Investment Decision Pack
A9.12 – Tyne Crossing
December 2019

As a part of the NGET Business Plan Submission

nationalgrid

Engineering Justification Paper; Non-Load Related Tyne Crossing			
Asset Family	Overhead Lines		
Primary Investment Driver	Other - Economic Development		
Reference	A9.12 Tyne Crossing		
Output Asset Types	Non-Load - New Horizontal Directional Drill Cable solution Non-Load - New Tunnel Non-Load - Overhead line Asset Replacement		
Cost	£[redacted]m		
Delivery Year(s)	2021 – 2026		
Reporting Table	C2.2A		
Outputs included in RIIO T1 Business Plan	No		
Spend Apportionment	**T1**	**T2**	**T3**
	£[redacted]	£[redacted]	£[redacted]

Contents

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1. EXECUTIVE SUMMARY

This report provides justification for our RIIO-T2 Tyne Crossing plan for a permanent solution to the constraints posed by our Overhead Line (OHL), for a cost of £[redacted] **(£[redacted] during RIIO-T2**).

The overhead route passes through the Newcastle-upon-Tyne and South Shields area, and the circuits cross the River Tyne. The cables were installed in 1950s and the line did not create concern for the river users until recent years, as the height of vessels has increased.

In the recent years, innovation and technology improvements have allowed vessels with higher structures on the river. The Port of Tyne authority (PoT), regional MPs, consultants and River Tyne business users have told us the existing overhead line crossing is a constraint to the local manufacturing industry and the bidding for offshore oil, gas and wind contracts (see Appendix B). This has been noticed in 2017, 2020 and 2021 for the passage of vessels holding offshore wind structures.

Vessels with a height close to or above the height of the power line require the physical removal of the line or line elements to allow the safe passage of vessels, creating large disruptions and costs for end consumers. For instance, outages are required to allow the temporary removal of the line resulting in significant constraint costs to the Electricity System Operator (up to £[redacted]) and preventing National Grid Electricity Transmission (NGET) from delivering up to £[redacted] of planned asset replacements in RIIO-T2 and T3.

In 2020, there is a conflict which could impact the reliability of the network, as connecting customers through the North Sea Link Interconnector into Blyth and enabling sailing of vessels requested by Port of Tyne under the overhead line create conflicting requirements for concurrent outages. These outages cannot be managed concurrently without putting a high share of the electricity system demand at risk, a view supported by the local distribution network. To address this, we have already incurred some costs to marginally improve the overhead line height and foresee further costs of approximatively £[redacted] in T1, although this work will not deliver an enduring solution as the height of vessels continues to increase.

This paper explains the constraints created by the line in RIIO-T1, forecasts the impact over RIIO-T2 and beyond and assesses the options available. It presents cost benefit analysis (CBA) for enduring options from a whole system perspective, including construction costs and system constraints costs over the life of the assets.

The CBA highlights that drilling a cable route under the river is the most economic and efficient option, at a total cost of £[redacted]. This provides the best Net Present Value of £[redacted] and offers better value than the 'Do Minimum' option with temporary removal of the OHL conductor to allow passage of vessels.

As this project is still within its development phase, with technology risks linked with underground cabling under a river, it is proposed to share an update on the project once the development is further progressed at the end of 2020. This will allow us to share a

better understanding of these risks, confirm that the option progressed remains the most economical and share the final programme and costs

2. INTRODUCTION

The existing overhead line, identified as ZZA, operates at 275kV and carries the Blyth-South Shields-Tynemouth and Tynemouth-West Boldon circuits. The overhead route passes through the Newcastle-upon-Tyne and South Shields area and at span ZZA064 - ZZA065 the circuits cross the River Tyne (referred to as the Tyne Crossing), (refer to Figure 1).

Located upstream of the Overhead Line (OHL) crossing is the Port of Tyne (PoT), with the River Tyne acting as their primary transportation route. The PoT uses the river to transport large structures to and from onshore and offshore sites.

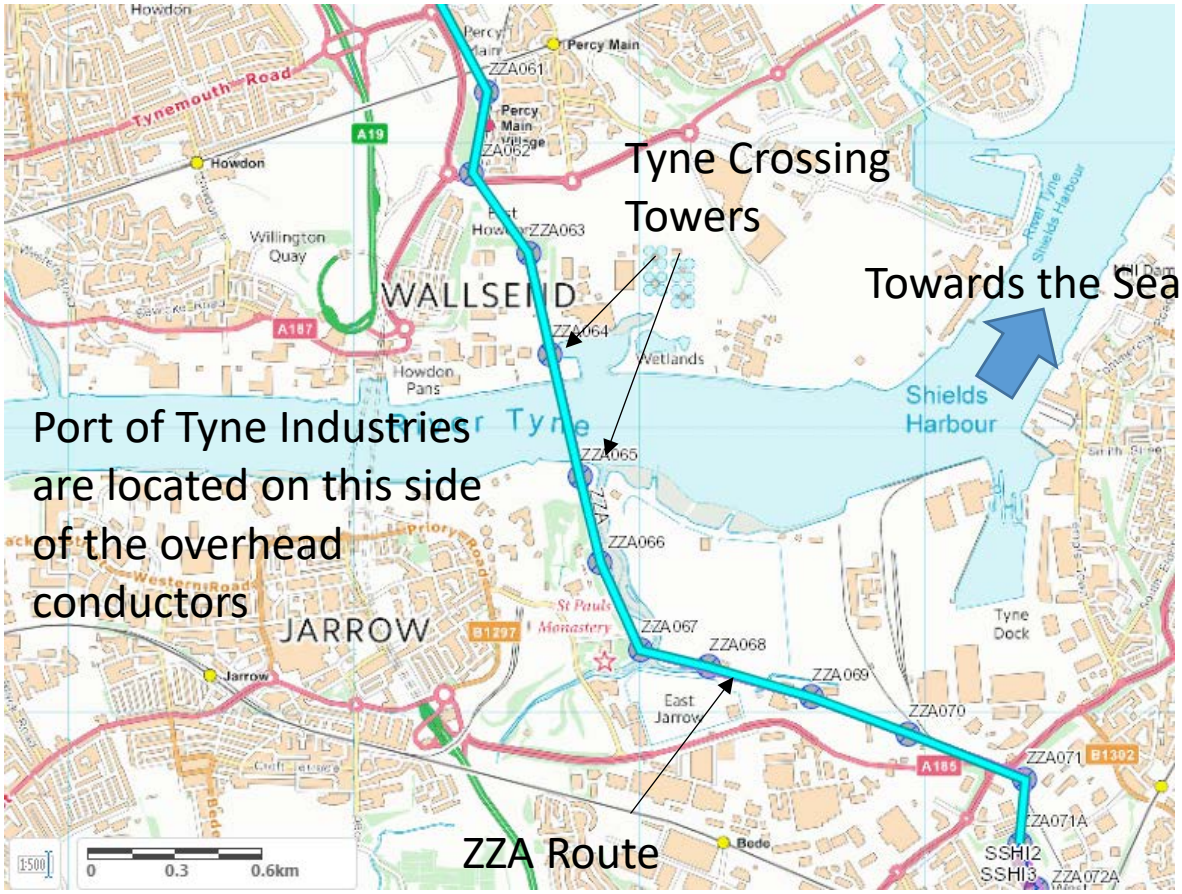


Figure 1: ZZA Route across the River Tyne

The OHL acts as a height constraint to vessels using the River Tyne. At present, vessels up to a maximum height of 83.3 meters above mean high water spring (MHWS) can pass under the conductor in energised conditions. The clearance to the conductors is 85.7m, a 2.4m electrical safety clearance is deducted from this height to provide the safe passing clearance for vessels (refer to Figure 2).

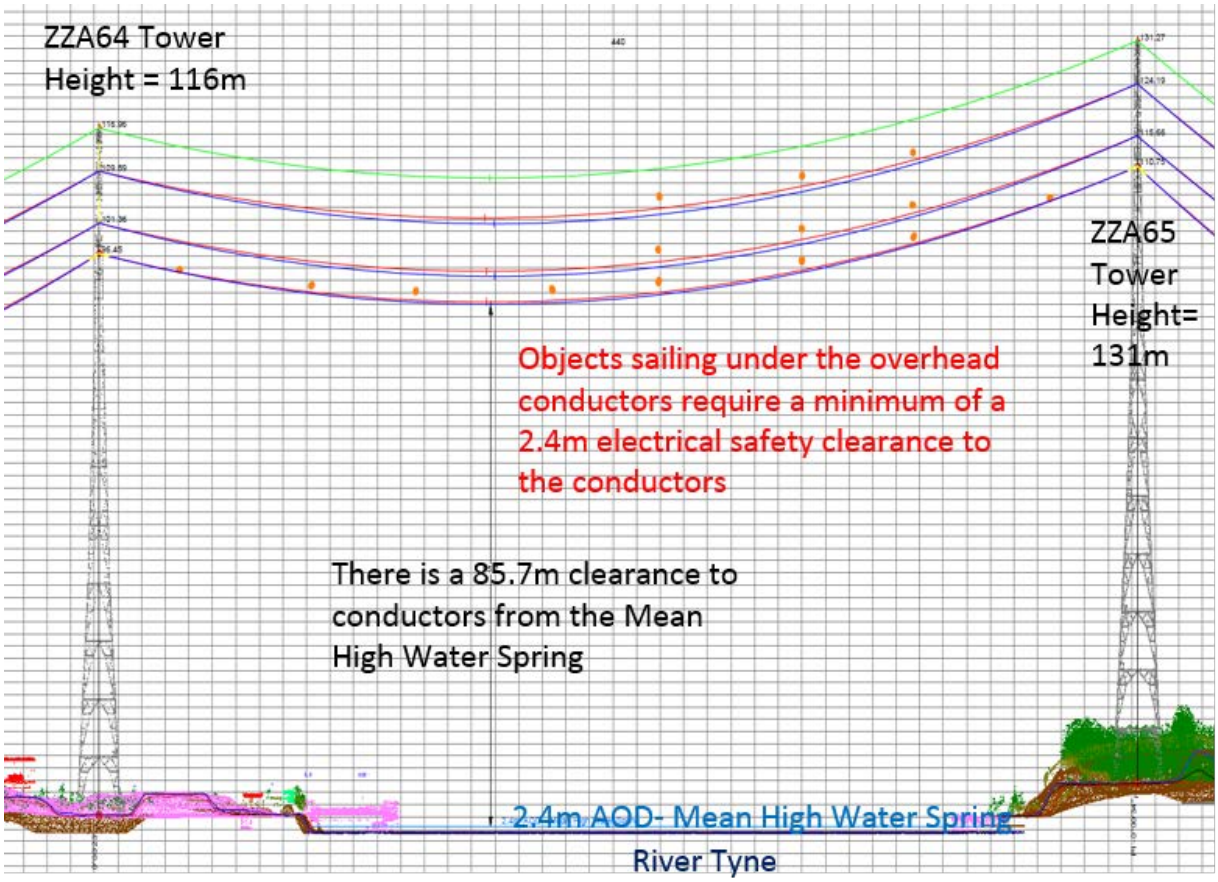


Figure 2: Tyne Crossing- Max clearance to the conductor is 85.7m when the circuits are energised

The air draft restriction is creating an obstruction to the transportation of jackets (foundations) for wind turbines in the surrounding offshore area. The jackets are assembled within the Port of Tyne, then sailed downstream and out to the construction site of offshore wind farms. The OHL limits the height of the jackets (typically above 87 meters tall) that can be transported downstream and hence is considered a constraint to the development of the port, businesses and the economic region.

3. RIIO-T1 VOLUMES AND PERFORMANCE

3.1 RIIO-T1 VOLUMES AND SPEND

At the time of RIIO-T1 price control review, no work was planned for the Tyne Crossing and therefore no funding was requested. However, during RIIO-T1 we began planning for this work, due to requests from stakeholders (see Appendix B for further information) to remove the OHL constraint which was posing a restriction on the anticipated increase in passage of vessels carrying jackets on the River Tyne.

During RIIO-T1, Smulders, a steel fabricating facility based within the PoT area, was awarded a contract for the fabrication of jackets for the Moray East wind farm. The jackets vary in height with the largest jacket infringing on the lower conductor. Options have been developed so that appropriate changes can be made to the ZZA OHL route to accommodate the increased usage of the River Tyne.

Recent works undertaken by National Grid to install suspended tension insulators to the bottom phases of the crossing were completed in 2017 at a cost of ~£[redacted] (refer to Table 1). This increased the conductor height by ~1m allowing the sailing of the largest jackets under the conductor, when de-energised.

For 2020 Smulders have won a subsequent contract for further 55 jackets for Moray East offshore windfarm. Outages are a challenge during 2020 as the North Sea Link (NSL) already requires double circuit outages between April and July 2020 for commissioning works, with the concurrent work posing constraints to the local Distribution Network Operator (DNO). To resolve this challenge between NSL and sailings of jackets, a remedial solution has been proposed to tension the conductor at a cost of £[redacted] This uses suspended tension sets and provides an additional ~2m of clearance (refer to Table 1).

Smulders are bidding on further contracts with the earliest sail away date of 2021. Initial views on jacket heights require an air draft of 98.4m above MHWS; this is a 12.7m increase on the present air gap to the maximum sag point. To date, development is ongoing to enable a solution which will meet the 2021 sail away date.

One of the options NGET are exploring is to increase the height of the existing Tyne Crossing towers by inserting additional steelwork panels using the innovative AMPJACK® tower raising technology. The AMPJACK® tower raising solution is a Canadian technology which has not yet been proven in the United Kingdom. This project will be the first application. This technology will be subject to the capacity within the tower foundation to accommodate the additional loading and the estimated cost for this reactive solution ranges between £[redacted] and £[redacted] (refer to table 1 below).

Table 1: Estimate RIIO-T1 Spend

Contract	Indicative Solution	Scope of solution	Installation year	Estimated RIIO T1-Spend (£m)
Moray East Offshore Wind Farm	Suspended Tension Insulator Sets	Install suspended tension sets. No steelwork or foundation upgrades required.	2017	[redacted]
Moray East Offshore Wind Farm	Tensioning of conductor	Install tension sets. Strengthen tower steelwork, Tower foundation upgrades may be required.	2020 *Detailed development on-going now for construction Feb/Mar 2020.*	[redacted]
Sea Green Offshore Wind Farm	Tower height increase using AMPJACK® technology	Insert additional steelwork to tower to increase the height of the tower. Tower foundation upgrades required	2021	[redacted]
			Estimated total	[redacted]

3.2 RIIO-T1 STAKEHOLDER FEEDBACK

Over the past few years, we have received increased feedback and requests from the Tyne river users.

Whilst the stakeholders acknowledge the efforts and activities currently undertaken by NGET with regard to the overhead line, they also highlight that further changes are needed.

You can find letters of support for the removal of the Cross-Tyne power cables from River Tyne facility operators and other local organisations in Appendix B. These include letters from:

- Port of Tyne
- Smulders Projects (UK)
- North Tyneside Council, as Facility Operators for the Swan Hunters site.
- Shepherds Offshore
- A&P Tyne

For instance, [redacted], thanks us for our organisation's continued co-operation and assistance in the management of high-elevation structures passing under the cross- Tyne power cables in the past and acknowledges the recent successes, but states:

"I appreciate that these [works in past year] are not insignificant activities and I recognise the commitment this has taken from National Grid. […]

However, as the UK offshore and renewable industry moves into deeper water, and vessel and structure sizes continue to increase, the current configuration of cross-

Tyne cables creates a significant limitation to activities on the River Tyne and is an inhibitor to business growth for the many renewables, offshore, ship-repair, construction and engineering businesses located on the river.

A long-term solution, which would likely involve routing the cables below the river, has been discussed for a number of years. I understand there are various options under consideration to allow the cables to be re-routed below the River Tyne and I respectfully request your commitment to this solution as a matter of priority.

UK Ports are recognised as vital enablers of the UK economy and trade, and physical infrastructure such as the cross-Tyne power cables are key considerations in achieving efficient and effective connectivity and in generating inward investment. As I am sure you are aware Infrastructure is recognised as one of the five foundations in the UK Government's Industrial Strategy where it is noted that infrastructure choices must actively support long-term productivity.

On this basis I would request that the longer-term solution to re-route the cross-Tyne cables below the river is implemented as a priority to remove this barrier to investment and growth on the River Tyne."

Similarly, [redacted]

[redacted] explains the constraints the power line is creating for the economic development of the area and states following:

"I am delighted to hear that temporary and permanent solutions are being considered by National Grid in relation to the issue of the Cross Tyne Power Cables located between Howdon and Jarrow. The height restrictions from the cables significantly reduces the economic benefits of the River Tyne and ideally a permanent solution could be found to remove the draft restrictions which effect all of the sites to the west of the cables.

The Swans Offshore Energy Park is owned by North Tyneside Council and we have been seeking occupiers for the site for a number of years now. The draft restrictions mean that certain sub-sectors within the energy sector currently do not consider Swans as a viable site as they could not get larger vessels to the quay and could not load in/out larger products, which would not fit under the cables easily. The site could support over 500 jobs when fully occupied and will be a significant boost to the local economy.

North Tyneside Council also support our local business community and other business have expressed concerns to us that the cables are constraining their business. If there is no further action to improve the draft restrictions it is anticipated that this would place a significant number of jobs at risk on Tyneside as it will not be able to compete with other locations where these restrictions do not apply. Moreover, it will also restrict the competitiveness of existing sites to attract new business investment."

Three local organisations explain both how the power line has hindered further economic development from their organisation.

First, [redacted], a local manufacturer of structures for offshore wind, explains the constraints the cables are creating for his organisation's development and states the following:

"We have been able to build up a significant and important reputation not just in the North East, but the UK and globally with respect to building offshore wind jacket foundations. […] Currently we are working on the Moray East Wind Farm Project [this relates to the 2020 works referred in the section above].

Since the start of our endeavour in the North East in 2016, the Power Cables have been the critical component that has significantly hindered our operations on the river Tyne. The jacket structures that have been built so far on the river Tyne are of such a significant size that they intervene and even clash with the Power Cables on a permanent basis during shipment (from our yard to the final installation field). As a global trend in the offshore wind, every structure is getting bigger and bigger including the jacket foundations.

Although National Grid increased the available air-gap in 2017 with 5 meters, the steel structures we are currently building on the river Tyne, have forced National Grid to raise the cables yet another 2 meters. However, not only are the structures getting taller, the installation vessels used for these projects are too big to pass underneath the Power Cables.

So, for Smulders and the +500 workers on the yard, it is of utmost importance that a long-term solution is found (permanent removal of the overhead Power Cables) to safeguard the future of the yard."

Second, [redacted] states:

"Since working on the Tyne, the Power Cables have played a critical role in economic and business performance when creating limits on vessels and projects. Over time, this has led to less business for stakeholders, hindering key operations along the Tyne.

Unfortunately, our marketing intelligence has confirmed that the Tyne fails to achieve enquiries due to this restriction. In turn, this dictates what we see on the banks of the Tyne today and hinders job creation.

Newcastle and surrounding areas are proud of what the River Tyne brings to our communities and we continue to preserve capabilities when bringing responsible regeneration to the region. It is therefore an importance that a long-term solution is found for the removal of the overhead Power Cable".

Finally, [redacted], which currently operates in various industry sectors such as Marine, Oil & Gas and the Renewable markets, states that they have had a less positive experience due to lack of a solution which accommodates their requirements:

"With the increase in the size of the wind turbine generator structure currently in production, the demand for larger vessels in order to facilitate movement and ultimately the installation of these structure has also increased. A recent example of this can be seen with the award of the new crane lift vessel which has the capacity to lift structure onto and from the main deck that are in excess of 100m high.

During 2016/17 we were actually unable to accommodate a number of Jack Up vessels at our facility; in fact, we were forced to withdraw from the tender process due to the limited air draft and restricted access currently on the river.

[…] As technological advancements are introduced in the sectors in which A&P operate, we can only see the crossing becoming more of an issue placing restrictions and limitations on our business"

It is interesting to note that most of these competitors are within global markets, with the UK companies competing with companies located close to ports situated in different countries, such as the Netherlands.

4. INVESTMENT NEED

During RIIO-T1, National Grid have engaged with the Tyneside businesses being affected by the current OHL. The consensus of these stakeholders is that, though the continued efforts of National Grid to raise and temporarily remove the OHL have been greatly appreciated, the presence of the assets continues to inhibit business growth and development in the area. This includes bidding for offshore oil, gas and wind contracts, latterly being for the construction of support structures for offshore wind turbines.

If we do not intervene on this asset during the RIIO-T2 period, conflicts between sailings and NGET operations will continue to occur. This will lead to increasing operational costs and reduced security of supply for consumers.

NGET has obligations to meet these stakeholder needs, allow customer connections and maintain the network reliability.

4.1 Investment Drivers

National Grid Electricity Transmission (ET) has listened to the stakeholders on the River Tyne and recognises that the overhead power line may cause a constraint to the passage of vessels along the river.

ET has obligations to transmit electricity in the most cost effective and efficient way to customers through the Transmission system, of which the River Tyne powerline crossing is a critical part.

The following drivers have been identified for the Tyne Crossing intervention plan.

Security and Quality System Standards

Currently, to allow passage of vessels that would otherwise make physical contact with the OHL, the conductors must be removed for a temporary period. During RIIO-T2 it is anticipated further contracts will be won by Smulders and other local manufactures that will breach the air draft limits and require conductor removal.

Based on the current contracts, we expect each contract to require approximatively a 6-month outage. Local manufacture requires approximately 30 sailings at a rate of one per week for contracts. To accommodate these sailings, the conductors would need to be temporarily removed, which means a double circuit outage for this six-month period.

The transmission network is designed and operated in accordance with the Security and Quality of Supply Standard (SQSS). An enduring double circuit outage reduces the network resilience, making other additional outages in the North-East region challenging. Often, when these contracts are won, the passage of vessels is required in the following two years, for which other works are already planned on the network. For instance, in 2020, allowing the outage by postponing the other work would mean delay in the customer connection of the North Sea Link Interconnector into Blyth.

A double circuit outage due to the temporary removal of conductor results in a combination of:

a) When the outage conflicts with another existing outage, the inability for NGET to adhere both to its existing customer or reliability work outage and the outage required

for the passage of vessels. We would be unable to maintain the network reliability in the North-East region and to meet our licence obligations; and/or

b) Constraining demand, generation and interconnectors in the region, resulting in increased constraint costs for consumers.

Economic Development of North East region and the Net-Zero target

NGET understand the potential impact the overhead line has on the development of the PoT and the North-East region. We also acknowledge the UK's legislative target of net zero greenhouse gas (GHG) emissions by 2050, and the industries residing within the PoT and their functions in supporting this ambition.

In conjunction, NGET recognises its obligations to maintain safety and reliability to the public, personnel and plant, and to provide the best value to the end consumer.

Stakeholder activities

Smulders has shared information on the future development considered and have provided us with a forecast for contracts up to 2022 subject to them winning these. As these works are typically of shorter timescales than the development of the network, there is more limited information on the 3-8year contractual plans. However, we have no information to foresee a reduction in the wind generation and wind plant manufacture.

These forecast contracts are listed in Table 2. It is also important to note that jacket heights are indicative and are often vary post contract award.

Table 2 : Contracts Smulders are bidding on up to the year 2022

Contract	Estimated sail away date	Estimated additional air draft clearance required (m)
Sea Green	Q4 2020	12.7
NNG	Q4 2020	12.3
Inchcape	Q1 2022	8.8
East Anglia 3	Q1 2022	1.3
Moray West	Q2 2022	0.8

Smulders is one of many companies within the PoT, who have indicated the OHL is restricting bidding on contracts due to height constraints. The PoT, working with the local enterprise group One North East, are producing an Economic Business case which outlines the economic benefit for the removal of the overhead line to the North-East region.

To facilitate the cost benefit analysis of the options available, National Grid have engaged with the businesses of Tyneside that are being affected by the current OHL. The businesses include: The Port of Tyne; Smulders Projects UK – wind jacket foundation suppliers; North Tyneside Council; Shepard Offshore – Oil and Natural Gas.
The consensus of these stakeholders is that, though the continued efforts of National Grid to raise and temporarily remove the OHL has been greatly appreciated, the presence of the cables continues to inhibit business growth and development in the area. The letters from the stakeholders have been attached in Appendix B.

Stakeholders have stated that not removing the OHL will impact over 500 existing jobs and limit investment in a proposed development, which is expected to result in the creation of a further 500 jobs. Market research carried out by Shepherd Offshore has confirmed that the Tyne fails to achieve business enquiries due to this restriction. Stakeholders, including A&P, have reported on many occasions that they have been forced to withdraw from tenders due to the restriction.

Memorandum of Understanding Obligation

Post privatisation in the early 1990s, National Grid inherited the Memorandum of Understanding (MoU formed in 1968), the agreement between the Central Electricity Generation Board (CEGB) and the Navigation Authority, (presently known as the Port of Tyne Authority). As part of the inherited responsibilities, National Grid Electricity Transmission (NGET) shall use 'reasonable endeavour to raise the electric lines so far as reasonable practicable on reasonable terms agreed with the Port of Tyne' provided sufficient notice by the Port of Tyne, whilst it clarifies this shall not be construed as a permanent obligation to raise the height of the electric lines.

NGET have sought legal advice on the MoU as it seems that it was unlikely at the time that the vessel height was envisaged to be a constraint of the significance it is today. The legal advice has confirmed this contract would require arbitrage to clarify the obligations and what constitutes reasonable endeavour. Similarly, arbitration would clarify the outcome if third parties were to bring claims against the Port of Tyne, which the PoT then seeks to pass on to National Grid.

5. OPTIONEERING

To determine the optimum mix of interventions to allow the passing of vessels without impacting upon the safety and security of the network, a Cost Benefit Analysis (CBA) was undertaken. We have analysed the CBA output for each of the options together with a wider technical and stakeholder justification for the work proposed to be undertaken. Details of our approach, analysis and outcome is presented below.

5.1 Approach to Estimating Cost and Benefits

We have used a staged approach to identify the most cost-effective package of options for this paper:

1. **Identify potential intervention strategies** for the Tyne Crossing. This identified several alternative intervention strategies to improve demand security during double circuits outages, which were then tested for feasibility/applicability. They include a 'Do Minimum' option for this project. We have considered whole system options, particularly reliance on DNO system interconnection, but they are unable to provide the capacity required to avoid constraints and system security issues and has therefore been discounted.
2. Once the set of feasible options has been established, we combine these into **packages of options**. Quantitative **Cost Benefit Analysis (CBA)** is carried out on these options packages to identify the most cost effective.

We have included NGET investment costs and ESO constraints costs (which are ultimately borne by consumers) into our quantitative CBA, using the NPV calculation approach in the Ofgem template to arrive at an NPV estimate for each of the option packages. We have not quantified wider societal benefits for each options package because these impacts are minor in the context of the overall costs of the investment package and would not affect the choice of option. We therefore address societal impacts qualitatively in the analysis below.

5.2 Option Identification

To allow the passing of vessels which would otherwise make direct contact with the ZZA route, the following solutions were identified:

a) BASELINE - DO MINIMUM: No transmission asset investment; remove conductor when required and replace
b) OPTION 1: New crossing with an increase in the height of the conductor
c) OPTION 2: Install a Horizontal Directional Drill (HDD[1]) cable solution
d) OPTION 3: Install a new bore tunnel, with a suitable cable solution to meet the thermal rating required.

These options have been selected as the most viable solutions that either increase air draft clearance or remove the height restriction placed upon vessels using the River Tyne and are explored in further detail below.

5.3 Potential Intervention Strategies

a) No transmission asset investment - Remove conductor when required – ~£[redacted] per temporary removal plus associated constraint costs to NG ESO

This option explored the removal of the conductor as required by the PoT on a temporary basis. The conductor can be temporarily removed for the duration to allow the safe passage of vessels.

With this option the constraint posed by the route remains on a permanent basis. The conductor has historically been temporarily removed and reinstated in the early 2000s, for the safe passage of the Bonga Oil Platform for AMEC Ltd. Over the years, the importance of the circuits along this route have increased due to changes in demand, generation and further development in interconnectors in this region.

The Electricity System Operator has assessed this option to cause approximatively £[redacted] of constraints costs for consumers over a 10-year evaluation period.

The associated risks with these options have also to be considered. A long double circuit outage would lead to a requirement to constrain both demand and generation, including the Hartlepool generation and the North Sea Link interconnector (connecting in 2021), to secure against further creditable faults on the system.

[1] Horizontal Directional Drill (HDD) - Directional drilling is method used for installing cables and ducts underground where conventional trenching methods are not practical or viable, such as under water courses, existing utilities, roadways and areas of sensitivity etc. A prescribed underground path or multiple paths are drilled from one side of the crossing to the other. This technology requires the underground path to have a shallow bending radius, which depending on the depth of the HDD beneath the crossing, affects the starting setback distance either side of the crossing and potential land effected area.

Figure 3 illustrates a series of scenarios of taking outages in the north east region in conjunction with a double circuit outage on the Tyne Crossing circuits.

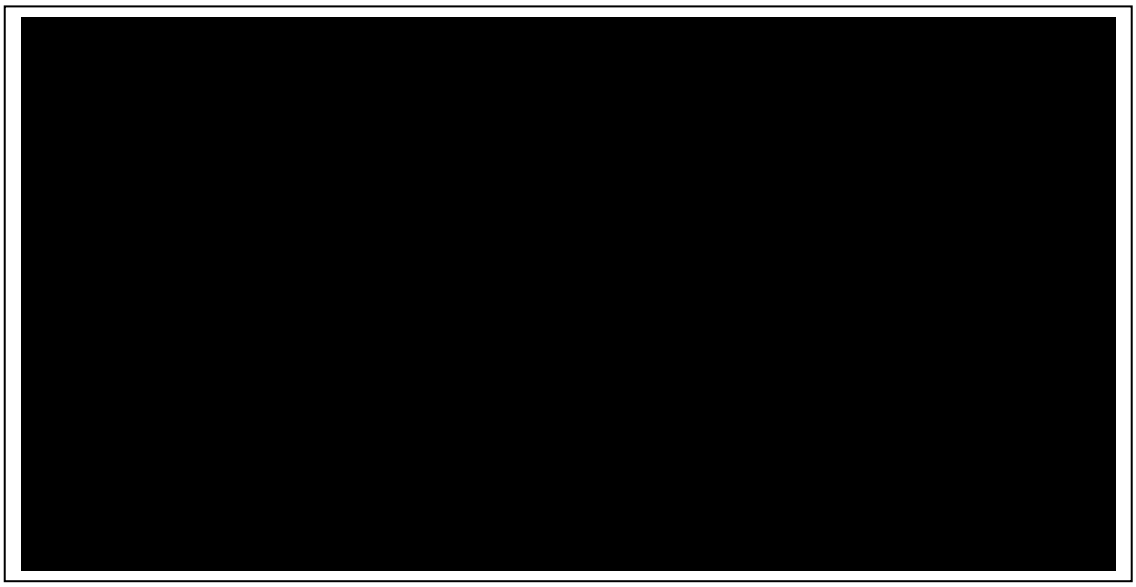


figure 3: The Great British Electricity Transmission System by circuit showing the North East Region.

[redacted]

[redacted]

[redacted]

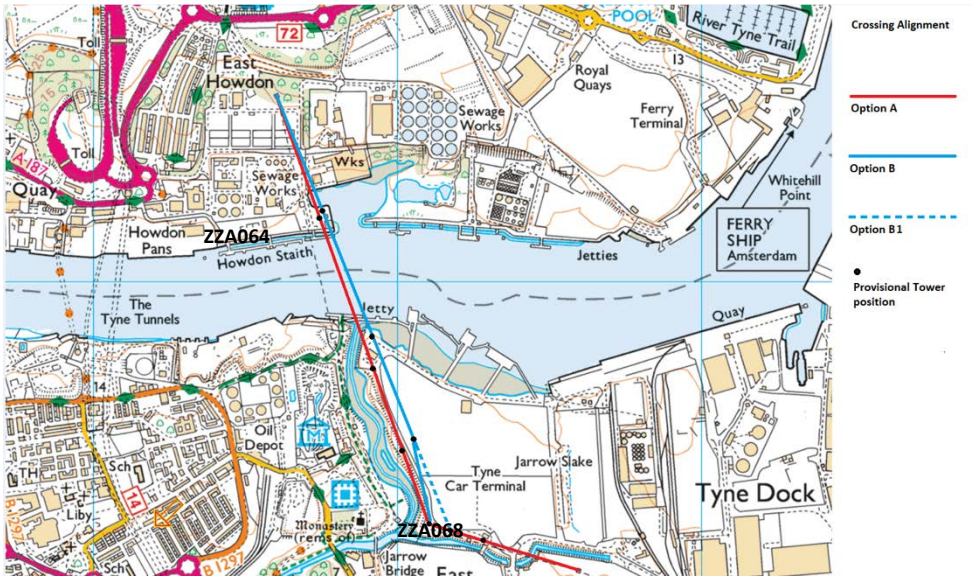


Figure 4: Initial view on OHL diversion. Option A- Red Route is the preferred route

This solution is the quickest to implement and the most economical but is likely to continue to pose a permanent physical constraint to the PoT, although the constraint would be somewhat reduced. Hence, the crucial question around this option is its longevity. Whilst this option is more economical, there is a likelihood that the power line would once again become a constraint in the future, given the view that the size of the jackets will increase as construction of wind farms move further out into the North Sea.

The ESO have performed a Cost Benefit of this solution based on the information provided by NGET and have concluded that increasing the height of the overhead line is only the most economical solution provided it does not become a constraint to vessels in

the future. If the overhead line becomes a constraint within 5 years, a subsea cable solution becomes the most economical solution. This is because the constraint costs are driving an infrastructure change solution (see table 3 and 4 in the CBA section).

We have already seen vessels with an increased height requirement of 12.7 meters for the end of next year. If we assume a similar rate of vessel height increase, it is unlikely that this solution would remain practical over the next 4-6 years.

b) Horizontal Directional Drill (HDD) cable - £[redacted]

Horizontal Directional Drill (HDD) is a method used for installing cables and ducts underground where conventional trenching methods are not practical or viable, such as under water courses, existing utilities, roadways and areas of sensitivity etc. This solution would allow a permanent removal of the constraint and be economic but has some technological constraints which need to be addressed in development.

A new HDD cable would be installed under the riverbed of the River Tyne. To allow for the future development of the port, the solution would be matched to the depth of Tyne Tunnel 2, 13.3m below ordnance datum. The cable must be at a depth that avoids potential cable strikes from dredging or anchors and still achieve the thermal rating which will be tested during development.

There are two potential alignments for the HDD cable cross the River Tyne (Figure 5). Both alignments are near the existing overhead line. The preferred alignment is subject to further geotechnical investigations. Either alignment would avoid a significant overhead line diversion and in turn minimise the capital expenditure. Reducing the deviation from the original overhead alignment relies on the approval and purchase of land from third parties, including Northumbrian Water.

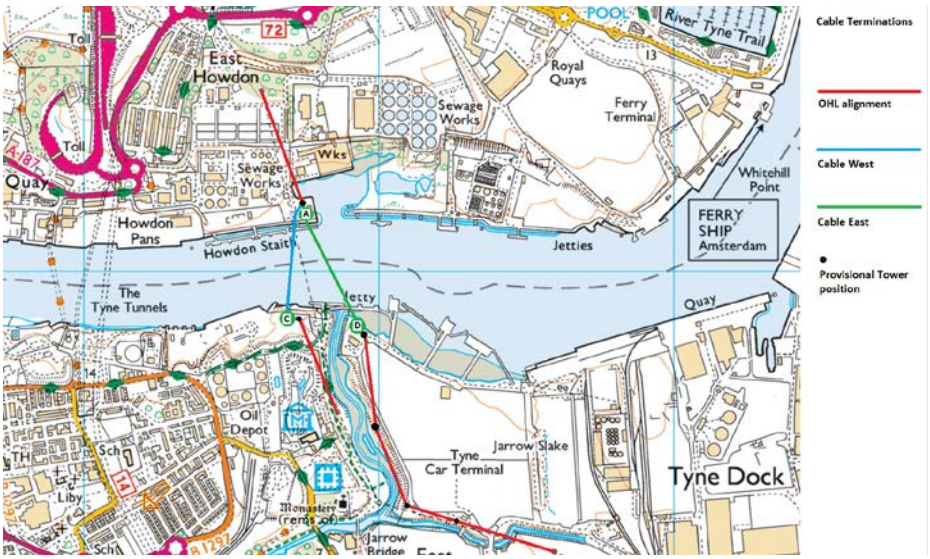


Figure 5: Indicative routes for cable crossing for HDD cable solution

On either side of the riverbank, new cable sealing end compounds with new terminal towers would be constructed, to tie the HDD cable into the diverted existing OHL. With

the new HDD cable installed and connected, it would allow the conductor span over the River Tyne together with the crossing towers to be removed.

Horizontal Directional Drilling requires a large set up area. As the subsea cables would need to meet the existing conductor thermal rating, this could result in several cables per phase. Assuming two cables per phase, and two circuits, this solution would encompass twelve cables across the River Tyne, with onshore landing positions on either side of the river.

Delivery of the HDD cable could potentially be completed in 2025 and it is likely that this option would require Town and Country Planning consent. This solution would be the most economical option as outlined by the CBA.

c) Install a deep bore tunnel - £[redacted]

This option would involve boring and constructing a new tunnel under the River Tyne.

Within the tunnel two technologies could be used; gas insulated lines (GIL) or XLPE cable, with cable being the preferred option as the tunnel only needs to be two-thirds of the diameter compared to the GIL option, enabling significant cost savings. For a single XLPE cable per phase, a tunnel diameter of 3m would be enough given forced air ventilation. In comparison, due to the size of GIL, to achieve the thermal rating requirements a 4.4m tunnel would be required.

Evaluation of the existing geotechnical information reveals that the tunnel could be constructed approximately 25m below the riverbed (i.e. approximately 31m below ordnance datum). The riverbed depth in the area of the overhead line is at a depth of 6m below ordnance datum. There is the opportunity, should the ground geology prove favourable to decrease the depth of the tunnel, thereby also reducing the shaft depths.

To support a tunnel solution a drive shaft of approximately 12.5m in diameter would be required, with a reception shaft of approximately 10.5m in diameter. Each shaft would require a tunnel head house and Mechanical and Electrical (M&E) systems for ventilation. Further geotechnical sampling and analysis will inform the preferred shaft position on the south bank. Indicative shafts location into the tunnel can be placed at location B on the north bank, and at either location C or D on the south bank (refer to Figure 6).

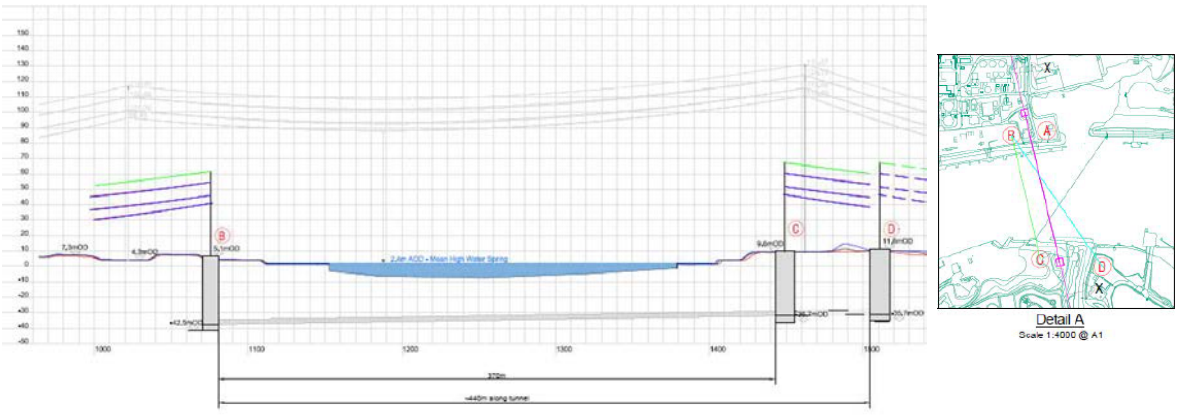


Figure 6: Indicative tunnel crossing and potential tunnel shaft locations

The tunnel could be routed within the route corridor of the existing overhead line. This reduces the overhead line diversion and in turn minimises the capital expenditure.

Reducing the deviation from the original overhead route relies on the approval and purchase of land from third parties, including Northumbrian Water.

The cable crossing will require a new terminal tower and new cable sealing end compound on each side of the River Tyne. Pending the positions of the cable sealing end compounds, further new towers or changes to existing towers might be required to connect the existing overhead line to the new terminal towers. The existing Tyne crossing towers would be removed.

This option is likely to trigger the need for a Development Consent Order (DCO) for the tunnel head house and the cable sealing end compound.

This option is more expensive than the HDD cable option and would also take longer to construct, with an estimated delivery year of 2026/27.

5.4 Detailed Cost Benefit Analysis

A CBA (see Appendix A) was completed on the proposed options and assessed against the baseline scenario ('Do Minimum') of temporary removal of the conductor when required. The following points were accounted for within the model:

a) National Grid Electricity Transmission with regards to capital expenditure; and
b) ESO, with regards to network demand and generation constraint costs

To start, below is a recap of the options timescales and the capital expenditure relating to the infrastructure changes (Table 3).

Table 3 : Comparison of Infrastructure options taken forward

Option	Expected Expenditure	Scope	Exp. Completion Year.	Potential future air draft constraint	Solution Risk degree	Risks
Do Nothing- Continual temporary removal of the conductor	£[redacted] per shipping contract awarded	N/A	Required once per year	Yes	No risk	1) High ESO constraint costs due to demand and generation constraints 2) Obstacle to delivering NGET's planned asset replacements 3) Does not support regional economic growth (inability to bid for work etc.) 4) Resource intensive
Increase the height of conductors (New Crossing)	£[redacted]	OHL [redacted]km	2022/23	Yes	Low risk	1) Double circuit outage required 2) Temporary impact to Northumbrian Water operational site 3) Risk of future ESO constraint costs through constraining demand and generation. 4) New towers >10% higher than existing, is likely to require the minimum consenting requirement of Town and Country Planning 5) Potential land acquisition
HDD cable	£[redacted]	OHL [redacted], HDD Cable [redacted]	2025	No	Medium risk	1) Achieving required circuit rating 2) DCO may be required extending the programme 3) Seabed unknown/tidal river 4) Land acquisition required, wide river frontage
Install new bore tunnel	£[redacted]	OHL [redacted] Tunnel [redacted]km	2026	No	Low risk	1) DCO may be required extending the programme 2) Achieving required circuit rating 3) Geology unknown 4) Land acquisition required

5.5 Whole Life Cost Analysis - Increasing the Height of the Overhead Line

Of the three investment options being considered (over do nothing), the lowest capital expenditure option is to 'increase the height of the conductor'. However, the effectiveness of this option is dependent on its longevity.

As discussed above, this option is the most economical to implement but is likely to have a shorter life as the vessel height is further increasing, requiring an additional investment once it is a constraint again. If the new asset solution is required early, then increasing the conductor's height would have increased the whole life costs of the solution inefficiently.

To understand the whole life effectiveness of increasing the height of the conductor, three scenarios were modelled within the CBA. In these scenarios, the height of the conductors becomes a restriction to the passage of vessels at:

- 2 years;
- 5 years; and,
- 10 years

Table 4 summarises the overall cost of increasing the height of the conductor. The shorter the longevity (2 years), the less advantageous the solution.

Table 4 : ESO Net Present Value- Increase of Conductor Height Scenario Review

Long Term Options (assuming 6 months NG TO outage required each year for a 10-year evaluation period)	**Net Present Value (£m)** Electricity Transmission Assessment based on Ofgem template CBA (utilises the averaged constraint costs from the two ESO scenarios)	**Two Degrees with TO outage** **Net Present Value (£m)** Electricity System Operator Assessment [2]	**Steady Progression with TO outage [2]** **Net Present Value (£m)** Electricity System Operator Assessment [2]
Increase of Conductor Height (Constraint at +2 years)	[redacted]		
Increase of Conductor Height (Constraint at +5 years)			
Increase of Conductor Height			

[2] *Scenarios based on Electricity System Operator report appended, titled Cost Benefit Analysis Report, August 2019. Energy Scenarios based on ESO Future Energy Scenarios, with Two Degree representing the most aggressive energy scenario meeting the UK's 2050 carbon reduction target and Steady Progression representing the least aggressive scenario where the 2050 target is not met. Further context on the scenarios can be found within Future Energy Scenarios 2019 and the appended supporting report by the ESO, titled Cost Benefit Analysis Report, August 2019.*

(Constraint at +10 years) [redacted]

The CBA takes into consideration two of the ESO's Future Energy Scenarios, firstly "Two Degrees" which represents the most aggressive energy scenario path towards the UK's 2050 carbon reduction target and secondly "Steady Progression" which represents the least aggressive change scenario where the 2050 target is not met. As these cover the two extremes, they provide confidence in the selection of the option which is the lowest cost to the end consumer. The Electricity Transmission Owner scenario is generated through averaging constraint cost across the two scenarios.

The Electricity Transmission Cost Assessment is based upon Ofgem's CBA template and methodology and utilises a cost of capital of [redacted]%. The document titled NGET_A9.12_Tyne Crossing_CBA01_Strategic Replacement provides the full analysis. To undertake the Electricity Transmission CBA analysis, the Electricity System Operator constraint costs were utilised (the average of the two Future Energy Scenario constraint costs; Two Degrees and Steady Progression to generate the overall CBA for each proposed option.

A forward view of a single six months double circuit outage per year has been modelled during RIIO T2 and RIIO T3; this equates to one sailing contract per year. A six-month sailing period is a credible sailing programme based on information shared by the Port Authority. It should be noted that for the Moray East sailings in 2020, it is predicated sailings will span between eight and eleven months. Future contracts would be expected to follow a similar pattern. If this increased outage duration was modelled, Electricity System Operator constraint costs would increase.

At this stage, we have already seen contracts with vessels size increases of 12.7 meters for 2020. Assuming a similar rate, the height of the conductor will once again become a restriction to the passage of vessels on the River Tyne in the next three to six years. The increase in conductor's height is likely to be only be a short-term solution before vessels and cargo are once again constrained by the height of the OHL. The worst case would see the constraint arising before the commissioning of the new increased height OHL.

To aid comparison between this option and the two other permanent options, the middle scenario of a constraint at plus five years has been applied. Table 5 summaries the whole life costs of the permanent options, assuming the increase in conductor's height is only addressing stakeholder's concern for five years.

Table 5 : ESO Net Present Value Output.

Long Term Options	**Net Present Value (£m)** Electricity Transmission Owner Assessment[3] (utilises the averaged constraint costs from the two ESO scenarios)	**Two Degrees (with TO outage) Net Present Value (£m)** Electricity System Operator Assessment[4]	**Steady Progression (with TO outage) Net Present Value (£m)** Electricity System Operator Assessment[4]	**Ranking position**
Increase of Conductor Height (Constraint at +5 years)	[redacted]	[redacted]	[redacted]	ETO ranking 2, ESO ranking 3
HDD Cable	[redacted]	[redacted]	[redacted]	1
Install new bore tunnel	[redacted]	[redacted]	[redacted]	ETO ranking 3 ESO ranking 2
No transmission assets investment - Remove conductor when required	[redacted]	[redacted]	[redacted]	4

Please note this considers the system constraints costs which can arise before the solution is implemented, during the construction outages, and after the solution is implemented if it is not removing the constraint fully.

In both the Electricity Transmission Owner's and the Electricity System Operator's CBAs, the HDD Cable option is the least cost option. Permanent asset options are also always more advantageous and cost effective than the current baseline position of removing the conductor when required.

In the Electricity System Operator analysis, installing a new bore tunnel is ranked in second place over increasing the height of the conductor and in reverse, the Electricity Transmission Owner's analysis of increasing the height of the conductor is ranked in second place, likely due to different modelling of constraint costs and other parameters.

A fully supported Cost Benefit Analysis from the Electricity System Operator can be found appended to this Justification Report (see Appendix A).

5.6 Understanding the impact on the Electricity Transmission Owner

Under the no investment option, across RIIO-T2 and RIIO-T3, outages taken on the Tyne Crossing circuits to allow sailing for the PoT, would sterilise the North-East network.

This would impact on the availability of the network to deliver other asset replacements, required to achieve Network Asset Risk Metric (NARM) outputs in RIIO-T2. Table 6

[3] *Scenario based on the output of the Electricity Transmission Cost Assessment, titled NGET_A9.12_Tyne Crossing_CBA01_Strategic Replacement. Electricity System Operator constraint costs are generated through averaging constraint cost provide in the following two Future Energy Scenario; Two Degrees and Steady Progression.*
[4] *Scenarios based on Electricity System Operator report appended, titled Cost Benefit Analysis Report, August 2019. Energy Scenarios based on ESO Future Energy Scenarios, with Two Degree representing the most aggressive energy scenario meeting the UK's 2050 carbon reduction target and Steady Progression representing the least aggressive scenario where the 2050 target is not met. Further context on the scenarios can be found within Future Energy Scenarios 2019 and the appended supporting report by the ESO, titled Cost Benefit Analysis Report, August 2019.*

outlines a total capital expenditure of £[redacted] associated with the planned asset replacement in the North-East. Values in the table below represent the value of the un-delivered planned asset replacements for the respective years.

The risk and the associated cost of not achieving or delaying this work have not been captured within the Cost Benefit Analysis. This makes the preferred investment option even more beneficial than the no investment option.

Table 6 : ETO Asset Replacement Delivery Risks

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Circuit Breakers (£m)	[redacted]									
SGTs (£m)										
Fittings (£m)										
Total (£m)										

6. ASSESSMENT OF COST EFFICIENCY

Table 7: Summary for spend profile for the preferred option of installed an HDD Cable

RIIO-T1 £m Forecast & Actuals	RIIO-T2 Total £m Forecast	Post RIIO-T2 £m Forecast	Scheme Total (Gross) £m Actual & Forecast
[redacted]			

The engineering solution for the preferred option, the HDD cable, has been reviewed to ensure a proposal that is the minimal cost solution that addresses the need for an alternative to the base case.

This Tyne Crossing project is bespoke, and to cost, quantify and bound any uncertainty we have broken down specific work scope cost elements into those which can be defined, such as tower steel strengthening, access roads, project mobilisation costs.

For these defined aspects, we have estimated the cost using UK industry standards which have been benchmarked and aligned internally against other T1 projects and recently against major strategic wider works such as the Dorset Visual Impact Project.

For cost elements subject to further scoping during the development phase, such as beneath the surface ground conditions and cable vibration mitigation, we have quantified the associated risks and uncertainties through a detailed assessment using our risk tool 'Predict'. Within this report, this is presented as a point estimate and risk assessment combined to create the total project cost estimate.

The recommended solution is supported by the PoT and interested parties. National Grid is working with the interested parties to ensure stakeholder requirements are incorporated into early design to assess the feasibility of the solution.

7. Key Assumptions, Risk and Contingency

As the preferred solution is considering a complex technology of drilling cable (horizontal drilling) under a river, there are several risks associated with this project.

- **Continuation of the local manufacture in the future and the constraint created by the power line**

  These works are developed in order to allow the safe passage of vessels past the cables and allow the local manufacture to continue to strive, namely supporting the development of wind energy. This is based on the windfarm industry operating further out to shore which will require larger jackets. If this local manufacture would no longer exist in the future, the overhead line would not be considered as a constraint. In this perspective, we have asked local stakeholders to re-affirm the constraint this line causes and the need for its removal, which you can find in Appendix B. The Port of Tyne is also seeking to provide a more detailed economic business case of the region development.

- **Outage availability**

  To allow work to be conducted, some work will require specific short outage periods. This work assumes that these outages would be granted by the Electricity System Operator when the work is further developed and allow its constructions in light of avoiding a need of recurring longer outages in the future.

  It is also accepted that there is the potential for disruption to river traffic during construction which includes dismantling.

- **Land access and consenting**

  This solution will require land access and consent to be granted to construct an HDD solution. The HDD cable option requires a large set up area and onshore cable landing positions due to the number of cables required to achieve the thermal ratings. National Grid is working with engineering designers, Tyne stakeholders and grantors to review the land availability and identify the best solution. The consent will be sought through an application to the appropriate body as part of the detailed development.

- **National Grid resource**

  Specialised NGET resource is required to develop these power line alternatives, including specialist cable personnel. This is a finite resource and some smoothing would be required to manage this constraint.

- **Development timescales**

  To ensure the most efficient solution is progressed for delivery, sufficient time is required to allow project development and contracting. This activity is reliant on finite internal and external design resource.

- **Cost benefit analysis**

  Costs have been assessed across the whole of the RIIO-T2 period. ESO constraint costs included within the Electricity Transmission Cost Benefit Analysis are simplified; and an average across the Future Energy Scenarios Two Degrees and Slow Progression has been applied. ESO constraint costs have been applied up-to 2030.

- **Area geology**

  The geology of the area is unknown. Complex geology has the potential to impact the:
  - design option selected, route, expenditure;
  - programme duration.

  An assessment on existing geotechnical information has been carried out. Further geotechnical information will be collected to develop the preferred option, narrowing down the corridor to a single route across the River Tyne.

- **Cable thermal rating**

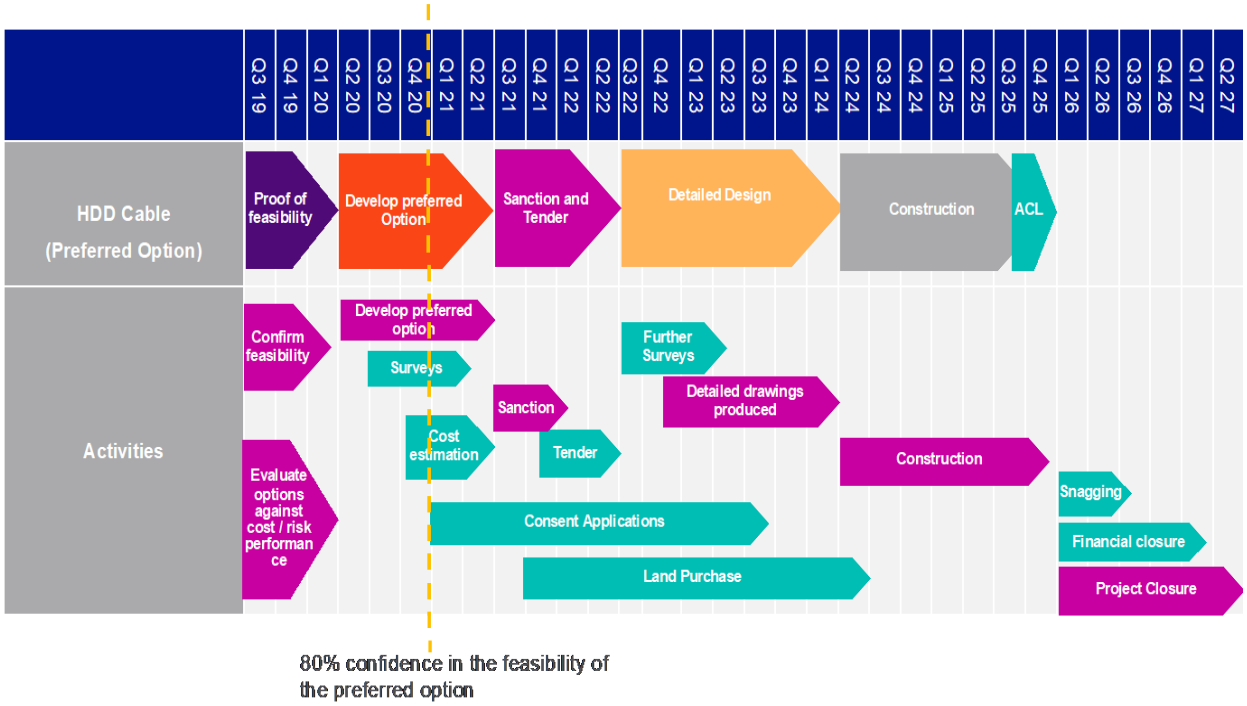
  The cable thermal rating is depending on cable depths and other cable specificities. In a river, the cable needs to be at a depth where cable strikes can be avoided and allow for dredging. The deeper the cable the harder it is to achieve the thermal rating. Through engagement with the PoT, requirements to avoid cable strikes can be incorporated into the concept design. The impact on the thermal rating of the cable can then be evaluated through working with Front-End Engineering Designers.

- **Indicative Programme**

  The preferred solution has remining technology risks, as indicated in the section above, and is still in its development phase. As a consequence, we propose to share an update on the project risks and costs once the development is further progressed, at the end of 2020. This will allow us to share a better understanding of these risks, confirm the options progressed remain the most economical and share details of the final programme and costs.

Figure 7 shows the programme of work and has been based on preliminary studies. The programme indicates when the project will reach a stage of improved feasibility confidence for the preferred option.

Figure 7: Indicative programme of work



8. Conclusion

This report provides justification for our RIIO-T2 Tyne Crossing plan for a permanent solution to the constraints posed by our existing Tyne Crossing OHL. The preferred HDD option has a total cost of £[redacted] (£[redacted] during RIIO-T2).

Section 3 informs there was no work planned for the Tyne Crossing in RIIO-T1, however, due to stakeholder requests to remove the OHL constraint (see Appendix B) and the importance of the PoT for the economic growth of the region and commissioning of offshore cables, interim work has been undertaken, but a more permanent solution is needed in the long-term due to increased demand for the use of the river.

Section 4 sets out the investment need for RIIO-T2, covering the drivers for this investment. This highlights the increase in demand for 'high load' vessels sailing in the region, the economic growth and potential for the region, the need for network resiliency to help the system manage it safely and securely, and all while coordinating activities that aid the commitment and vision to net-zero within the UK and the North East region.

Section 5 sets out the Cost Benefit Analysis which looks at three options and assesses them against the 'Do Minimum' option. It highlights that drilling a HDD cable under the river is the most economic and efficient solution when considering both construction costs and wider system constraints over a whole life timeframe. This option will meet consumers' needs and embed several efficiencies but has some risks which needs to be addressed in delivery.

Section 6 explains how the costs for the PoT during RIIO-T2 have been derived by comparison to internal and external benchmarks where possible.

Section 7 states assumptions made and identifies the potential risks to the deliverability of the proposed investment due to the more complex technology of underground cables, and how we propose to mitigate these. As this project is still within its development phase and the technology risks, it is proposed to share an update on the project once the development is further progressed, at the end of 2020. This will allow us to share a better understanding of these risks, confirm the option progressed remains the most economical and share the final programme and costs.

9. Outputs included in RIIO T1 Business Plan

No work and therefore outputs were included in the T1 plan for the Port of Tyne.

10. Appendix A - Electricity System Operator Cost Benefit Analysis Report, August 2019

Please refer to NGET_A9.12__Tyne Crossing_ESO_CBA.docx

11. Appendix B – Stakeholder Engagement, November 2019

PORT of TYNE

[redacted]

11th November 2019
Company Secretary
National Grid
1 – 3 Strand
London
WC2N 5EH

Dear Sirs,

CONVENTIONAL & BULK CARGO

CAR TERMINALS

CRUISE & FERRIES

LOGISTICS: CONTAINERS WAREHOUSING DISTRIBUTION

ESTATES

Re: Cross Tyne Power Cables - Blyth – Lackenby - ZZA and XA and Memorandum of Understanding National Grid - Port of Tyne dated 27/07/17

I would like to take the opportunity to express my thanks for your organisation's continued co-operation and assistance in the management of high-elevation structures passing under the cross-Tyne power cables and would like to acknowledge the recent successes.

- In mid-2017 the cable conductors were adjusted to gain an additional 4.5m of clearance, this being facilitated by yourselves in response to a request from Smulders Projects end-client regarding clearance requirements for the wind turbine support structures they are producing for Beatrice Offshore Windfarm.
- Subsequent to this National Grid have facilitated a series of six downratings of the cross-Tyne power cables to facilitate the passage of the highest structures for this project.

I appreciate that these are not insignificant activities and I recognise the commitment this has taken from National Grid.

Port of Tyne currently enjoys a very positive, supportive relationship with National Grid staff and we are very grateful for the commitment to the short-term enabling works that are planned for 2019.

However, as the UK offshore and renewable industry moves into deeper water, and vessel and structure sizes continue to increase, the current configuration of cross-Tyne cables creates a significant limitation to activities on the River Tyne and is an inhibitor to business

PORT of TYNE

growth for the many renewables, offshore, ship-repair, construction and engineering businesses located on the river.

A long-term solution, which would likely involve routing the cables below the river, has been discussed for a number of years. I understand there are various options under consideration to allow the cables to be re-routed below the River Tyne and I respectfully request your commitment to this solution as a matter of priority.

UK Ports are recognised as vital enablers of the UK economy and trade, and physical infrastructure such as the cross-Tyne power cables are key considerations in achieving efficient and effective connectivity and in generating inward investment. As I am sure you are aware Infrastructure is recognised as one of the five foundations in the UK Government's Industrial Strategy where it is noted that infrastructure choices must actively support long-term productivity.

On this basis I would request that the longer term solution to re-route the cross-Tyne cables below the river is implemented as a priority to remove this barrier to investment and growth on the River Tyne.

Yours sincerely

[redacted]

CONVENTIONAL & BULK CARGO

CAR TERMINALS

CRUISE & FERRIES

LOGISTICS: CONTAINERS WAREHOUSING DISTRIBUTION

ESTATES

EIFFAGE
SMULDERS

[redacted]

Date : 29th October 2019
Our reference : [redacted]
Your reference : [redacted]
Concerning : Cross-Tyne Power Cables Request for Stakeholder Support

Dear [redacted],

Since Smulders took over the former Amec / OGN Yard on the river Tyne in 2016, we have been able to build up a significant and important reputation not just in the North East, but the UK and globally with respect to building offshore wind jacket foundations. Our track record consists of jackets for the Beatrice Offshore Wind Farm 48 jackets and the Aberdeen Bay Offshore Wind Farm 11 jackets. Currently we are working on the Moray East Wind Farm Project 55 jackets.

Since the start of our endeavour in the North East in 2016, the Power Cables have been the critical component that has significantly hindered our operations on the River Tyne. The jacket structures that have been built so far on the River Tyne are of such a significant size that they intervene and even clash with the Power Cables on a permanent basis during shipment (from our yard to the final installation field). As a global trend in the offshore wind, every structure is getting bigger and bigger including the jacket foundations.

Although National Grid increased the available air-gap in 2017 with 5 meters, the steel structures we are currently building on the river Tyne, have forced National Grid to raise the cables yet another 2 meters.

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Registered in England No. 10156755

However, not only are the structures getting taller, the installation vessels used for these projects are too big to pass underneath the Power Cables.

So, for Smulders and the +500 workers on the yard, it is of utmost importance that a long term solution is found (permanent removal of the overhead Power Cables) to safeguard the future of the yard.

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North Tyneside Council

Regeneration & Economic Development Quadrant, The
Silverlink North, Cobalt Business Park,
North Tyneside, NE27 0BY

[redacted]

[redacted]

4 November 2019

[redacted]

Cross Tyne Power Cables

I am delighted to hear that temporary and permanent solutions are being considered by National Grid in relation to the issue of the Cross Tyne Power Cables located between Howdon and Jarrow. The height restrictions from the cables significantly reduces the economic benefits of the River Tyne and ideally a permanent solution could be found to remove the draft restrictions which effect all of the sites to the west of the cables.

The Swans Offshore Energy Park is owned by North Tyneside Council and we have been seeking occupiers for the site for a number of years now. The draft restrictions mean that certain sub-sectors within the energy sector currently do not consider Swans as a viable site as they could not get larger vessels to the quay and could not load in/out larger products, which would not fit under the cables easily. The site could support over 500 jobs when fully occupied and will be a significant boost to the local economy.

North Tyneside Council also support our local business community and other business have expressed concerns to us that the cables are constraining their business. If there is no further action to improve the draft restrictions it is anticipated that this would place a significant number of jobs at risk on Tyneside as it will not be able to compete with other locations where these restrictions do not apply. Moreover, it will also restrict the competitiveness of existing sites to attract new business investment.

Please advise if there is anything else we can do to support any funding applications to help resolve this issue.

Sincerely,

[redacted]

nationalgrid

Shepherd Offshore
Part of the Shepherd Offshore Group

[redacted]

Date : 07/11/2019
Your reference : Email dd. 24/10/2019
Concerning : Cross-Tyne Power Cables – Request for Stakeholder Support

Dear Steven,

For over 35 years, Shepherd Offshore has worked on the river Tyne to improve and sustain job creation and economic growth in the North East. Our history and reputation has significantly been built not only locally, but nationally and globally, connecting different countries and sectors to the area. Our successful track record consists of thousands of vessels and projects over the years and coming to the Tyne, however we believe the region has been blocked when winning work because of the Power Cable restrictions.

Since working on the Tyne, the Power Cables have played a critical role in economic performance when creating limits on vessels and projects. Over time, this has led to less business for stakeholders, hindering key operations along the Tyne. Unfortunately, our marketing intelligence has confirmed that the Tyne fails to achieve enquiries due to this restriction. In turn, this legacy dictates what we see on the banks of the Tyne today and hinders job creation.

Newcastle and surrounding areas are proud of what the River Tyne brings to our communities and we continue to preserve capabilities when bringing responsible regeneration to the region. It is therefore an importance that a long term solution is found for the removal of the overhead Power Cables to end project interference.

On behalf of Shepherd Offshore and its employees, we hope this long term situation can be solved quickly and efficiently.

Yours Sincerely,
For and on behalf of Shepherd Offshore

[redacted]

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[redacted]

A&P Tyne currently operate in various industry sector's such as the Marine, Oil & Gas and the Renewable markets, and the main access to our facility for large structures is via the River Tyne.

To meet these demands, the access by river to our facility in Hebburn is critical and any limitations placed on the size of structures / vessels either arriving or departing the site would severely restrict A&P Tyne's ability to compete equally in aggressive markets against our competitors.

With the increase in the size of the wind turbine generator structures currently in production, the demand for larger vessels in order to facilitate movements and ultimately the installation of these structures has also increased. A recent example of this can be seen with the award for a new crane lift vessel which has the capacity to lift structures onto and from the main deck that are in excess of 100m high.

During 2016 /17 we were actually unable to accommodate a number of Jack up vessels at our facility, in fact we were forced to withdraw from the tender process due to the limited air draft and restricted access currently on the river.

Regarding the marine industry, changes in ship design driven by hull form dynamics and performance related efficiencies, together with access to different trade routes which have contributed to the changing vessel profiles increasingly since the late 1970's. As a consequence, the increase in vessel size in order to carry more cargoes, passengers etc. can be negatively affected by the reduced access to our facility caused by the river crossing having a reduced air draught for incoming and outgoing vessels.

As technological advancements are introduced into the sectors in which A&P operate, we can only see the crossing becoming more of an issue placing restrictions and limitations on our business.

Yours Sincerely

[redacted]

nationalgrid

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