Core Document

CD3.2

nationalgrid

NGET/CD3.2

Public Local Inquiry into:

The National Grid Electricity Transmission Plc (Pitsmoor-Wincobank-Templeborough 275 kV Cable Replacement Scheme) Compulsory Purchase Order 2023

The Electricity Act 1989 and The Acquisition of Land Act 1981

STATEMENT OF EVIDENCE PURSUANT TO RULE 15 OF THE COMPULSORY PURCHASE (INQUIRIES PROCEDURE) RULES 2007

of

Dave Rogerson

B Eng Electrical Engineering

On behalf of National Grid Energy Transmission PLC ("**NGET**")

On matters relating to Engineering and Design

17 June 2024

CONTENTS

Clause **Page**

1. INTRODUCTION

1.1 My name is Dave Rogerson and I am a Lead Transmission Engineer with National Grid Electricity Transmission Plc (NGET), specialising in Over Head Lines (OHL) and High Voltage (HV) Cable Technology.

1.2 My evidence is relating to the engineering elements of the Pitsmoor-Wincobank-Templeborough 275 kV Cable Replacement project (the Project). In particular, I give evidence about the technical need for the Project; the optioneering process undertaken; challenges faced by the Project, and the approach to decommissioning. My evidence should be read together with that of Mr Spurr, who deals with need and alternatives from a non-technical perspective.

2. QUALIFICIATIONS AND EXPERIENCE

2.1 I have a Degree in Electrical Engineering combined with Power Engineering and Communications.

2.2 I have eighteen years design experience with twelve years in my role with NGET where I am authorised to National Grid's Business Procedure 141 for both OHL and Cable design assurance which is an assessed, industry recognised authorisation. This authorisation is part of NGET’s formal process with the regulator to ensure the correct operation and the safety of any equipment connected to or anyone working on the transmission network.

2.3 In my role I am responsible for ensuring that:

2.3.1 NGET discharges its legal obligations concerning health, safety and environmental requirements;

2.3.2 design is undertaken in accordance with NGET technical policy specifications and applicable supporting documents;

2.3.3 a holistic design is integrated through all technical disciplines and is effectively specified, managed and optimised;

2.3.4 those undertaking the design from the Principal Contractor organisation have the minimum skill sets in accordance with the National Grids standards;

2.3.5 the design is undertaken with a demonstrable level of technical governance; and

2.3.6 the design appropriately balances technical compliance, cost and operational risk.

2.4 At present I am working on approximately 100 transmission asset projects across the NGET portfolio, across both OHL and HV cable projects.

2.5 I have been working on the Project since 2015 as a cable design assurance engineer.

3. SCOPE OF EVIDENCE

3.1 This section outlines the key area of my evidence, which I set out below. I provide a full overview of the engineering development, challenges and methodologies related to the Project and provide supporting information relating to the case for the CPO, across the following sections:

3.1.1 Section 4, A technical overview for the case of Replacement

3.1.2 Section 5, Options and Route consideration

3.1.3 Section 6, Installation Methods

3.1.4 Section 7, Decommissioning Methodology

3.1.5 Section 8, Consideration and Response to the Objections

4. A TECHNICAL OVERVIEW FOR THE CASE OF REPLACEMENT

4.1 Figure 1 below (and Appendix A, provided at a larger scale) shows in green, a high level overview of the existing cable circuits between Pitsmoor-Templeborough, Pitsmoor – Wincobank and Wincobank – Templeborough. The existing cables were installed in 1968 are 275,000 V (275kV) single core cables and are a combination of 1sq.in and 1.5 sq.in diameter oil insulated cables.

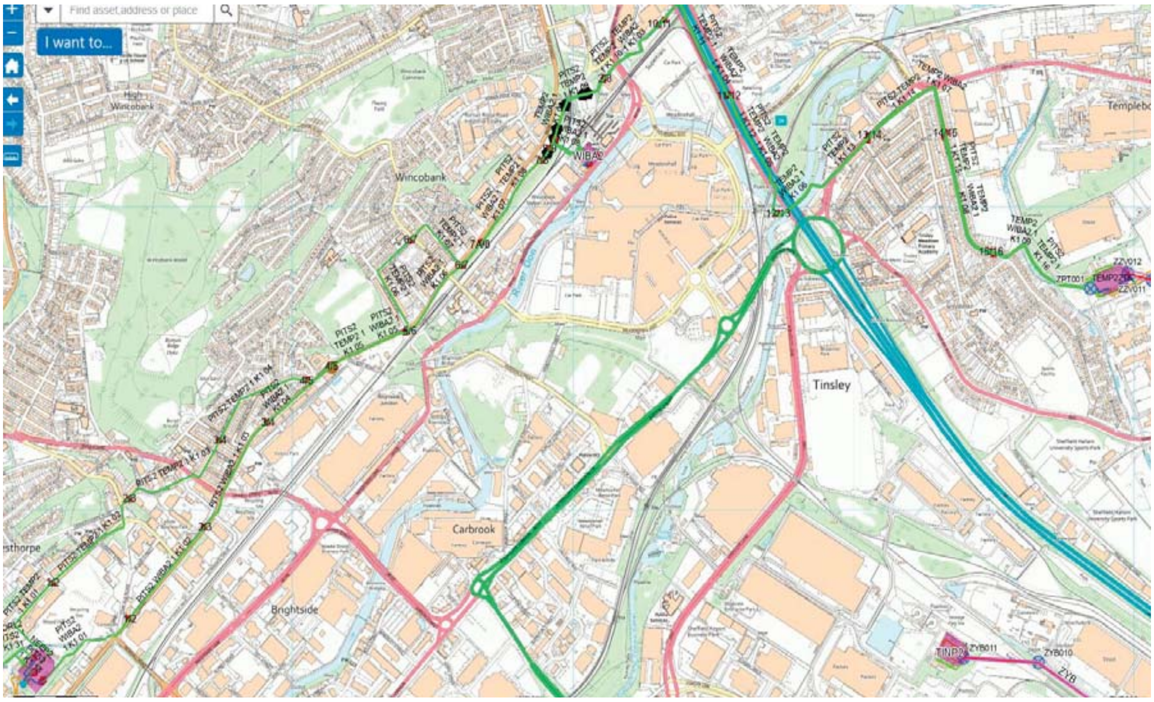

Figure 1 – Existing Pitsmoor – Wincobank – Templebrough Circuits

4.2 The existing cables comprise a combination of cables directly buried within the backfill material, and installed in cable ducts in both the highway and in private land as well as on two cable bridges.

4.3 National Grid's asset lifecycle team have given the cables an anticipated lifetime from commissioning of 60 years thus remaining asset life of these cables is 2-3 years, as identified as part of the RIIO reporting period T2 assessment completed by National Grid, outlined in my colleague Mr Spurr's evidence (CD3.3). The process for determining this score, is detailed below in my evidence.

4.4 To inform National Grid's replacement strategy, additional asset data is gathered for the circuits and used as part of the scoring assessment for end of life replacement, which is the point at which the service condition of the cable is such that it is no longer feasible to continue to operate that cable. This includes but is not limited to: number of oil leaks, the laying environment (installation), the number of faults reported against, similar or relevant asset family issues, and any site specific adjustment factors.

4.5 The above information is then processed and provides an End of Life (EOL) score, which is capped at 100, and thus is the highest risk score. The circuits being replaced here have slightly different EOL scores with a score of 75 for the Pitsmoor – Wincobank cable circuit and the Pitsmoor - Templeborough and Templeborough – Wincobank circuits having a score of 100. It should be noted that although the EOL score for the Pitsmoor – Wincobank is at 75, it is still subject to additional risk as outlined in paragraphs 4.6 and 4.7 of my evidence below. The EOL score is than used as part of the justification for replacement to the regulator within the defined reporting periods.

4.6 It has been identified, via maintenance works and coordination with other stakeholders that the sections of the Pitsmoor – Wincobank and Pitsmoor – Templeborough circuits which are installed within the network rail embankment have been concluded to be at risk of subsidence due to slope stability. This poses a risk to both the cable asset and Network Rail operations, should the bank stability become worse and the cables and slope slide towards the track. This is being monitored and mitigated as part of the Project. This section is highlighted in Figure 2 below which shows the area of concern with respect to the network rail infrastructure.

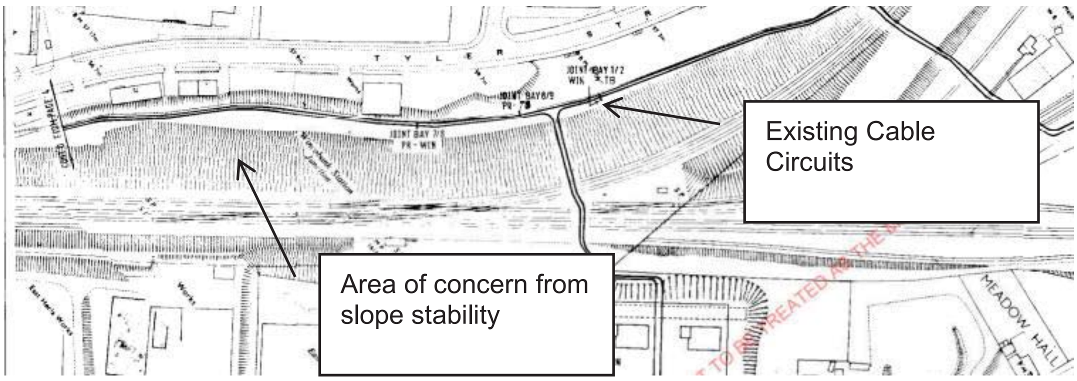

Figure 2 – Network Rail Section

4.7 An additional concern to NGET is the condition and performance of the Pitsmoor – Templeborough and the Wincobank – Templeborough cables installed on the cable bridges. Due to the age installation arrangement, environment and the resulting condition of the cables and bridges, there is a risk around access and electrical testing of the cables which could cause further damage.

Testing of the cable is done by applying a test voltage to the outer layers of the cable to check the integrity. This could in turn cause the cables more long term damage and as a result, the failure of the circuit. Figure 3 below shows one of the cables on the bridge, which has been wrapped as a temporary risk mitigation measure on one of the cable bridges to seal the cable thus lowering the possibility of leakage of insulating cable oil. This doesn't remove of fix the issue but tries to mitigate the impact should the cable fail and leak oil.

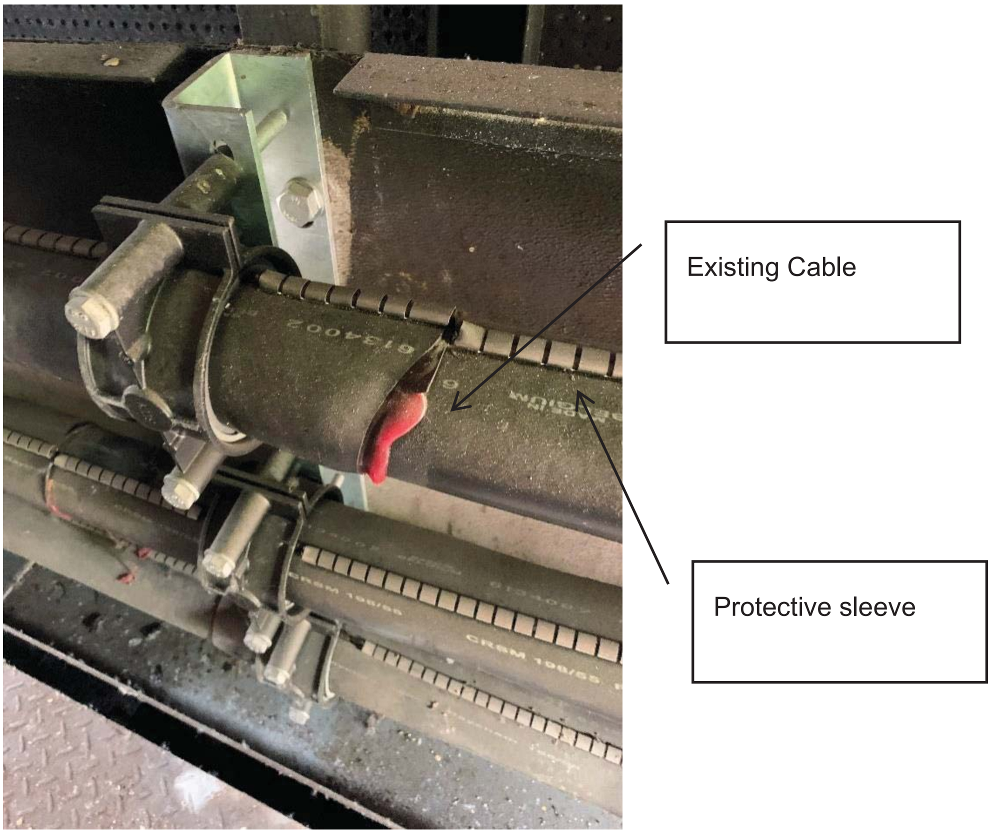

Figure 3 – Image of Existing Cable on the Bridge

The information presented above drives the technical need for replacement of the assets and highlights the consequence of not replacing them , namely, the loss of the circuit and the environmental and safety implications along the route.

4.8 The Optioneering Report (CD1.10) links back to the assessment above regarding replacement and the conclusion reached. This document also identifies other options rejected around target replacement works, which based on the criteria set out in this section, still wouldn't meet the overall requirement due to the number of drivers supporting the replacement including age, condition and risk to the transmission network.

5. OPTIONS AND ROUTE CONSIDERATION

<u>Introduction</u>

5.1 This section provides and overview and considerations for the replacement of the cables as well as the challenges identified as part of the proposal. The proposed installation methods are also identified within this section to allow for context around the proposed methods along the route.

Selection of in situ or offline replacement

5.2 The project has been in the development phase for a number of years looking at the options available to support the replacement. When considering replacement of existing cables the project team will consider both in situ and offline replacement.

5.3 In situ replacement would require the removal of the existing cables and installation of the new cables in the same location. This option would require significant system outages to allow this to happen, resulting in issues for the operation of the network and impact to the local Distribution Network Operator, and with outages and risk being imposed on them as a result of the loss of the National Grid circuit for a prolonged period of time. This would place a number of local circuits at risk of trip and resulting loss of supply to businesses and other properties during this period.

5.4 This option could mean that it would take up to 2-3 years per circuit for replacement to be completed, due to traffic management, access, and installation methodology due to the local environment. In addition, the system operator could not allow all circuits to be switched out at the same time due to management of the network from a supply perspective and impact on other works in the nearby area. This would introduce a safety concern when trying to replace sections of cable which are currently installed in close proximity to each other.

5.5 The offline replacement involves finding a new route to allow the existing cables to remain operating for as long as possible and to minimise the system outage to facilitate the installation. The offline installation can be started independently of any outages to the existing circuit thus minimising any impacts on the system security.

5.6 As a result of the restrictions outlined above in 5.2-5.4 of my evidence, the offline replacement was selected by National Gird as the way to proceed with the project.

5.7 The offline replacement for this project also has the benefit of avoiding some of the significant challenges on this route relating to reasons for replacement such as the Network Rail embankment and the cable bridges via utilising alternative routes. Avoiding these areas removes significant risk to the project from an installation and a long term perspective.

Development of the offline route

5.8 During the development of the offline route multiple options, including but not limited to Overhead Lines (‘OHL’) proposals were considered for the replacement of the circuits but, due to the geographical locations of the transmission substations, the routing in an urban area is very challenging with limited options when compared to the cable options.

5.9 Starting at Pitsmoor substation, all the development options for the new route considered the installation down Newhall Road from Pitsmoor substation. Due to the existing cables running down Carlisle Street East this option (Figure 4 below) allowed for the installation to progress without introducing challenges around working near the existing 275KV cables.

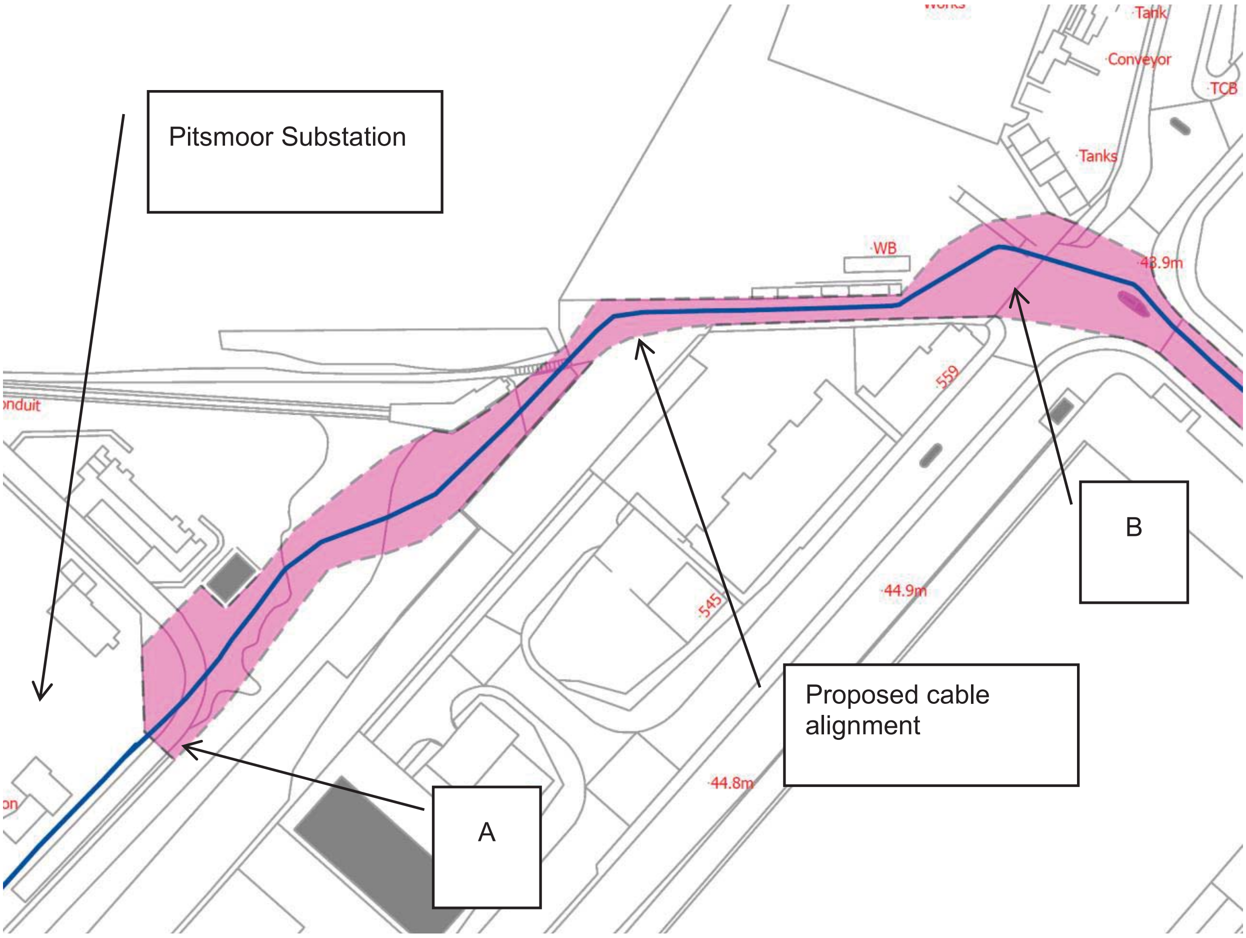

Figure 4 Proposed cable route out of Pitsmoor Substation

5.10 Due to the critical infrastructure installed at Pitsmoor and the challenging access to the site which also has a number of District Network Operator ("DNO") circuits within the main access road as well as a number of substation control buildings on the entrance to the site, the route into the substation via Garter Street was rejected as not feasible. Any works within this area would block the only possible vehicle access into the substation impacting significantly on the operation of the site.

5.11 At present Northern Power Grid also have plans to rebuild the 33KV substation next to the entrance to the site, which would also further restrict any access works and coordination with other contractors as a result of using Garter Street.

5.12 The substation is also surrounded by a significant retaining wall. In the early stages of development consideration was given to the use of Horizontal Directional drilling under the wall but due to the technical restrictions of the technology and the need for a location of a launch and reception pit it was confirmed as not feasible to instal via this method in this location. Any open cut of this retaining wall would not be technically possible due to the depths and supports required.

5.13 Figure 4, shows the proposed route out of the substation which is directly in line with the existing cables which are installed in this location along with other DNO Assets identified between the markers A and B. Due to the challenges identified with alternative routes, this option was considered as the primary option, as it would allow for a short section of the cables to be replaced in situ, providing the only feasible route into a substation.

5.14 For the routing down Brightside Lane (Figure 5 below), although a number of services are present following Ground Penetrating Radar ('GPR') surveys and trial holes within the carriageway and verge it has been possible to confirm the viability of a route avoiding services and also minimising the impact on the businesses on the road with traffic management. This micro routing has been done via the Principal Contractor in line with the contract strategy outline in Mr Spurr's evidence, demonstrating a good level of confidence with the route, based on the known information.

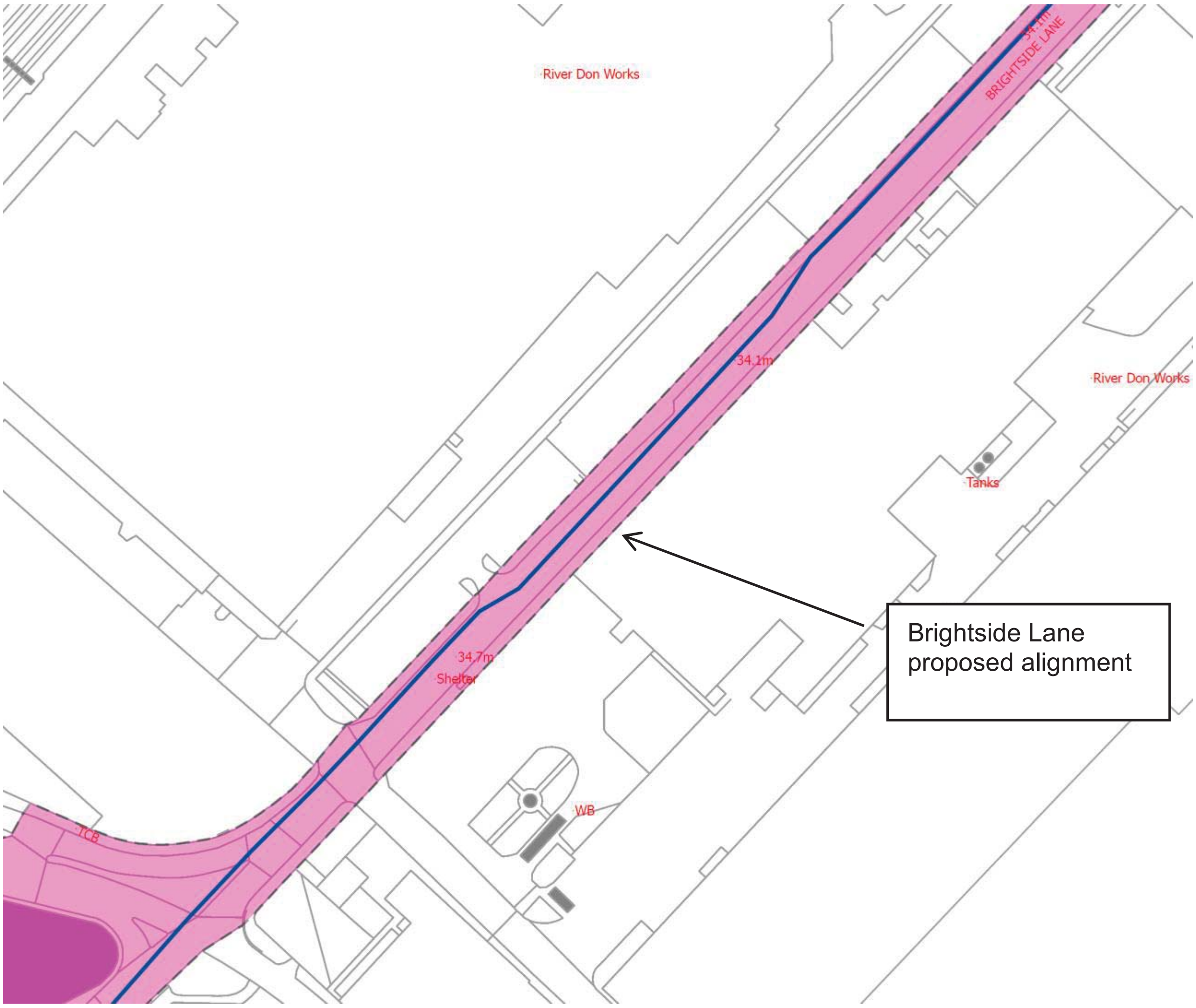

Figure 5 Section of Cable Routing Down Brightside Lane

5.15 With the exception of challenges from services, the routing of the cables from Brightside Lane to Wincobank substation only gives rise to the type of challenges typically encountered on an urban cable project; relating to other utilities, obstructions crossings and coordination of the traffic management. These are all ‘business as usual’ issues and can be managed.

5.16 From Wincobank substation to Templeborough substation the route contains a number of challenges. The existing cables are installed under Network Rail tracks and though industrial land, under the elevated section of the M1, and then over two cable bridges, down Sheffield Road and into Ferrars Road, until the cut through at the junction with Highgate Street where it runs in the Chapel Flat Dike to Templeborough substation.

5.17 For this section, over the course of the development phase options including OHL were considered and discounted for a number of engineering feasibility reasons including the M1 motorway elevated section and the helipad for Meadow Hall, but other routing options were identified and progressed.

5.18 Initial consideration was given to running along Alsing Road to the M1 / Tinsley Viaduct and running in the utility corridor under the motorway with the existing cables (shown in Figure 6 below), however, following development work and discussion with the Meadowhall shopping centre, an option was presented which ran though the staff carpark to join with the bottom of Blackburn Meadows way. This option removed the interaction with the existing cables (which eliminated the risk of working in close proximity to live cables) and identified a clear route to cross the culvert and the junction with Alsing Road.

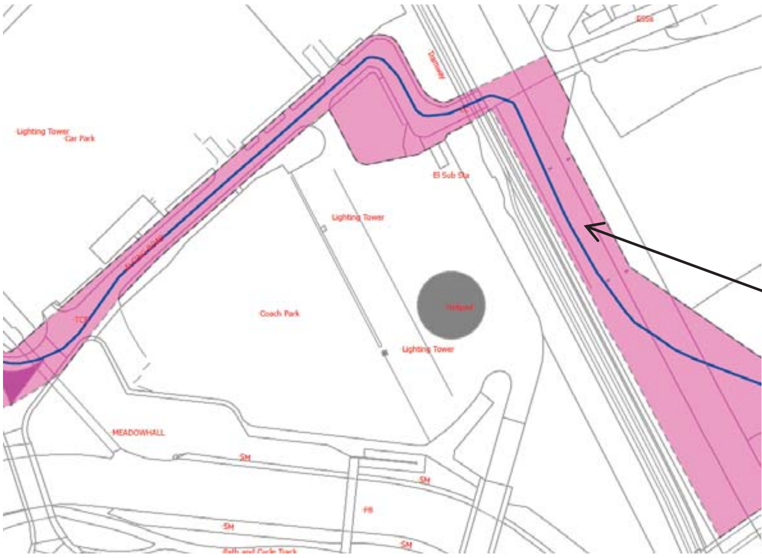

Figure 6 – Image of initial proposed route under the viaduct section of the M1

5.19 It was hoped that the construction of Blackburn Meadows Way was such that it would provide an option for installation of the cables within the road to enable the circuit to cross the railway and the river. However, on further liaison with the highways authority and review of the as-built records, it emerged that there is insufficient space in the road substructure to install and operate the cables safely. The road has approximately 400mm of clearance from the base of the road surface to the underside of the structure. As a result it would not be possible to safely install cables, ducts and thermal stable material therein. This is also evident from the raised lighting column foundations within the footpath indicating that there is insufficient depth for the foundations to be fully installed beneath the surface of the highway.

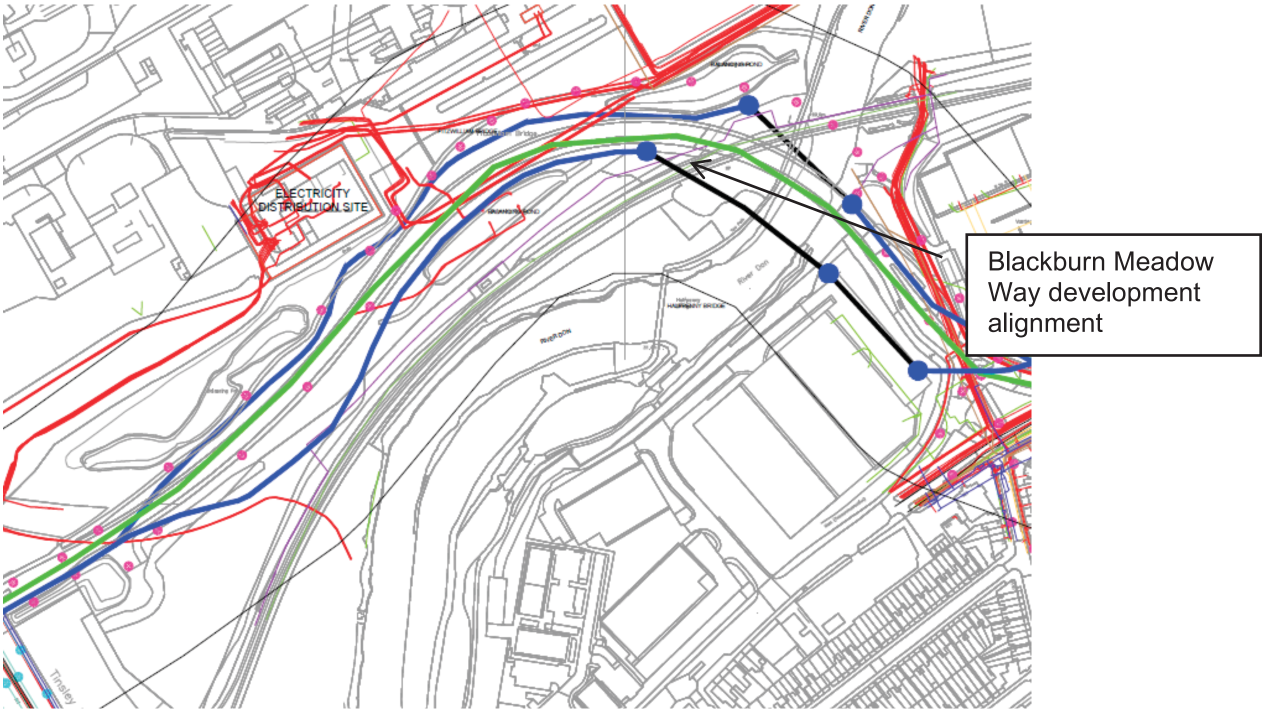

Figure 7 – Proposal for routing around Blackburn Meadows Way

5.20 The reuse of the existing bridges was also considered but NG policy recommends against the use of cable bridges due to third party risk and maintenance issues. The condition of the existing structures as well as the challenges with installing in close proximity to the canal was also considered when ruling out the option. In the current locations and due to the condition, the cable bridges would also have needed to be replaced completely again, posing significant challenges around access due to the railway, the canal and the Tinsley Viaduct.

5.21 Through discussions with National Grid's Framework contractors the option to undertake a Horizontal Directional Drill ('HDD', see paragraph 6.4 of my evidence) under the rail and river was presented as viable and provided a technical solution to the routing challenges within the area. The crossing in this location is subject to final agreement with Network Rail, however the proposed alignment is such that it avoids interaction with any Network Rail infrastructure by crossing via HDD, through the centre of the bridge structure.

5.22 Once into Sheffield Road following Blackburn Meadows Way (Figure 7 above), options included continuing along Sheffield Way and turning into the area known as Chapel Flat Dike, which is a public footpath and water course constrained either side by properties and a cable corridor for the steelworks. This route was considered, but again due to construction space available at the entrance to the area of Sheffield Road, shown in figure 8, this was considered as not feasible. This is because the route is constrained by an existing building and retaining causing a width restriction meaning that access for plant machinery and other equipment would not be possible.

Figure 8* - *Cable route entry in to Chapel Flat Dike

Figure 9 – Image of alternative development cable route in Chapel Flat Dike

5.23 Notwithstanding the challenges above, once within Chapel Flat Dike, the working area is significantly restricted due to the footpath, watercourse and old steelwork corridor running parallel. This means that there would be no access for construction vehicles to carry out installation or joint the cables up between Chapel Flat Dike and the area running parallel with Ferrars Road access, which aligns with the location of the existing cables.

5.24 This then resulted in the decision to route the cables up St Lawrence Road and then, as with Pitsmoor substation, carry out an in situ cable replacement under outage conditions at Templeborough substation.

5.25 The installation from Ferrars Road to the Chapel Flat Dike area includes a section running down the pathway from the road. Within this area the narrow footpath introduces construction challenges, therefore a temporary working area has been sought from the neighbouring garden to allow for the installation. Once completed, this will be reinstated with no asset within the property boundary.

6. INSTALLATION METHODS

6.1 As part of the development and Early Contractor Involvement phase, a number of different installation methods are being considered, these include, but are not limited to:

6.1.1 Ducted installation; and

6.1.2 Trenchless installation

6.2 Ducted installation involves excavating a trench, installation of the special cable backfill material to provide suitable conditions for the cable operation, installation of the cable ducts and then backfilling of the trench. The cable is then pulled in at a later date in complete sections, at lengths of approximately 800-1000m.

6.3 When installing cables in the highway, short sections of the road will be closed while the ducts are installed. This will be done continuously until getting to a joint bay where two sections of cable will be connected together.

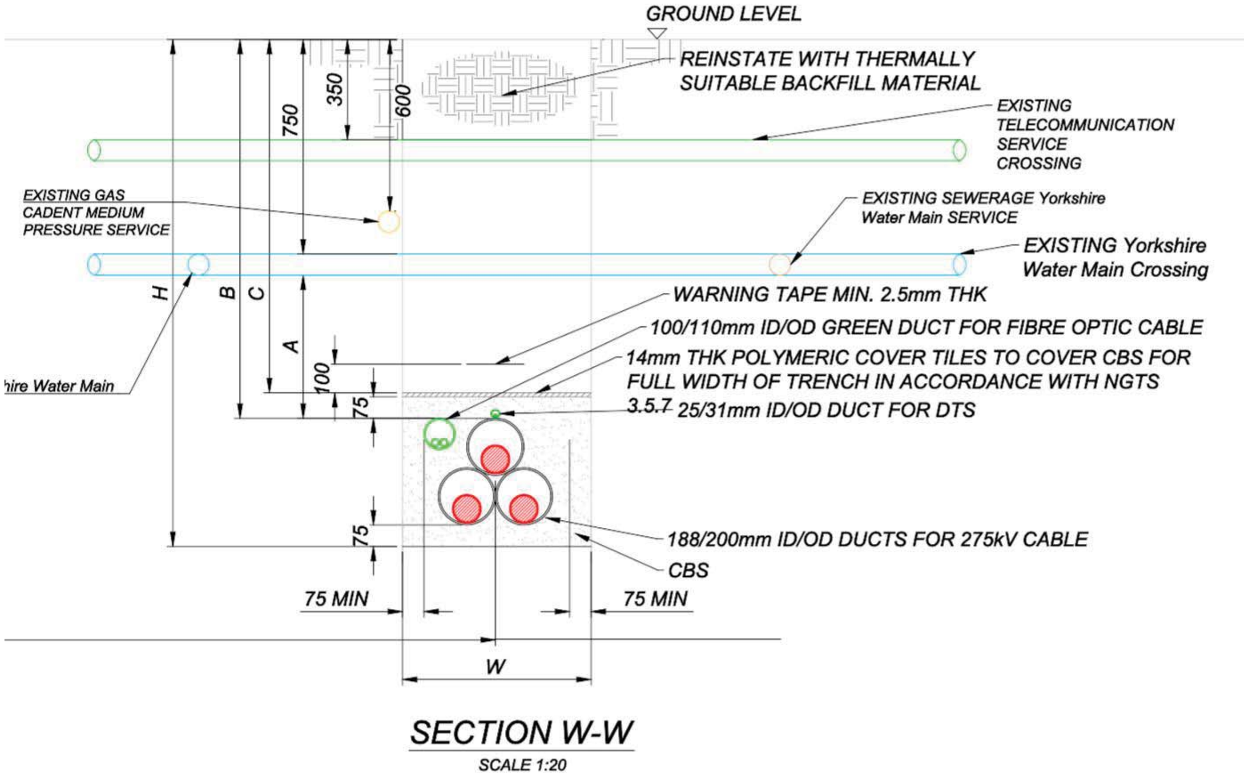

Figure 10 Typical Trench Cross Section Showing Utility Details

6.4 Trenchless installation for this project is proposed to be in the form of HDD. This technique involves drilling a small pilot hole from ground level from a sending pit to a receiving pit at the other side of the crossing. The pilot hole is then increased in size by the process of reaming until it is of sufficient size to pull in a cable duct though the hole created. Once in place, the high voltage cable can then be installed within this duct and continued via the ducted solution.

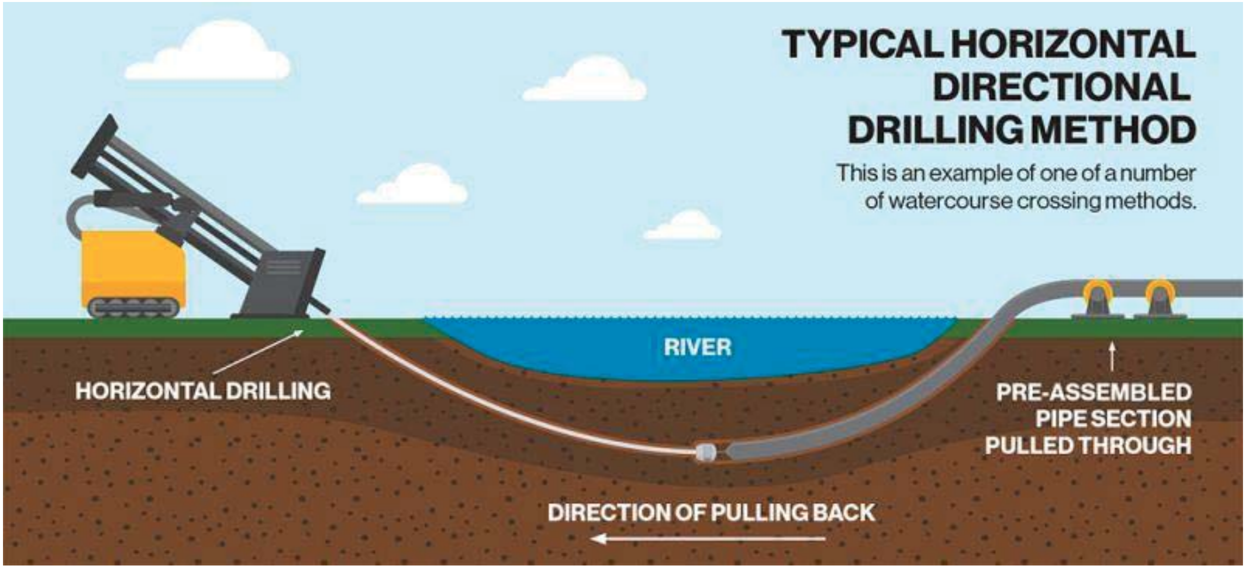

Figure 11 Typical HDD profile

6.5 This technique has limitations due to technical constraints on the cable thermal rating. The deeper you install a cable, the wider separation you need between phases to avoid the heat generated by one cable impacting on the other due to the time it takes to dissipate as a result of the increased cover. In addition, there are limitations on length as a result of being able to pull the cable though, and risk introduced by unknown ground conditions. This installation method is only recommended to overcome challenging complex crossings where it is not possible or challenging to disturb the ground from the surface.

6.6 To confirm the detailed design of the HDD, the Contractor is currently undertaking trial investigation holes along the alignment of the proposed HDD to confirm viability by understanding the geotechnical information and thermal resistivity of the ground (which is the rate at which heat can dissipate from the ground as a result of the cable installation) to develop both the physical and electrical design for the crossing.

6.7 For the remaining sections of the route, and to confirm the actual installation method and specific route within the corridor, the contractor is undertaking further GPR and trial hole surveys to microsite (i.e. precisely locate) the cable.

7. DECOMMISSIONING METHODOLOGY

7.1 Following installation of the replacement cables, National Grid will be looking to manage the risk associated with the existing asset and as a result will be considering the recovery/removal of the existing cable and which sections of cable can remain'

7.2 NGET's policy for decommissioning cables provides the project team with options to consider when assessing the existing cable route around the decommissioning proposal. The policy identifies the factors to consider when developing the decommissioning strategy for the project, which then drives the scope relating to the end of life asset and what happens to it once complete.

7.3 The policy describes the considerations around health and safety, environment, maintenance and cost when refining the scope, which could include leaving the cable in the ground, removing sections or all of the old cable. Each section of the route is assessed by each area of the project team including lands, operations, engineering and the project management team.

7.4 Prior to any removal of the cable, the decommissioning methodology includes the purging of the oil from inside the cable. This process is to ensure that as much insulating oil is removed as possible prior to cutting the cable, which minimises the risk when removing sections of cable, or minimising the amount of oil which requires collecting during the period after decommissioning due to migration of the insulating oil from the papers.

7.5 When assessing the route for removal, each section of cable was assessed with the lands team, and operational and engineering teams to understand what needs to be done for each section of the cable. To ensure safety of the cable all at or above ground infrastructure will be removed; this includes cable link boxes and pillars, which are installed at existing cable joints to facilitate the cable system design.

7.6 Cable identified for removal includes the area within the Network Rail land, which was subject to the slope stability issues, the cable bridges and cable running in close proximity to the river and canal for environmental reasons, and the cable at both Pitsmoor and Templeborough, which is required to facilitate the installation of the new cable. Significant sections of cable, which have been subject to historical issues from leaking or which prevent future development, have also been identified for removal as part of this exercise.

7.7 Removal of cable from the highway is not considered to be economical as it would be as restrictive as installation of a new cable in short sections controlled by traffic management and would take a number of years to remove.

7.8 The remaining cable will be isolated and installed with monitoring pits to allow for inspection and further purging of the cable for any remaining residual oil still contained within the insulating cables. Over time as a result of the pressure not being maintained in the cable, the oil will migrate from the papers, and as such will require them to be purged again to remove any environmental risks in the first few years after decommissioning takes place. It should be noted that any cable left in situ will still be subject to similar restrictions as a live cable would be with respect to the potential for build-up of current or voltages due to adjacent circuits.

8. CONSIDERATION AND RESPONSE TO THE OBJECTIONS

8.1 Several objections have been raised in relation to the proposed installation, in terms of route selection, installation methodologies and engineering decisions. The following sections shall respond to these objections.

8.2 **Objection 3** raises issues from **National Highways** covering multiple plots regarding unregulated access to the strategic road network (SRN) during the course of the works, as the existing cables are located under the elevated section of the M1. As part of the works, NGET will not require access to the SRN as the cables are located in the area below the M1 motorway viaduct. Access the area under the motorway viaduct, and areas in proximity to this land will be required to support the installation of the cables along Blackburn Meadows Way, and for works associated with the decommissioning. During the decommissioning works, access will be controlled via the principal contractor and incorporate additional Contractor security to ensure the required security is maintained. There will be no impact to the existing security features in the area during the works such as CCTV. I understand Mr Salomon’s evidence (CD3.1) deals with the question of protective provisions.

8.3 **Objection 5** Fieldfisher LLP on behalf of **BOC Limited** raises an issue with respect to concerns over the infrastructure installed under Balk Lane, and the proposed vehicle traffic crossing as part of the cable project resulting in the potential for damage to the infrastructure. At present, it is not anticipated that any significant vehicle or plant will be required to access this area over and above the plant currently used as part of the general substation operations. It should be noted that the route via Balk Lane is the Advance Indivisible Load (AIL) route for all Supergrid Transformer (SGT) deliveries and other equipment to site each weighing in excess of 200 tons without any restrictions. In relation to the Project, the cable is currently anticipated to be pulled into the substation so only standard HGV access will be required for plant and equipment delivery. It is understood and presented in evidence from my colleague Mr Salomon that conversations around the protective provisions are ongoing in this location.

8.4 **Objection 6** raises an issue **from E.ON** around the routing of the cable from Blackburn Meadows Way to the proposed HDD locations, due to impact on the settlement ponds and E.ON's access to this area during and post completion of the works. As outlined in Mr Spurr's evidence the contracting approach we have adopted on this project is to develop the route alignment within the proposed corridor and produce the final detailed design following geotechnical surveys with the Principal Contractor. This is an ongoing process and will be confirmed using the main works contractor to ensure the viability of the solution. The potential for contaminated land, the position of the reception site for the drill and the resulting bend radius of the cable will dictate the final position and installation methodology for the cable within this area and, once confirmed, the impact on features such as the SUDS can be assessed and mitigated. The ongoing survey works at present will feed into this detail design. Once the final route is confirmed NGET will liaise with the E.ON to confirm any reasonable access and crossing points required during the construction works. Following completion of the works, the land will be returned to its previous conditions and there will be no permanent impact on the landscaping and pathway in the area.

8.5 **Objection 8** raises issues from **MHH Contracting Limited** regarding a number of points, but from an engineering perspective the points raised concern the cable route access to Pitsmoor substation. As identified in section 4 of my evidence, consideration was given to alternative routing for the cable out of the substation set out in section 5 of my evidence, but all had issues with respect to construction access, other services, other ongoing works in the substation identified in section 4 of my evidence, as well as the retaining wall. The proposed route allows for an installation route into the substation, following the existing cables, whilst decommissioning the old cables at the same time. The final routing of the cable will also be subject to investigations around the existing services in the location as well as aiming to minimise the disruption to the site by routing away slightly from the original alignment to minimise the impact where possible with MHH operations. The site is subject to existing NGET and the DNO cables and all efforts will be focused around minimising disruption, including incorporating a temporary access for MHH.

8.6 **Objection 11** raises issues from **Forged Solutions Group** over the proposed works around the decommissioning of the cables. The works within the relevant plots relate to the decommissioning and removal of the cables and no new cables are planned to be installed. The decommissioning proposal within this area is to remove the cable completely. Therefore in coordination with the land owner around access and the decommissioning methodology NGET will work with Forged Solutions Group to remove any NGET asset from the land.

9. SUMMARY AND CONCLUSIONS

9.1 My evidence provides an overview of the technical need for the replacement of the cables, the asset condition score of 100 combined with other risks associated with the current cable circuit including the existing condition and the risk to a section of Network Rail embankment which is driving the needs case for replacement to reduce the resulting risk to the transmission system.

9.2 When considering the replacement I have identified the options considered around replacement in situ and replacement off line and the associated risks and benefits and the decision-making around selecting the offline replacement route. In addition, breaking the route into sections, I have covered the installation proposals, current methodology under consideration and mitigation measures to the risks.

9.3 My evidence details the proposed installation methods and the rational and selection of these when considering the route and specific challenges presented. Whilst also highlighting some of the areas of engineering difficulty proposed by some of the more significant crossings, but whilst still presenting a technical solution.

9.4 On the basis of my evidence, and the other evidence presented to the Inquiry on behalf of NGET, I respectfully ask the Inspector to recommend to the Secretary of State that the CPO for the Project be confirmed in this case.

10. DECLARATION

10.1 I confirm that the opinions expressed in this statement of evidence are my true and professional opinions.

Signed DocuSigned by: Dave Rogerson 977281E3FF184B6...

Dated 18-06-2024

11. APPENDIX A TO CD3.2– EXISTING CABLE ROUTES