two proposed HVDC links is appropriate?

Question 2: Do you agree with our conclusions on the appropriateness of the options considered?

Question 3: Do you agree with our conclusions on the technical design and the costs of the proposed E2DC and E4D3 projects?

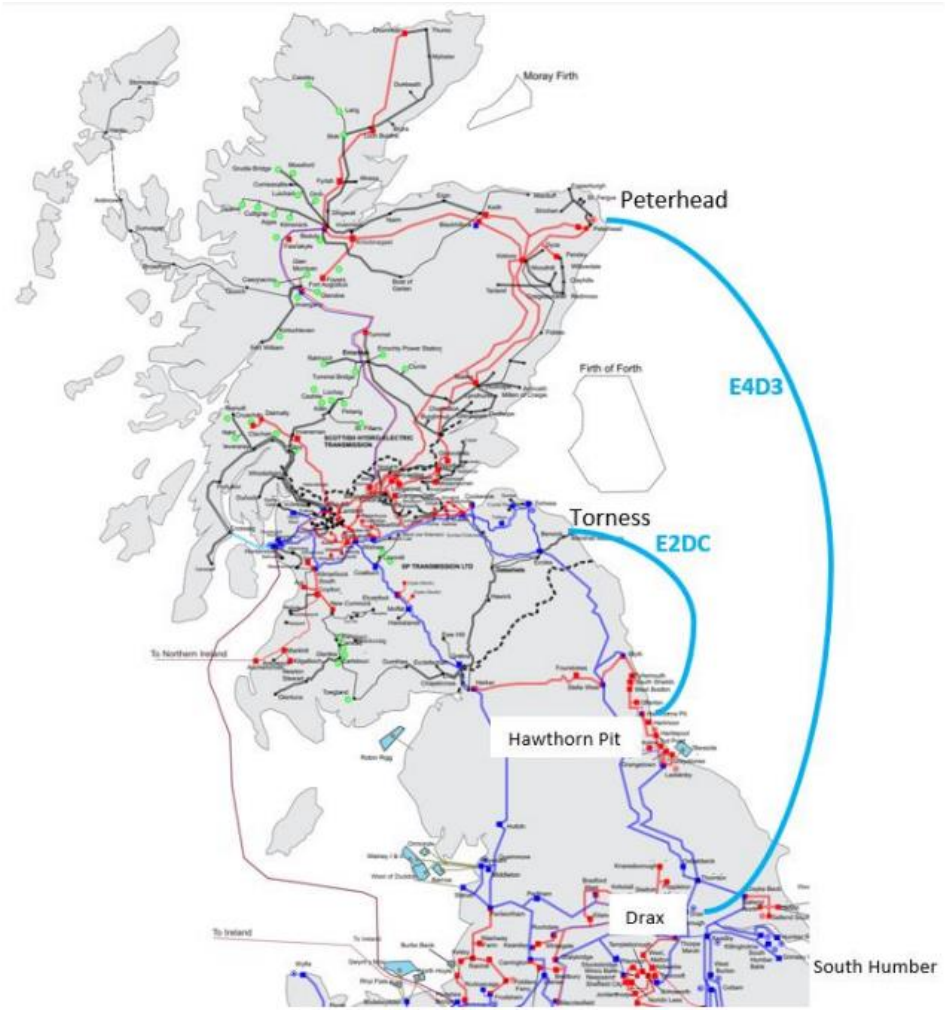
Overview of the Eastern HVDC Proposals

2.1. We assess any Final Needs Case submission(s) to: determine the progression and changes to the project since the Initial Needs Case and; reach a final view on whether or not the projects as proposed is needed. Through this process we assess whether the key drivers of the need for the project remain, and whether the optimum design and cost of the project has changed since the Initial Needs Case stage.

2.2. NGET, SPT and SSENT have submitted two separate Final Needs Case submissions for the proposal to progress the development of two subsea HVDC links, with capacity of 2GW each:

- One from Torness in Scotland to a connection point on the existing network at Hawthorn Pit in the North-East of England to be completed in 2027 – identified with the Network Options Assessment code E2DC; and
- One from Peterhead in North East Scotland to a connection point on the existing network at Drax in North Yorkshire to be completed in 2029– identified with the Network Options Assessment code E4D3.

Figure 2: Indication of TO preferred schemes



2.3. The Final Needs Case submissions are supported by a CBA carried out by the ESO, as well as recommendations from the annual NOA process and report.[8]

2.4. Due to similarity in most elements (e.g approach to delivery, CBA methodology), the close interaction between the two projects, and because the initial needs case stage focused on both projects together, we are consulting on both projects together at the Final Needs Case stage. This consultation document, where relevant, highlights the differences between the two proposed links, E2DC and E4D3 (e.g. cable route, CBA results, costs, delivery time). The approach of consulting on the Eastern HVDC projects as a whole will reduce repetition

[8] Further information on the NOA can be found here: Network Options Assessment (NOA) | National Grid ESO

and more broadly reduce the volume of information for stakeholders to review. We intend to publish any decision documents on the Eastern HVDC projects in the same manner.

2.5. Moreover, we recognise that the full benefit of the Eastern HVDC project will come through only if both E2DC and E4D3 are progressed. This means that our decision on Eastern HVDC project will necessarily need to consider both E2DC and E4D3 rather than on a project by project basis.

2.6. Should we approve the Final Needs Case for Eastern HVDC projects, we will engage with the NGET, SSENT and SPT to agree on approach to Project Assessment Our current view is that the Project Assessment should be carried out for each link separately as the costs and outputs will be project specific. We also expect the Project Assessment submissions for E2DC and E4D3to be made at different times, depending on the progress in supply chain engagement.

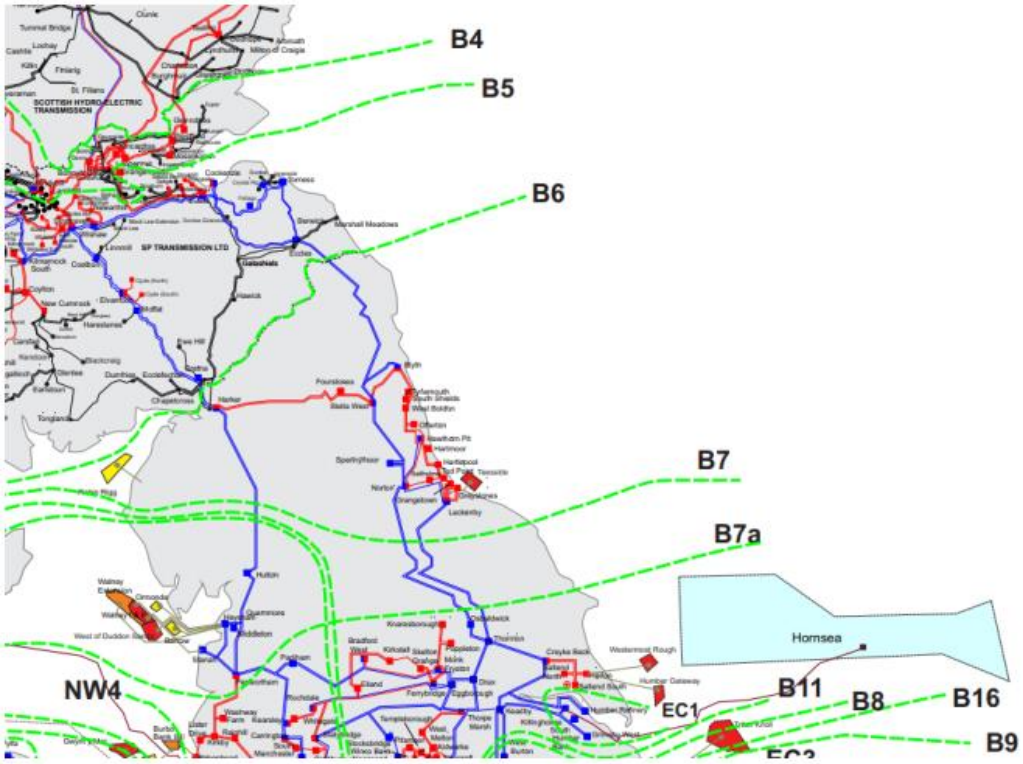
Why the projects have been brought forward

2.7. As identified in our Initial Needs Case Decision, a significant growth in renewable and low carbon electricity is expected in Scotland and along the North-East coast of England, including an expansion in offshore wind in line with net zero targets. Analysis from the ESO forecasts that unless the electricity transmission network is upgraded, we should expect significant 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[9].

2.8. The ESO's annual 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 3 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 areas from the SSENT area.

Figure 3: GB Transmission System Boundaries B4 – B9 (from ETYS 2020).

[9] More information can be found in NGESOs modelled constraint costs: download (nationalgrideso.com)



2.9. NGET, SPT and SSENT put forward possible solutions to relieve constraints on the effected boundaries and reduce consequential constraint costs; to be compared within the ESO's NOA process (the NOA being designed to give an indicative view of necessary investments across the network). The NOA compares investment options through a CBA and makes recommendations on options to progress further, to pause, or to stop based on assessment against estimates of future supply and demand across a range of Future Energy Scenarios. In the case of those proposed investments that we have deemed to be eligible as a LOTI project, these projects are subject to further comparative CBA by the ESO in support of NGET, SPT and SSENT's LOTI submission to us. The CBA conducted by the ESO is able to consider options in a greater level of detail, including in terms of route location and timing, and local wider supply and demand forecasts and trends.

2.10. Boundary capability changes over time as the network, generation and demand change. Expected further reinforcement needs can be identified by comparing required power transfers with boundary capability. In the case of Eastern HVDC projects, the requirement for increased boundary capability is consistent across B2, B4, B5, B6, B7a and B8. The required transfers across all four Future Energy Scenarios (both Future Energy Scenarios 2020 and

Future Energy Scenarios 2021)[10] significantly exceed current capability, continuing to indicate a strong need for transmission reinforcement.

2.11. NGET, SPT and SSENT highlight through the Final Needs Case submissions that they consider the need for increased north to south transfer capability across key network boundaries in Scotland and the north of England is further sustained by the continued customer connection activity since the Initial Needs Case submission and the uptrend in Future Energy Scenarios 2021 when compared to Future Energy Scenarios 2017 (used in the Initial Needs Case submission).

2.12. NGET, SPT and SSENT note there are a number of onshore network reinforcement options being progressed that increase boundary capability in the short term. However, NGET, SPT and SSENT are clear that it is only major system reinforcements (i.e. the Eastern HVDC projects) that can provide the magnitude of uplift being indicated by the required transfers.

Our views on why the projects have been brought forward

2.13. We remain satisfied that there is a clear consumer benefit in the Eastern HVDC projects progressing. We continue to appreciate the risk that not delivering substantial reinforcements in this area could cause a significant detriment to consumers in terms of constraint costs. The combination of options considered and the counterfactual of not investing is explored further later in this Chapter.

Interactions with the Offshore Transmission Network Review

2.14. Through the Final Needs Case submissions NGET, SPT and SSENT have stated that they are very supportive of greater coordination in the development of offshore energy networks and are actively engaged in the workstreams of the OTNR. However, NGET, SPT and SSENT consider there are distinct differences in the methodologies employed in the economic analysis completed for the LOTI process and the OTNR's Holistic Network Design (HND) workstream, and these need to be considered in the context of the interaction between the proposed options and the OTNR. Namely, their view is that the ESO's LOTI CBA for the Eastern HVDC projects considers the lifetime costs of the reinforcements, whereas the HND specifically targets the requirements of the GB transmission network in 2030. As a result,

[10] 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. Further information on the NOA and FES can be found here: Network Options Assessment (NOA) | National Grid ESO

NGET, SPT and SSENT consider that the HND assessment of the Eastern HVDC projects would be a 'snapshot' of the network as expected around 2030. NGET, SPT and SSENT consider this would mean the benefits associated with the E2DC option (such as the earlier delivery date in 2027) would be masked when compared to other options with different landing points. The TOs therefore argue that this analysis is not appropriate for this purpose.

2.15. NGET, SPT and SSENT have also highlighted that they consider the programme for OTNR no longer aligns with the FNC submissions and further programme for E2DC and E4D3. Noting that the OTNR project was previously due to finalise its HND in January 2022.

2.16. NGET, SPT and SSENT identify that the early work undertaken as part of the HND development has indicated that with the recommended NOA 2021/22 reinforcements in place (including four HVDC Eastern links between Scotland and England together with further onshore and 'notional' reinforcement), the generation background established for the Pathway to 2030 assessment continues to involve significant residual constraints, indicating that the reinforcements proposed (E2DC and E4D3) will be required as key enablers on the Pathway to 2030.

2.17. NGET, SPT and SSENT also highlight that the ESO CBA for Eastern HVDC projects included with the Final Needs Case submissions considers a number of future reinforcements (beyond E2DC and E4D3). These reinforcements are based upon the outcome of the NOA 2020/21 and used to represent future strategic reinforcements that may come from the OTNR and subsequent NOAs. Further detail on the ESO CBA for Eastern HVDC projects can be found in Chapter 4.

2.18. For the reasons above, NGET, SPT and SSENT consider that the work on OTNR will not change the approach, timescales or outputs targeted in relation to both Eastern HVDC projects, E2DC or E4D3. NGET, SPT and SSENT consider that introducing design changes at this stage would result in significant risk to delivery timescales with consequential additional costs to consumers.

2.19. NGET, SPT and SSENT conclude that both E2DC and E4D3 have been considered in the context of OTNR and are required as the next step in the coordinated development of the transmission network. The TOs consider there is no evidence to indicate that future offshore network coordination will have a material impact on the consumer benefit case for the Eastern HVDC projects as proposed and fully expect the continued need for E2DC and E4D3 will be re-confirmed through the OTNR.

Our views on the interactions with the Offshore Transmission Network Review

2.20. The future impact of a more co-ordinated offshore network was not a consideration within the early design and development of the Eastern HVDC options, as offshore co-ordination was not a key consideration of the onshore electricity transmission planning process. However, in our Initial Needs Case assessment[11] we set out that we would continue to monitor the work of the OTNR project and at our Final Needs Case assessment consider whether any significant additional evidence has come to light that should be considered when making our decision.

2.21. Over the last three 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 NGET, SPT and SSENT preferred options for the Eastern HVDC projects. The ESO has confirmed that the Eastern HVDC projects areincorporated within the Holistic Network Design (HND) process in the form of selectable reinforcement options. This means that E2DC and E4D3 are options that can be recommended as part of an optimal suite of onshore and offshore transmission reinforcements within the HND. Equally, it means that they will not be recommended if they are not optimal, which could be the case if integrated offshore generation connection designs can deliver a similar constraint benefit at better value, or the supply and demand background used to produce the HND indicates sufficiently different underlying network requirements. The HND will not look at the full range of alternative routing possibilities for the Eastern HVDC projects, but it will give an indication of the viability of any potential alternative routes for HVDC solutions through its assessment of potential coastal landing points.

2.22. Based on the current available evidence, we do not consider future offshore network co-ordination will have a material impact on the consumer benefit case for the two links covered by the Eastern HVDC projects. However, we consider it prudent, before making our decision on the FNC for Eastern HVDC projects, to check whether any alternative route options or other material changes are recommended to E2DC or E4D3 as a result of the HND. We expect the HND outcome to be available before we make any decisions in relation to the Eastern HVDC projects and will take this outcome into account in coming to our decision.

2.23. We recommend that NGET, SPT and SSENT continue to carefully consider any interactions with the OTNR as part of any development of the two further east coast links recommended in NOA 2021 (identified as NOA code E4L5 and TGDC - see paragraph 2.26). Given the later timescale for the development of those further links, we expect the

[11] Paragraphs 2.26 – 2.31, Eastern HVDC - Decision on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

information provided within any Initial Needs Case submissions 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.

Reinforcement options considered

2.24. NGET, SPT and SSENT have considered a range of options to address the system requirements set out above. An initial list of 210 conceptual options were identified which intended to provide opportunities to provide an increase in boundary transfer capabilities over B6, B7, B7a and B8, before narrowing down a shortlist of 32 options for further scoping and progression to assessment via a CBA. Further detail on the options assessed at the Initial Needs Case can be found in our Initial Needs Case Consultation.[12]

2.25. Following the Initial Needs Case assessment, the onshore alternative to E2DC crossing B6, the Torness to Lackenby 400KV overhead line (NOA code, TLNO) is no longer considered an alternative standalone option to the offshore links. The NOA process, and ESO's CBA for the Eastern HVDC projects at Initial Needs Case stage established that a larger reinforcement[13] is required earlier than can be achieved through an onshore overhead line option. TLNO is therefore no longer included in the options taken forward to the ESO's CBA for the Eastern HVDC projects at Final Needs Case shown in Table 1.

Table 1: Options considered within the Final Needs Case CBA

NOA Code	Option	Onshore/Offshore	EISD	Cost (19/20 prices)
E2DC	Torness to Hawthorn Pit	Offshore	2027	£1,294m
E2D2	Torness to Cottam	Offshore	2030	£2,300m
E2D3	Torness to Drax	Offshore	2029	£1,979m
E4DC	Peterhead to Hawthorn Pit	Offshore	2029	£1,687m
E4D2	Peterhead to Cottam	Offshore	2031	£2,528m
E4D3	Peterhead to Drax	Offshore	2029	£2,105m

[12] Paragraphs 3.7-3.12 Eastern HVDC - Consultation on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

[13] The onshore reinforcement from south east Scotland to north west England identified with the NOA code CMNC was recommended to proceed in NOA2020/21 over the TLNO alternative. CMNC has been included in the post-link package, within the LOTI CBA. Further detail on the LOTI CBA is set out in Chapter 4.

2.26. Following the Initial Needs Case assessment, the NOA 2020/21 included and recommended a 'proceed' signal for a third and fourth 2GW HVDC link from Scotland to south of the Humber in the NGET licence area, both with an Earliest In Service Date of 2031 (these are identified with the NOA code E4L5 and TGDC). NOA 2020/21 also recommended that several network investment options across the B6, B7a and B8 boundaries also proceed for delivery in the early 2030s. These options have been considered in the ESO's CBA for Eastern HVDC projects and are explained further in Chapter 3.

Our views on the reinforcement options considered

2.27. At the Initial Needs Case stage we were satisfied that NGET, SPT and SSENT's optioneering process seemed to have followed a logical approach and we did not identify any options that had been inappropriately excluded from the CBA for the Eastern HVDC projects. This is also our view at the Final Needs Case stage.

2.28. NGET, SPT and SSENT have provided a clear account of the options considered through both the Initial Needs Case and Final Needs Case assessments. We are satisfied that NGET, SPT and SSENT have responded to NOA signals in a reasonable way to ensure that aprpopriate options could be assessed in a timely manner.

2.29. We consider the options included in the ESO's CBA for the Eastern HVDC projects and the removal of the onshore alternative (TLNO) following the Initial Needs Case is appropriate and reflects the outcome of the NOA 2020/21 analysis.

Delivery programme

2.30. The delivery programmes for each of the reinforcement options have been coordinated across NGET, SPT and SSENT to produce the Earliest In Service Dates set out in Table 1, above. These are based on the scope of the reinforcement, procurement methods, consent requirements and delivery timescales based on NGET, SPT and SSENT's experience and construction and commissioning timelines.

2.31. As set out at the Initial Needs Case assessment, a key consideration for the Eastern HVDC projects is the trade-off between the benefits of links landing further south on the network, versus the consumer detriment of delays.[14]

2.32. A high level programme for E4D3 and E2DC is included in Appendix 1.

Deliverability E2DC Torness to Hawthorn Pit

2.33. The Final Needs Case submission for E2DC highlights that the approach to Risk Management has continued to develop following the Initial Needs Case assessment and development of the project. The Final Needs Case submission includes a high level overview of the processes, methodology and approach for management of risks.

2.34. NGET and SPT have carried out a risk assessment exercise on the high-level programme for E2DC. The purpose of this is to give an indicative view of the likelihood of achieving the Earliest In Service Date (2027).

2.35. Although indicative at this stage, the outcome of this analysis suggests the probability of achieving the Earliest In Service Date of 2027 is approximately 40%, rising to 50% in February 2028 and 80% in July 2028.

2.36. NGET, SPT and SSENT have confirmed that based on an Earliest In Service Date for E2DC of December 2027 and delay analysis carried out by the ESO (further detail on which is set out in Chapter 3) a delay to February 2028 (2 months) would lead to additional constraint costs of between £17.2m and £37.5m, and a delay to July 2028 (7 months) would lead to additional constraint costs of between £60.1m and £131.3m.

Our views on the delivery programme

2.37. One of the areas of focus of this Final Needs Case assessment is to assess whether a robust delivery plan is in place to deliver the Eastern HVDC projects on time. Whilst we note that NGET, SPT and SSENT are not proposing any changes to the delivery dates of the proposed options (E2DC and E4D3), we consider the risk analysis carried out for E2DC

[14] Further information is set out in Chapter 3 of our INC consultation: Eastern HVDC - Consultation on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

demonstrates that some delay beyond the currently estimated December 2027 delivery date is fairly probable.

2.38. Throughout our assessment of the Eastern HVDC projects the impact of delay has been highlighted by both the ESO and NGET, SPT and SSENT as extremely costly to the consumer. We would therefore have expected earlier engagement from NGET and SPT if they considered there was a significant chance that E2DC may be delivered later than previously estimated.

2.39. Through further engagement, NGET and SPT have confirmed that there may be opportunities to mitigate a number of the risks contributing to the 40% probability, however it is possible that any mitigation measures may only have a marginal impact. NGET and SPT have highlighted that a more definite view on the programme can only be reached during the procurement process, as this will allow a more in-depth assessment to take place once the main works contracts are finalised (at this point key programme dates and manufacturing slots are confirmed).

2.40. In relation to E4D3, NGET and SSENT have confirmed that the current programme with delivery in 2029 remains their assumption and that risk analysis will be completed to inform the Project Assessment stage of the LOTI process.[15] NGET, SPT and SSENT note a key difference with E2DC, compared to E4D3, is that the cable and converter elements of the project are both on the critical path.

2.41. We will continue to monitor the delivery programme for both Eastern HVDC projects. The impact of any potential delay is assessed in full through the sensitivities included in the ESO's CBA for the Eastern HVDC projects, detailed in Chapter 3.

Technical Design

2.42. We have reviewed the technical design of E4D3 and E2DC.

2.43. NGET, SPT and SSENT have confirmed they have engaged with a range of suppliers and reviewed a number of HVDC technologies that are expected to enable capacity of 2GW on each of the links. They assessed options for cables, converters, and optimal configurations. Following engagement with suppliers, technical, operational and economic review, as well as

[15] As set out in the LOTI Guidance, at the Project Assessment stage we expect the TO(s) to outline its approach to delivery and risk management.

risk assessment of readiness of technology and review of experience so far, NGET, SPT and SSENT's recommended design included:

- Cross-linked polyethylene (XLPE) cables – with a fall back option of Mass Impregnated (MI) cables in case +525kv XLPE cables will not be available at the stage of procurement. Other cables that were considered included Paper Polypropylene Laminated (PPL) and High Performance Thermoplastic Elastomer (HPTE)

- Voltage Source converter (VSC) technology instead of Line Commutated Converter (LCC).

- Rigid bi pole configuration without metal return and overall voltage of +-525kV. Alternative configurations were not recommended due to higher cost and/or more operational risk.

2.44. Specific detail in relation to the technical design of each of the projects is set out in Appendix 2.

Our views on the technical design

2.45. We have reviewed the technical options put forward by NGET, SPT and SSENT in relation to converter type, cable type and configuration. We have reviewed the benefits (both qualitative and quantitative) and the risks that were clearly flagged in the Final Needs Case submissions, the relevant appendices and through further via direct engagement with NGET, SPT and SSENT.

2.46. We have also reviewed the mitigation actions suggested by NGET, SPT and SSENT to reduce and/or mitigate the risks identified, for example in relation to certain cable market readiness.

2.47. We are content with the approach taken by NGET, SPT and SSENT to identify options, assess risks and benefits and their approach to mitigating the risks identified. We are content that the technical designs put forward meet the requirements of industry codes and standards (SQSS) and will support the preferred option of 2GW additional capacity as approved in the Initial Need Case.

Costs

2.48. As set out in Table 1, NGET, SPT and SSENT's currently estimated capital costs for SSENTE4D3 and for E2DC are £2,105m and £1,294m, respectively. The costs for each of the options set out in Table 1 are unchanged from those included in the Initial Needs Case assessment.

2.49. The cost estimates for the options considered in the ESO's CBA for the Eastern HVDC projects are based on development and capital expenditure only. Operation and maintenance costs are excluded within National Grid's CBA for the Eastern HVDC projects. NGET, SPT and SSENT have highlighted they do not consider operation and maintenance costs are likely to be significantly different between competing options and these costs are therefore not considered for the options listed in Table 1.

2.50. Any estimates for non-tendered elements were developed based on historic project data. The spend profile for all of the options considered is based on those of similar projects such as Western HVDC, Shetland HVDC and Caithness-Moray HVDC.

Our views on costs

2.51. We consider these costs provide an appropriate basis under which to robustly compare the options at this stage, while recognising that the current cost estimates are indicative. We have reviewed the factors used to develop the cost estimates for the different shortlisted options such as the cable unit costs, base costs for convertor stations costs and assumed overhead costs. We are satisfied that these factors have been applied in consistent manner that allows the shortlisted options to objectively compared.

2.52. If we were ultimately to approve the Final Needs Case for the Eastern HVDC projects, our decision would confirm that NGET, SPT and SSENT would be funded for the efficient delivery of their respective E4D3 and E2DC projects. This funding would not include any areas of costs that we did not consider to be efficient or appropriate to fund following our Project Assessment.

3. Final Needs Case Assessment – Cost Benefit Analysis

Section summary

This chapter covers our assessment of the CBA methodology and results submitted on the Eastern HVDC projects.

Questions

Question 4: Do you agree with our conclusions on the cost benefit assessment and the appropriateness of taking forward the E2DC and E4D3 options?

Question 5: Do you agree that considering the proposed investment reinforcements in the context of wider network reinforcements (reinforcement pathways) is an appropriate approach?

Question 6: Are there any additional factors that we should consider as part of our Final Needs Case assessment?

Cost Benefit Analysis

3.1. Starting in early 2018, NGET, SPT and SSENT alongside the ESO began developing a CBA to identify the optimal reinforcement pathway for the Scotland and the North of England region. NGET, SPT and SSENT provided the ESO with a set of inputs for the CBA that included: 1. option descriptions, 2. base boundary capability, 3. option combinations, 4. boundary capability uplifts, 5. cost profiles and 6. Earliest In Service Dates, i.e. the earliest date a project can be operational.

3.2. The methodology used in the ESO's CBA is consistent with that which has been used on previous LOTI projects, and with that which is used each year when the ESO undertakes the NOA.

3.3. The methodology compares the likely benefits (in terms of reduction in future constraint 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, to get a Net Present Value (or NPV).

3.4. The CBA determines the preferred option based on a Least Worst Regret approach. The regret of each option is determined by the difference between its NPV value and the option with the highest NPV value. The option with the smallest regret across all generation scenarios is then determined as the option with the Least Worst Regret. the ESO's CBA determines the preferred option based on a Least Worst Regret approach, assuming each of the generation scenarios has an equal probability of occurring.

FES Scenarios

3.5. In line with the NOA analysis, the ESO's CBA for the Eastern HVDC projects uses the ESO's Future Energy Scenarios to determine the benefits of each option across a range of future scenarios. The Future Energy Scenarios are updated annually each summer. This allows the most up to date Future Energy Scenario to be used for the following NOA, which is published each January.

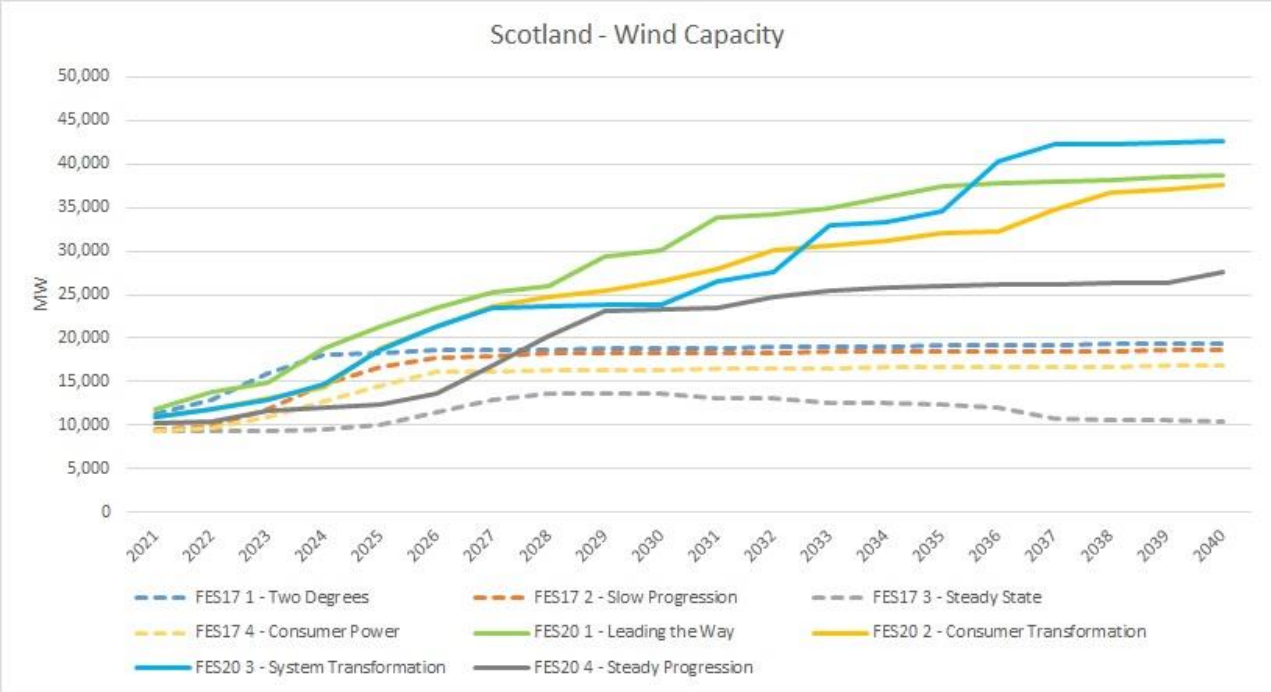
3.6. The Future Energy Scenarios 2020 are used in the CBA for the Eastern HVDC projects. The Future Energy Scenarios 2021 were not available until NOA 2021/22 analysis had been completed, and as such were not available for use within this Final Needs Case submission. The four broad scenarios under the Future Energy Scenarios 2021 remain the same as those used in the Future Energy Scenarios 2020. Three of the Future Energy Scenarios pathways meet net zero greenhouse gas emissions levels.

3.7. The Future Energy Scenario *Leading the Way* remains the most ambitious net zero scenario, achieving net zero in 2047. The other two net zero scenarios Consumer Transformation and System Transformation achieve net zero in 2050. Whilst Steady Progression continues to be the one scenario that does not achieve net zero.

Initial Needs Case - CBA for the Eastern HVDC projects

3.8. The CBA for the Eastern HVDC projects at the Initial Needs Case stage was completed using a background of Future Energy Scenarios 2017. Since this time, there has been a significant shift in the GB energy picture, with the goal of ensuring net zero by 2050. The most significant change in Scotland and the north of England is the level of wind connecting across the Future Energy Scenarios. Figure 4 below, shows how the level of wind generation assumed has changed between the CBA for the Eastern HVDC projects at Initial Needs Case stage (using Future Energy Scenarios 2017) and CBA for the Eastern HVDC projects at Final Needs Case stage (using Future Energy Scenarios 2020).

Figure 4: Change in wind levels between FES 2017 and FES 2020



Option combinations

3.9. The increasing requirement for boundary transfer capabilities is driving the need for continued network reinforcement in this region. This includes network reinforcements both before and after the completion of the Eastern HVDC projects.

3.10. NGET, SPT and SSENT have developed reinforcement pathways to demonstrate the benefit of these network reinforcement options on a standalone basis and also to quantify their benefit when assessed in combination with wider network investment plans.

3.11. The network reinforcement packages are categorised into the following options:

- Counterfactual – these are reinforcements that are a) in construction or commence construction in 2021, or b) have authorised funding, are delivering to scope and have a NOA 2020/21 proceed signal.

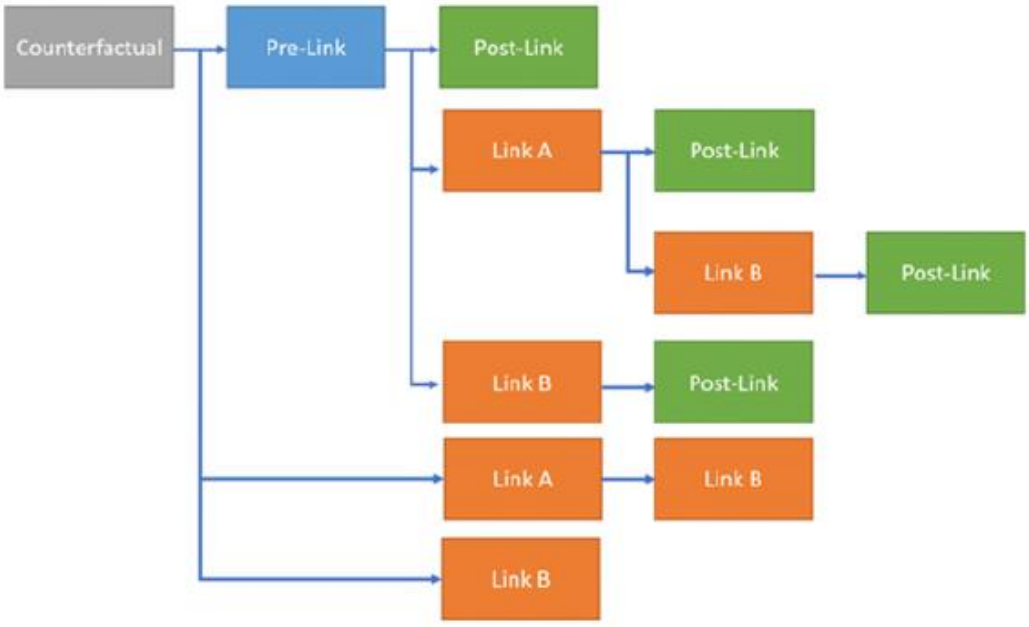
- Pre-link package – these are reinforcements to be delivered on or before the timespan of the Eastern HVDC links, as recommended in the optimum path in NOA 2020/21 for all four Future Energy Scenarios.

- Standalone option – these are the Eastern HVDC link options which form the subject of this Final Needs Case (the options detailed in Table 1).

- Post-link package – these are reinforcements to be delivered after the HVDC links as recommended in NOA 2020/21 for all four Future Energy Scenarios. These reinforcements would complete after the proposed E2DC and E4D3 links.[16]

3.12. Figure 5 sets out an example reinforcement pathway. These pathways have been developed for each individual network boundary, with each box representing a change in network state. In total 93 pathways are considered within the CBA for the Eastern HVDC projects.

Figure 5: Example FNC Pathway



[16] This assumes a post-link package of proposed network reinforcement options that will be subject to their own regulatory processes.

3.13. There are a number of network reinforcements that are assessed as extensions to the packages described in paragraph 3.11 above.

- The South Lincolnshire to Rutland reinforcement (LRNC) and the Uprate Brinsworth and Chesterfield double circuit to 400kV and a new 400kV double circuit between Ratcliffe and Chesterfield (EDNC) have been assessed as an extension of the post link package to provide an additional level of detail. LRNC and EDNC have been assessed in this way as these options were not recommended to proceed in NOA 2020/21 for all four Future Energy Scenarios, and are therefore not included in the post link package.

- The Denny to Wishaw 400kV reinforcement (DWNO) is included as a standalone option. This is not included as an alternative to the two HVDC links. It is included to provide more information on the value to the network of DWNO and its interaction with the proposed E2DC HVDC link.

3.14. A full list of the network reinforcement options included within the CBA for Eastern HVDC projects and how they have been categorised by NGET, SPT and SSENT is set out in Appendix 3.

Sensitivities

3.15. A number of sensitivities have been tested in the CBA for Eastern HVDC projects, detail on which is set out below:

- CAPEX costs – the CBA for the Eastern HVDC projects has been re-run with CAPEX values tested at +/- 10% and +/- 20%. This is to test the robustness of the preferred solutions against increased and decreased estimated CAPEX costs.

- Constraint costs - the CBA for the Eastern HVDC projects has been re-run with constraint costs tested at +/- 10% and +/- 20%. This is to test the robustness of the preferred solutions against a range of assumed constraint costs.

- In addition to the four Future Energy Scenarios 2020, an additional generation sensitivity has been included which alters the Steady Progression scenario and

removes Torness Nuclear Power Station earlier than the Future Energy Scenarios indicated closure date (referred to as 'SP Torness within the CBA').[17]

- Timing sensitivities – the CBA for the Eastern HVDC projects has been re-run using varied EISDs to determine the impact of delays to the HVDC links. The EISDs are delayed individually and in combination, as shown in Table 2, below.

Table 2: Delay sensitivities included in the LOTI CBA

Single year delay	Two year delay
E2DC +1 year (2028) and E4D3 as per EISD (2029)	E2DC +2 year (2029) and E4D3 as per EISD (2029)
E4D3 +1 year (2030) and E2DC as per EISD (2027)	E4D3 +2 year (2031) and E2DC as per EISD (2027)
E2DC +1 year (2028) and E4D3 + 1 year (2030)	E2DC +2 year (2029) and E4D3 + 2 year (2031)

LOTI CBA Results

3.16. Table 3 below shows a summary of the CBA results for the Eastern HVDC projects for the top 5 performing pathways.

Table 3: Summary LOTI CBA Results

Pathway	Link 1	Link 2	CBA Rank	Benefit gap (£m)
Base + Pre-Link + Link 1+ Link 2 + Post Link + DWNO + (LRNC + EDNC)	E2DC	E4D3	1	
Base + Pre-Link + Link 1+ Link 2 + Post Link + (LRNC + EDNC)	E2DC	E4D3	2	-235
Base + Pre-Link + Link 1+ Link 2 + Post Link + DWNO	E2DC	E4D3	3	-462
Base + Pre-Link + Link 1+ Link 2 + Post Link + DWNO + (LRNC + EDNC)	E2D3	E4DC	4	-485
Base + Pre-Link + Link 1+ Link 2 + Post Link +DWNO	E2DC	E4D2	5	-526

[17] The northern connection point of E2DC is close to Torness Nuclear Power Station, as such TOs considered it important to understand the interaction between its closure and the E2DC link.

3.17. The CBA for the Eastern HVDC projects concludes that the optimum option, based on a LWR approach across all pathways and scenarios, is the HVDC link from Torness to Hawthorn Pit (E2DC) combined with the HVDC link from Peterhead to Drax (E4D3). The complete pathway NPV ranges from £12.5bn to £35.4bn. When the two links (E2DC and E4D3) are considered in isolation (ie without the base, pre-link, post-link and other investments (DWNO, LRNC & EDNC)) they provide NPVs ranging from £2.3bn to £4.6bn across the Future Energy Scenarios. Pathways that contain two HVDC links consistently outperform pathways that contain only one link, reconfirming the analysis carried out at the Initial Needs Case stage.[18]

3.18. The preferred options of E2DC and E4D3 perform well across all core scenarios. Table 4 below, sets out the reinforcement pathway with the highest NPV in each of the Future Energy Scenarios, and therefore the zero-regret option.

Table 4: Summary CBA results for the Eastern HVDC projects

Scenario	Zero Regret Pathway
LtW	Base network + Pre-link package + DWNO + E2DC + E4D3 + Post link package
CT	Base network + Pre-link package + DWNO + E2DC + E4D3 + Post-link package + (LRNC + EDNC)
ST	Base network + Pre-link package + DWNO + E2DC + E4D3 + Post-link package + (LRNC + EDNC)
SP	Base network + Pre-link package + DWNO + E2DC + E4D3 + Post-link package

3.19. The table above shows that E2DC and E4D3 are the recommended reinforcement options when considered as part of a wider strategy of system reinforcements, represented by the inclusion of the post link package. When considered only in combination with each other, (ie Base + Link 1 + Link 2, without the pre-link and post-link packages and without the DWNO or LRNC + EDNC reinforcements) the recommendation is for two longer HVDC links (E2D3, the Torness to Drax HVDC link and E4D2 the Peterhead to Cottam HVDC link). This remains consistent with previous analysis that demonstrates that all boundaries require reinforcement; however, when considered alongside further reinforcement that target those boundaries, then E2DC and E4D3 are optimal. NGET, SPT and SSENT consider that the Eastern HVDC projects must be considered in the context of the full GB electricity network,

[18] Eastern HVDC - Consultation on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

and therefore must consider network states after the proposed HVDC links (E2DC and E4D3) (ie the post link package, DWNO and LRNC + EDNC reinforcements)..

Sensitivities

3.20. As described in paragraph 3.15, a series of sensitivities have been tested through the CBA for the Eastern HVDC projects to examine the sensitivity of the recommended options to certain changes in assumptions.

3.21. Neither the sensitivity to vary CAPEX costs by +/- 10% or +/-20% or the sensitivity to vary constraint costs by +/- 10% or +/-20% change the recommended options. In all cases E2DC and E4D3 remain the optimum solution.

3.22. When the Future Energy Scenarios generation sensitivity 'SP Torness' is considered, the recommendation also does not change.

3.23. A range of timing sensitivities were assessed by the ESO in the CBA for the Eastern HVDC projects. Only one case, a 2 year delay to both E2DC and E4D3, resulted in a change in recommendation. In this case the top ranked solution becomes E2D3 and E4DC. Any delay to either HVDC link would result in additional constraint costs as detailed in Table 5, below.

Table 5: Constraint costs incurred due to delay

Timing	Timing	Constraint costs (£m)				
E2DC	**E4D3**	**LtW**	**CT**	**ST**	**SP**	**Average**
E2DC + 1 (2028)	E4D3 (2029)	201	206	225	103	184
E2DC (2027)	E4D3 + 1 (2030)	156	197	184	290	207
E2DC + 1 (2028)	E4D3 + 1 (2030)	357	403	409	393	390
E2DC + 2 (2029)	E4D3 (2029)	402	416	453	283	389
E2DC (2027)	E4D3 + 2 (2031)	335	391	368	577	418
E2DC + 2 (2029)	E4D3 + 2 (2031)	737	807	822	860	806

3.24. To assess the sensitivity of the recommendation to the post link package, analysis was also carried out which delays both the post-link package and LRNC +EDNC (post link extension reinforcements) from the 2031 studied dates by 1 and 2 years. These sensitivities do not change the recommendation from E2DC and E4D3.

3.25. NGET, SPT and SSENT consider the sensitivity analysis shows the robustness of the recommended option (E2DC and E4D3) against future uncertainty.

Our views on the Cost Benefit Analysis for the Eastern HVDC projects

3.26. Our view is that the CBA supports the need for investment on this part of the network and justifies NGET, SPT and SSENT's progression of E2DC and E4D3 as the preferred options for the reinforcement pathway for the Scotland and the North of England region. When considered as part of a wider strategy of system reinforcements E2DC and E4D3 display the highest NPV across each Future Energy Scenarios and are the LWR options.

3.27. We are satisfied that the CBA demonstrates that E2DC and E4D3 are the most efficient options overall, when compared against a suitably wide range of alternative options and sensitivities (ie potential future changes). We note that much of the relative benefit of the options is driven by the earlier Earliest In Service Dates compared to the other options, particularly when looking at E2DC. However, we are comfortable that based on the sensitivity analysis carried out (that considers delays to Earliest In Service Dates) both E2DC and E4D3 remain the most appropriate options based on current estimated delivery dates.

3.28. NGET, SPT and SSENT note that any delay to the Eastern HVDC projects would lead to additional constraint costs of up to £409m in the first year of delay, with up to £225m for E2DC alone in the first year of delay. Given the material impact of delay to delivery, we expect NGET, SPT and SSENT to continue to progress the Eastern HVDC projects in a timely manner that ensures that the full benefits of the projects can be realised.

4. Delivery model considerations

Section summary

This chapter summarises our assessment of whether the Eastern HVDC projects meet the criteria for competition and explains our minded-to decision on whether to apply a late competition model.

Questions

Question 7: Do you agree with our minded-to decision to retain the two Eastern HVDC projects within the LOTI arrangements under RIIO?

Background

4.1. 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. 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.

Whether the Eastern HVDC projects meets the criteria for competition

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

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

4.3. We remain of the view that the Eastern HVDC projects as proposed meets the "new" criterion. It involves the construction of new subsea HVDC links and associated other new electrical infrastructure (e.g converter stations) along new route corridors.

4.4. We also remain of the view that the Eastern HVDC projects as proposed meets the "separable" criterion. Whilst the proposed subsea HVDC links are expected to play an integral part in releasing constraints at various points on the network, and interact with a range of other proposed investments, the proposed links will only physically interface with the rest of the transmission network relatively close to the northern and southern landing points. The links are electrically separable and can be built with minimal interaction with the rest of the network.

4.5. Finally, we remain of the view that the Eastern HVDC projects will also meet the "high-value" criterion. The indicative costs for the Eastern HVDC projects provided by NGET, SPT and SSENT is greater than £3bn.

4.6. Overall, and in line with our assessment at the Initial Needs Case stage, we conclude that the Eastern HVDC projects meet the criteria for late model competition.

Delivery model considerations

4.7. Since we consider that the Eastern HVDC projects meets the criteria for late model competition, we have 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.

Relevant consideration of models

4.8. The late competition models for consideration for the Eastern HVDC projects are:

- Competitively Appointed Transmission Owner (CATO) Model
- Special Purpose Vehicle (SPV) Model
- Competition Proxy Model (CPM)

4.9. Below we set out details of each of these models, and our views on how applicable each might be to the Eastern HVDC projects.

CATO Model

4.10. Under the CATO model a competitive tender would be run for the financing, construction, and operation of the proposed assets that make up the Eastern HVDC projects,

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.

4.11. The high-level delivery plan for Eastern HVDC projects (included for E4D3 and E2DC in Appendix 1) presented by NGET, SPT and SSENT 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 UK Government has set out its intention to introduce the required legislation, but it is currently difficult to determine when the required legislation will be in place and whether this would support timely delivery of the Eastern HVDC projects by a CATO model.

4.12. In order for construction to commence in early 2024 the high-level delivery plan for Eastern HVDC projects requires the Invitation to Tender (ITT), the main stage of the procurement process, to start in spring 2022. We consider that the ITT stage is the critical point by which a delivery model decision should be made in order to ensure that the project can progress with clarity on the delivery model for NGET, SPT and SSENT and prospective bidders before they start spending significant money preparing their bids. Having reviewed the detailed assumptions on which the delivery plan is based, we agree that a decision to apply CATO at this point to the Eastern HVDC projects is likely to lead to delays that could significantly increase constraint costs.

4.13. In line with our Initial Needs Case Decision that any delay resulting from the application of the CATO model on the Eastern HVDC projects would not be in the interests of consumers, we can confirm that we are minded not to apply the CATO model to E2DC or E4D3.

4.14. While we welcome representations on this point, such representations would need to sufficiently evidence and demonstrate that an application of CATO would be in the interests of consumers for us to consider changing our minded-to position of not applying CATO for this project.

SPV Model

4.15. 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 Eastern HVDC projects.

4.16. Given the additional work needed to finalise the SPV model, and the close proximity of the ITT stages, we do not consider that the SPV model can be applied to this project without being likely to lead to delays. For this reason we consider that the SPV model is not an appropriate model to utilise for this project.

Competition Proxy Model

4.17. 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.

4.18. Importantly, the project would remain delivered by NGET, SPT and SSENT 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.

4.19. In RIIO-2 Final Determinations we explained that due to recent market conditions and our allowed financing arrangements for RIIO-2, we may not be able to have sufficient confidence that the application of the CPM to projects that need to start construction at the start of the RIIO-2 period would deliver benefits to consumers. This position was informed by the positions determined for the Hinkley-Seabank project in May 2020.

4.20. Since our decision on Hinkley-Seabank and RIIO-2 Final Proposals in 2020, we have seen some variability in the cost of debt benchmarks used to set the financing arrangements under CPM. However, we have not seen movements that would indicate that we are able to be confident that CPM is likely to deliver a benefit to consumers relative to the counterfactual LOTI arrangements under RIIO. In line with the approach undertaken for our Hinkley-Seabank decision, we have carried out some indicative comparative analysis of the consumer impact of applying CPM to the E2DC and E4D3 projects rather than the RIIO counterfactual arrangements. The results are summarised below.

	E2DC under RIIO	E4D3 under RIIO
CPM		
Mid point of construction & operational ranges	**CPM benefit:** - £93m (9%) to - £129m (13%)	**CPM benefit:** - £130m (9%) to - £155m (11%)
Mid point of construction and bottom of ops ranges	**CPM benefit:** £19m (2%) to - £55m (5%)	**CPM benefit:** £31m (2%) to - £56m (4%)
bottom of construction and ops ranges	**CPM benefit:** £33m (3%) to £3m (0%)	**CPM benefit:** £61m (4%) to £36m (4%)
Top of construction and ops ranges	**CPM benefit:** - £243m (14%) to - £279m (27%)	**CPM benefit:** - £350m (25%) to - £375m (25%)

Figure 6 – Indicative results of comparative analysis between CPM & RIIO for the Eastern HVDC projects

4.21. At this stage of the Eastern HVDC projects there remains uncertainty around the final costs associated with the E2DC and E4D3 links. There is also scope for potential market movements between now and the point at which the financing arrangements would be finalised for CPM, in parallel to the final setting of the cost allowances for the project. However, notwithstanding this we consider that we do not have sufficient confidence that application of the CPM to Eastern HVDC projects would deliver benefits to consumers.

Minded-to position

4.22. Given that we cannot envisage that implementing either the CATO model or SPV model for these projects without causing the delay of such critical investments and given the indicative results of the CPM analysis above in Figure 6, our minded-to position is to retain the E2DC and E4D3 links within the LOTI mechanism within the RIIO-2 framework.

5. Large Project Delivery

Section summary

This section sets out a summary of our approach to Large Project Delivery.

Questions

Question 8: Do you agree with our approach to LPD?

Question 9: Do you agree that reprofiling (rather than a milestone-based approach) is an appropriate mechanism for the Eastern HVDC project?

Background

5.1. In our RIIO-2 Final Determinations[19] we set out our approach to late delivery of large projects (>£100m). We aim to ensure a network company does not benefit financially from a delay to delivery of those projects by using one of the following options:

i. If a project is delivered late, we may re-profile the allowances to reflect actual expenditure to avoid the network company benefitting from the time value of money; or

ii. Milestone-Based Approach – we may set project allowances based on the delivery of specific, pre-agreed, milestones. The allowances would only be granted following confirmation that a milestone had been delivered.

1.2. We aim to ensure consumers are protected from any delay in delivery. To this end, we will consider setting a Project Delivery Charge (PDC) for each day a project is delivered late.

1.3. We will take into account a range of factors when considering a Project Delivery Charge, including:

i. estimates of potential consumer detriment

ii. industry benchmarks for delay clauses on similar projects

[19] RIIO-2 Final Determinations, ET Annex (REVISED), page 32 onwards

iii. the delay clause(s) that the network company negotiates with its contractor(s) for that project, which would be shared with Ofgem through the project assessment submission.

Our position

5.2. To address the possibility of NGET, SPT and SSENT benefiting financially from any delay in delivery of the Eastern HVDC projects our preferred option in a case of delay is to re-profile the allowances to reflect actual expenditure to avoid the network companies benefitting from the time value of money.

5.3. We do not consider that setting milestone based allowances is appropriate for the Eastern HVDC projects. This is mainly due to the significant cost of the Eastern HVDC projects and the fact each respective project will be delivered by two TOs. We accept that in the case of the Eastern HVDC projects, the representations from the TOs made as a response to our RIIO-2 Draft Determination consultation[20] are relevant, namely that using a milestone based approach may materially affect cashflow. Our view is that this may create a barrier for NGET, SPT and SSENT to engage with their contractors on efficient amendments to pre set milestone deliverables for the benefit of the project as a whole.

5.4. Our current view is that there is a clear need to set a PDCs for the respective Eastern HVDC projects to protect the interests of existing and future consumers. We are currently engaging with NGET, SPT and SSENT to consider the value at which to set the respective PDCs and how precisely the PDC will operate.

5.5. At this stage of our assessment of the Eastern HVDC projects, it is not yet possible to have a precise view of the nature and scope of any delay clauses that NGET, SPT and SSENT will negotiate with their suppliers. As such, we are continuing to engage with NGET, SPT and SSENT to inform our decision. We expect any decision on the precise level of the PDC to be made at latest as part of the Project Assessment stage, although we invite NGET, SPT and SSENT to continue to engage with us on the matter.

[20] See page 35 in the ET Annex (revised) here: RIIO-2 Final Determinations for Transmission and Gas Distribution network companies and the Electricity System Operator | Ofgem

6. Next steps

Section summary

This chapter sets out the next steps in our assessment of the Eastern HVDC projects under the LOTI mechanism.

6.1. Our consultation on the positions set out within this document will close on 4th of May 2022.

6.2. NGET, SPT and SSENT have requested through the Final Needs Case submissions that we commit to providing a decision on the Final Needs Case assessments prior to any decision by the relevant authorities on planning consents. NGET, SPT and SSENT argue that this is important to help support current delivery timescales. The final decision on planning consents for the Eastern HVDC projects is not expected until Q1 2023. The full programmes for both E2DC and E4D3 are included in Appendix 1.

6.3. We stated in the INC Decision, that we normally expect to only receive a Final Needs Case submission once planning consent is in place. However, in the case of the Eastern HVDC projects, due to the particular circumstances, including its strategic importance, we set out that we are satisfied that it is in the interest of consumers to allow some flexibility to the LOTI process to ensure the project meets its required delivery dates. As such we were comfortable in this instance to receive the Final Needs Case submissions well before the decision on major planning consents.

6.4. Furthermore, we are also willing in this instance to make a 'conditional' decision on the Final Needs Case for the Eastern HVDC projects in advance of the planning consent decision. By 'conditional' decision in this context we refer to our decision being conditional on the outcome of the planning consent process for the Eastern HVDC projects. However, we do not intend to make or publish a **final decision** on the Final Needs Case for the Eastern HVDC projects until after the planning consent decision. This is because it would not be appropriate for Ofgem to:

i. Pre-judge (or be seen to pre-judge) the outcome of the planning consent process, which is conducted by different parties under a different legislative framework and is entirely separate to the regulatory approval process; or
ii. Commit material consumer funding to the construction of the Eastern HVDC projects before it has secured planning consent, in case the planning consent

process raises any material issues with the need for, or design of, the Eastern HVDC projects.

6.5. If our decisions change from our minded-to positions set out in this document, in light of responses and new information received, then we may need to re-consult. Otherwise, we would anticipate publishing our conditional decision on the Final Needs Case for the Eastern HVDC projects in summer 2022.

Appendices

Index

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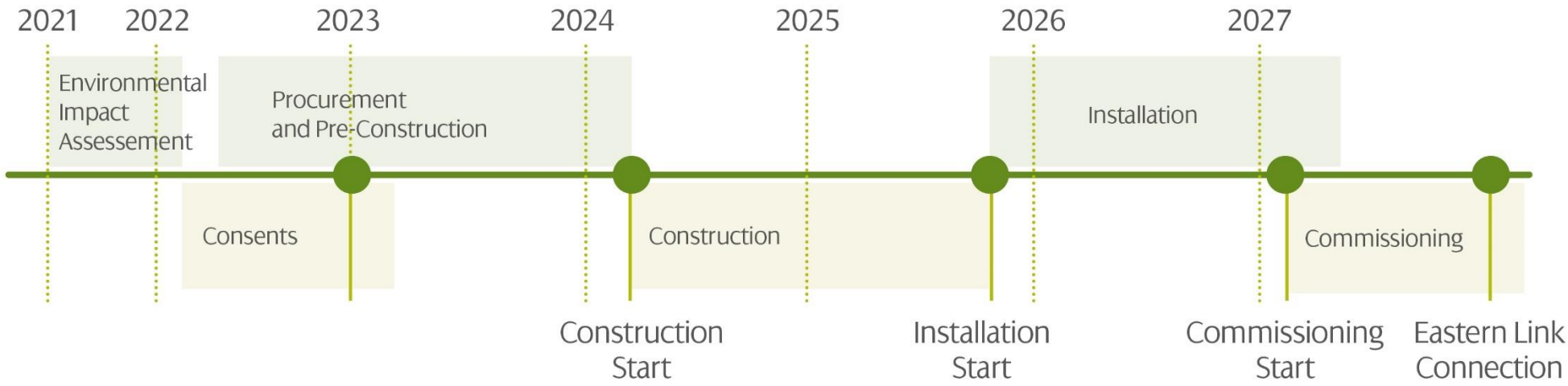
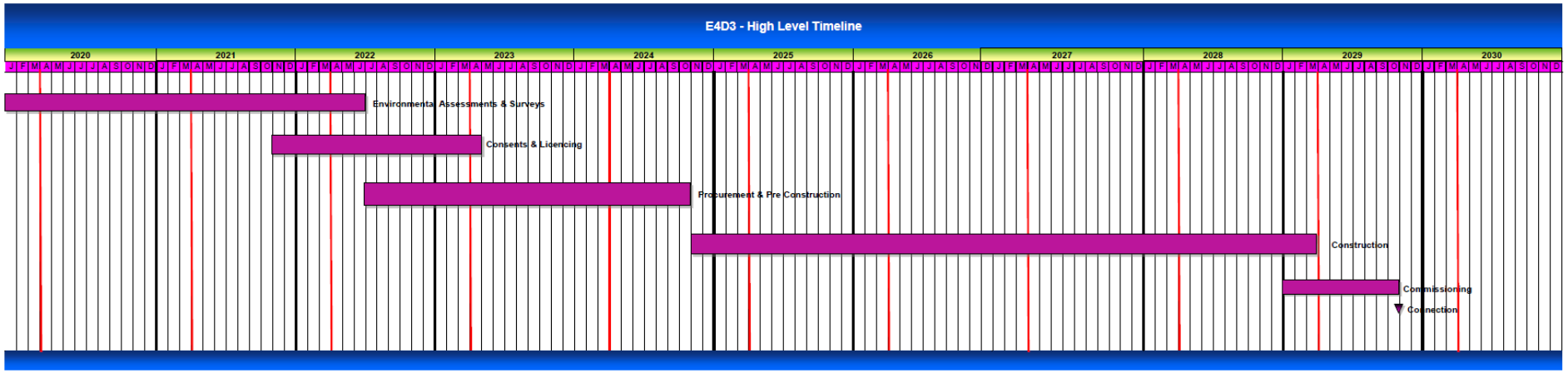
Appendix 1: Delivery Programme for Torness to Hawthorn Pit (E2DC) and Peterhead to Drax (E4D3)

E2DC: Torness to Hawthorn Pit



E4D3: Peterhead to Drax



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Appendix 2: technology proposals for Torness to Hawthorn Pit (E2DC) and Peterhead to Drax (E4D3)

Summary of TOs proposals

1.1. The TOs assessed and proposed the same technologies to deliver both E2DC and E4D3. This is due to the similarities in the proposed design of both projects which both involve a 2GW HVDC offshore link.

1.2. This section summarises the technology options considered by the TOs and the benefits and risks they have identified.

Technology selection

1.3. To deliver an HVDC link with a capacity of 2GW from (1) Torness to Hawthorn Pit (E2DC) and (2) Peterhead to Drax (E4D3), the following three design elements were considered by the TOs:

- Converter type
- Configuration and;
- Cable system

Converter technology selection

1.4. Two options were considered: Line Communicated Converters (LCC) and Voltage Source Converters (VSCs).

1.5. Despite LCC being a well-established and widely deployed technology, the TOs' proposed technology was VSC for the following reasons:

- Ideally suited to operate in weaker networks (connecting into lower short circuit ratio) without the risk of commutation failure. The converters also have an inherent capability to generate / absorb reactive power.
- The adaptability of VSC compared to LCC is better for dynamic networks. VSC converters could be used in a black start. With the appropriate control system functions, VSC converters can be operated in a grid-forming mode.

- LCC HVDC technology is prone to commutation failure under certain network conditions. A simultaneous commutation failure involving multiple LCC HVDC Links would further affect the operation of the onshore AC network and would pose a bigger network security risk. This risk is unacceptable to the GB electricity transmission system.

1.6. The ESO supports the conclusion that LCC converter technology should not be used for the Eastern HVDC projects.

Configuration and voltage selection:

1.7. Two configurations were considered: symmetrical monopole and rigid bi-pole (with or without metallic return). The TOs' proposed option is rigid bi-pole with no dedicated metallic return (DMR) for the following reasons:

- Switching impulse levels and transient voltage stresses are significantly lower than the levels for symmetrical monopole and consequently lower duty on converters, cables, and cable sealing ends.

- A rigid bi-pole configuration enables 50% redundancy against loss or planned outage of a converter pole or transformer; meaning 50% of the bi-pole power remains available. For a rigid bi-pole, a shutdown of the scheme is required for DC switching to by-pass the pole in outage. The scheme can continue to operate at half the bi-pole power rating if both cables are in service.

- The additional cost as well as the potential delay to the project outweigh the benefits of DMR. A bi-pole with a DMR has the added advantage that it can transition to half bi-pole power without interruption to the DC power flow. This is possible for a pole permanent fault or a single cable outage by using the healthy pole cable and the DMR together with an additional fast reconfiguring DC switchgear. TOs flagged that requesting suppliers to include DMR may increase lead time for suppliers and will have cost implications. They also flagged that installing DMR will require more trenches to ensure sufficient separation to minimise impact of damage from external event such as dropped vessel anchor drag.

- Voltage selection: two options were considered and a risk assessment carried out.

    - To reach 2GW using +320kV would require two parallel converter stations. A parallel solution would use a symmetrical monopole topology with each pole rated around 1.2GW and requiring four DC pole cables.

- At ±525kV DC, up to 2.5GW is achievable.

1.8. Bi-pole is the preferred converter supplier topology for operation at ±525kV (as per above).

Cable selection:

1.9. To secure 2GW capacity a configuration of 2 cable system operating at +-525kV was selected.

1.10. Following engagement with potential suppliers the type of cables that were considered included: MI (Mass Impregnated), XLPE (Cross-Linked Polyethylene Extruded type), PPL (Polypropylene Paper Laminate) and HPTE (High Performance Polypropylene Thermoplastic Elastomer Insulation).

1.11. The TOs assessed the various options using a RAG rating, considering mainly service status. Extract of the table can be found below.

Table 15: Summary of Submarine Cable Technology Status

Voltage	Subsea Cable Type			
	MI	XLPE	PPL	HPTE
320 kV	Good Service Experience	Service Experience (In early life region of bathtub curve)	No Service Experience	Not Offered
525 kV	Limited Service Experience	PQ Tests Planned/in Progressing for completion by 2022 No Service Experience	No Service Experience	PQ Tests Planned 2025
600 kV	PQ Tests Planned/ in Progress	Not Offered	Service Experience with Issues	Not Offered

Operation:

1.12. The TOs have confirmed that the link will be specified to be able to operate in both directions (ie north-south and south-north) and that this requirement will be included in contract.

Appendix 3 – Reinforcement Options included in the LOTI CBA

Reinforcement options included in the counterfactual

Scheme Name	NOA Code	EISD	NOA6 Recommendation	RIIO T2 Business Plan
East Coast 275kV Upgrade	ECU2	2023	Proceed	Authorised scheme
North East 400kV Upgrade	ECUP	2023	Proceed	Authorised scheme
East Coast 400kV Upgrade	ECU4	2026	Proceed	Authorised scheme
Kinardochy Reactive Compensation	TURC	2024	Not assessed	Authorised scheme
Windyhill Lambhill Longannet 275kV circuit turn to Denny North	WLTI	2022	Delay	Authorised scheme
Hunterston East 400kV Reinforcement	HNNO	2023	Proceed	Authorised scheme
Denny North SGT2	DNEU	2025	Hold	Non-Authorised scheme
Eccles Hybrid Synchronous Compensators and Real Time Rating	ECVC	2026	Proceed	Authorised scheme
West Boldon tee in at Hawthorn Pit	WHTI	2021	Proceed	Authorised scheme
Additional power controllers at Hawthorn and Penwortham	MRP2	2021	Proceed	Non-authorised scheme
Reconductoring of Thornton to Drax circuit 1	TDR2	2021	Hold	Non-authorised scheme
Reconductoring of Thornton to Drax circuit 2	TDR1	2021	Hold	Non-authorised scheme
Harker SGT5 and SGT9A banking arrangement	HAEU	2022	Proceed	Non-authorised scheme

Network reinforcement pathway categories

Scheme Name	NOA Code	EISD (NOA 6)	Counter-factual	Pre-Link	Post-Link	Stand alone
EHVDC link Torness to Hawthorn Pit	E2DC	2027				Y
EHVDC link Torness to Cottam	E2D2	2030				Y
EHVDC link Torness to Drax	E2D3	2029				Y
EHVDC link Peterhead to Hawthorn Pit	E4DC	2029				Y
EHVDC link Peterhead to Cottam	E4D2	2031				Y
EHVDC link Peterhead to Drax	E4D3	2029				Y
Windyhill Lambhill Longannet 275kV circuit turn to Denny North	WLTI	2022	Y			
Hunterston East 400kV Reinforcement	HNNO	2023	Y			
East Coast 275kV Upgrade	EUC2	2023	Y			
Denny North SGT2	DNEU	2025	Y			
East Coast 400kV Upgrade	ECUP	2026	Y			
Kinardochy Reactive Compensation	TURC	2024	Y			
Eccles Hybrid Synchronous Compensators and Real Time Rating	ECVC	2026	Y			
Denny to Wishaw 400kV reinforcement	DWNO	2028				Y
Elvanfoot to Harker reconductoring	EHRE	2027			Y	
Windyhill Lambhill Longannet 400kV upgrade	DLUP	2029				Y
Eastern subsea HVDC link: Peterhead to South Humber	E4L5	2031				Y
South east Scotland to north west England AC onshore reinforcement	CMNC	2033				Y
Uprate the Beauly to Denny 275kV to 400kV	BDUP	2028				Y

Beauly to Blackhillock 400kV double circuit addition	BBNC	2030				Y
Beauly to Loch Buidge 275kV reinforcement	BLN2	2030				Y
Loch Buidge to Dounreay 275kV double circuit reconductoring	DLRE	2027				Y
Additional power control devices at both Harker and Penwortham	MRP2	2021	Y			
Reconductoring of Thornton to Drax circuit 1	TDR1	2021	Y			
Reconductoring of Thornton to Drax circuit 2	TDR2	2021	Y			
Harker SGT5 and SGT9A Banking Arrangement	HAEU	2022	Y			
Harker SuperGrid Transformer 6 replacement	HAE2	2023		Y		
Generator circuit breaker replacement to allow Thornton to run a two way split	DREU	2027		Y		
Cellarhead to Drakelow circuits thermal uprating	CDHW	2023		Y		
Alternative power control device along Creyke Beck to Thornton	CTP2	2024		Y		
Power control device along Creyke Beck to Keadby to Killingholme	CKPC	2023		Y		
Power control device along Keadby to West Burton	KWPC	2023		Y		
Keadby to West Burton circuits thermal uprating	KWHW	2023		Y		
Power control device along Drax to Eggborough	TDPC	2023		Y		
Power control device along Drax to Eggborough	DEPC	2023		Y		

Additional power control device along Drax to Thornton	TDP2	2024		Y		
New 400kV reinforcement between Norton/Osbaldwick and Poppleton and relevant 275kV upgrades	OPN2	2027		Y		
Power control device along Cellarhead to Drakelow	CDP2	2023		Y		
Additional alternative power control devices along Cellarhead to Drakelow	CDP3	2023		Y		
Reconductor 13.75km of Norton to Osbaldwick number 1 400kV circuit	NOR5	2023		Y		
225MVAr MSCs within the North East Region	NEMS	2024		Y		
Stella West to Spennymoor circuit thermal uprating	SSHW	2022		Y		
225MVAr MSCs within the North East Region	NSM1	2024		Y		
Power control device along Blyth to Tynemouth and Blyth to South Shields	NEPC	2023		Y		
Power control device along Blyth to Tynemouth to Blyth to South Shields	NEP1	2024		Y		
Creyke Beck to Keadby advance rating	CBEU	2023		Y		
Two 225MVAr MSCs at Penwortham	PWMS	2024		Y		
Power control device along Cottam to West Burton	CWPC	2023		Y		
Power control device along Cottam to West Burton	CRPC	2023		Y		
Upgrade substation in the South Humber area	SHNS	2031			Y	

A new 400kV double circuit between the South Humber and South Lincolnshire	GWNC	2031			Y	
A new 400kV double circuit between Creyke Beck and the South Humber	CGNC	2031			Y	
Reconductor West Burton to Ratcliffe-on-Soar circuit	WRRE	2027			Y	
Reconductor 13.75km of Norton to Osbaldwick number 2 400kV circuit	NOR4	2023			Y	
South Lincolnshire to Rutland reinforcement	LRNC	2031			Y*	
Uprate Brinsworth and Chesterfield double circuit to 400kV and a new 400kV double circuit between Ratclifee and Chesterfield	EDNC	2033			Y*	

* Assessed as an extension of the post link package to provide an additional level of detail as these options were not recommended to proceed in NOA 2020/21 for all four FES.

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Appendix 4 Inputs used for CPM analysis

Refernce date: 29/10/2021

Construction:

	Low	High	Midpoint	
Cost of debt yield	1.90%	1.90%		5-7 yr BBB-rated non-financial
transaction costs	0.40%	0.50%		
CoD benchmark	2.30%	2.40%	**2.35%**	
Risk free rate	0.30%	0.80%		as per IDC
TMR	8.27%	8.78%		as per IDC & RIIO
Asset beta	0.45	0.7		as per IDC (w/ uplift for offshore working)
Gearing	37.50%	37.50%	**37.50%**	as per IDC
Equity beta	0.72	1.12		as per IDC
Cost of Equity bench	6.04%	9.74%	**7.89%**	as per IDC

Operational:

	Low	High	Midpoint	
Cost of debt yield	2.20%	2.53%		15+ year A & BBB-rated
transaction costs	0.10%	0.10%		
CoD benchmark	2.30%	2.63%	**2.47%**	
Gearing	85.00%	80.00%	**82.50%**	Historical OFTO (TR1-3)
Equity	7.00%	8.50%	**7.75%**	Historical OFTO (TR1-3)

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Appendix 5 – Privacy notice on consultations

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Instructions: Please edit the content of the generic privacy notice provided below to take account of the specifics of your consultation.

Contact the Data Protection Officer dpo@ofgem.gov.uk if you are unsure about any of the information to be provided to those responding to your consultation.

Note that this section only refers to your personal data (your name address and anything that could be used to identify you personally) not the content of your response to the consultation.

1. The identity of the controller and contact details of our Data Protection Officer
The Gas and Electricity Markets Authority is the controller, (for ease of reference, "Ofgem"). The Data Protection Officer can be contacted at dpo@ofgem.gov.uk

2. Why we are collecting your personal data
Your personal data is being collected as an essential part of the consultation process, so that we can contact you regarding your response and for statistical purposes. We may also use it to contact you about related matters.

3. Our legal basis for processing your personal data
The collection, use and storage of your personal data as it relates to a response to this consultation is necessary for the effective performance of receiving and considering your consultation response and is carried out in the public interest.

3. With whom we will be sharing your personal data
(Include here all organisations outside Ofgem who will be given all or some of the data. There is no need to include organisations that will only receive anonymised data. If different organisations see different set of data then make this clear. Be a specific as possible.)

4. For how long we will keep your personal data, or criteria used to determine the retention period.

Your personal data will be held for ***(be as clear as possible but allow room for changes to programmes or policy. It is acceptable to give a relative time e.g. 'six months after the project is closed')***

5. Your rights

The data we are collecting is your personal data, and you have considerable say over what happens to it. You have the right to:

- know how we use your personal data
- access your personal data
- have personal data corrected if it is inaccurate or incomplete
- ask us to delete personal data when we no longer need it
- ask us to restrict how we process your data
- get your data from us and re-use it across other services
- object to certain ways we use your data
- be safeguarded against risks where decisions based on your data are taken entirely automatically
- tell us if we can share your information with 3rd parties
- tell us your preferred frequency, content and format of our communications with you
- to lodge a complaint with the independent Information Commissioner (ICO) if you think we are not handling your data fairly or in accordance with the law. You can contact the ICO at https://ico.org.uk/, or telephone 0303 123 1113.

6. Your personal data will not be sent overseas

7. Your personal data will not be used for any automated decision making.

8. Your personal data will be stored in a secure government IT system.

9. More information For more information on how Ofgem processes your data, click on the link to our "Ofgem privacy promise".