

**Cable Installation Depth**

**THE NATIONAL GRID ELECTRICITY TRANSMISSION PLC (SCOTLAND TO  
ENGLAND GREEN LINK 2) COMPULSORY PURCHASE ORDER 2023**

**SUMMARY STATEMENT  
STATEMENT OF EVIDENCE**

**Dave Rogerson  
Lead Transmission Engineer  
National Grid Electricity Transmission plc**

## **1. QUALIFICATIONS AND EXPERIENCE**

- 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. I have a Degree in Electrical Engineering combined with Power Engineering and Communications.
- 1.2 I have eighteen years design experience with twelve years in my role with NGET where I am authorised to National Grids Business Procedure 141 for both OHL and Cable design assurance which is an assessed industry recognised authorisation currently only 5 people in the country hold for cables.
- 1.3 Section 1 of my evidence provides detail of my qualifications and experience.

## **2. INTRODUCTION AND SCOPE OF EVIDENCE**

- 2.1 The purpose of my evidence is to explain the engineering design around the cable installation depth as part of Scotland to England Green Link 2.

## **3. CABLE INSTALLATION DEPTH**

### *Industry Guidance and Specifications*

- 3.1 The following section sets out the relevant guidance pertaining to cable installation depths. This is to provide context around the position of a minimum depth of 900mm recognised as the industry standard.
- 3.2 The Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR) part 4, section 14.1 states “Every underground cable shall be kept at such depth or be otherwise protected so as to avoid, so far as is reasonably practicable, any damage or danger by reason of such uses of the land which can be reasonably expected”.
- 3.3 Energy Networks Association, Engineering Recommendation (ER) G57, Issue 2 2019, Cable Laying on Agricultural Land clause 4.2 states that all new cables, of any voltage shall be laid with a cover depth of not less than 910mm to the top of the cable when laid across good agricultural land. For reference this does not include the additional backfill required as well as the protection tiles as detailed within my evidence which increases this depth for the actual cable/duct.
- 3.4 Further within ER G57 Clause 4.2, paragraph 2 it is stated that the depth requirement takes account of the wishes of the National Farmers’ Union (NFU).
- 3.5 To implement the requirements of the ESQCR and the recommendations of ER G57, NGET adopted the requirements into National Grid Technical Specification 3.5.7 issue 10, Installation Requirements for HV Power Cables. Paragraph 1.6, b, ii, identifies the minimum depth below the surface of the ground and the protection tiles across good agricultural land at 900mm.
- 3.6 The current industry wide documentation confirms alignment with National Grid’s minimum installation depth requirements and demonstrates consistency across the regulated industry.

### *Impact of Cable Depth*

- 3.7 To achieve the most efficient cable solution that maximises the available ratings on the circuit, management of the heat generated from the cables is paramount. When cables transmit power, they generate heat in the conductor which is dissipated through the insulation of the cable into the surrounding material and ground. The deeper the cable is installed the time taken to dissipate the heat away from the cable increases, like adding more layers of insulation to a water pipe or a building. The cable's ability to transmit power is directly related to how hot the cable can operate, and as a result of this higher temperature around the cable, this starts to impact on the amount of power that can be transmitted prior to reaching the temperature limits set out by the cable manufacturer. To offset this, the spacing between the two poles, in the case of a HVDC circuit, needs to increase to reduce the thermal interaction as a result of the cables being installed deeper to ensure the heat generated in each pole does not significantly affect the adjacent cable.
- 3.8 The cables have a limit to operating temperature, and without offsetting the additional heat generated with the additional separation, the cables would reach this limit which would either mean reducing the capacity of the cables and the power they can transmit, or running the risk of cable failure as a result of operating above the maximum temperature.
- 3.9 Although still subject to detail design, assessment of ground parameters such as thermal resistivity (the rate at which the in-situ material around the cable to dissipate this heat generated heat), an increase from a minimum installation depth from 900mm to the cable protection tile to a minimum installation depth of 1200mm to the protection tile will result in an approximate increase of pole spacing from 500mm to 800mm. This takes the typical overall trench width from around 900mm to 1200mm. At this stage until the ground strata is known, it is difficult to estimate the additional time required as a result of the increased depth and width of excavation.
- 3.10 To add context, if this was applied as a blanket depth across the full SEGL2 route and all installed in such a manner, the additional stabilised backfill which is the surround installed around the cable for mechanical and thermal reasons would indicatively increase in the region of 6210m<sup>3</sup>. This would have a significant carbon impact on the project not only in the cement content of the back fill, but also the vehicle movements required to transport this material.
- 3.11 Depending on the ground strata, an increase of 300mm in depth could also change the temporary works proposals, with the introduction of a stepped trench or timber supports to avoid a wider excavation. It could also change the plant and machinery required to excavate the trench depending on the ground conditions at that depth such as rock or chalk.
- 3.12 Notwithstanding the above note, the protection of the asset, the safety of landowners and occupiers of the land, be that agricultural, highways or under other third party assets is of critical importance.

#### **4. OBJECTIONS RELATING TO CABLE DEPTH**

- 4.1 Several objectors have raised the proposed cable depth provided in the Heads of Terms (HoTs), and the lack of confirmation on final burial depth, as grounds for objection to the scheme.
- 4.2 As discussed in section 3 of my evidence, the HoTs identify a minimum cable burial depth (rather than an actual burial depth):

- 4.3 *“The cables will generally be laid so as to avoid continued interference with normal agricultural operations as far as reasonably practicable. The cables shall be laid to contour with a depth of cover not less than 900mm from the original surface to the top of the protection tile above the cables.”*
- 4.4 Each set of HoTs that has been issued by NGET was accompanied by NGET’s Construction best practice for underground cable installation version 1 (**CD F.5**). NGET’s HoTs include confirmation that all project works will be carried out in adherence to NGET’s Best Practice Guide. None of the objections comment on NGET’s Best Practice Guide or identify why NGET’s Best Practice Guide is insufficient to regulate the construction of the English Onshore Scheme.
- 4.5 Section 4 of my evidence provides further detail relating to OBJ6, OBJ7, OBJ9 and OBJ18 which relate either wholly or partially to cable depth.
- 4.6 At present there is no industry guidelines available to substantiate a minimum installation depth of 1200mm and why this depth is considered safe and to support future farming options. It is understood this depth was proposed as part of an offshore connection as referenced in objection 9 There is no intention to update NGET specifications to revise this minimum depth, however NGET will still follow the recommendations stated in the industry standard documents.

## **5. SUMMARY AND CONCLUSION**

- 5.1 In my statement of evidence, I have described the background to the UK and industry standards on the cable installation depth. What NGET proposed to complete as part of the installation detail design and how the installation risk will be assessed and managed to ensure both the safety of the asset and the landowner / occupier.
- 5.2 NGET are following industry requirements, consistent with other transmission owners when detailing the minimum installation depth.
- 5.3 NGET consider this as a minimum installation depth and if required, as per the industry requirements and recommendations will increase this to protect both the occupier and the asset, during the detail design.
- 5.4 NGET will consider drainage as any other service to be crossed or diverted as per agreed plans. I consider that the installation design and construction methodology of the above elements of the Project is appropriate, feasible, and compliant with the relevant standards, codes, and guidance.

## **6. DECLARATION**

- 6.1 I confirm that the opinions expressed in this proof of evidence are my true and professional opinions.

Dave Rogerson

16<sup>th</sup> February 2024