Edward Douglas,
SHE Transmission,
10 Henderson Rd,
Inverness,
IV1 1SN

17/11/2023

**LT09-SSEN-LU-XX-CO-ML-001**
**Shetland HVDC Cable Link Licence Variation**

Dear Marine Directorate – Licensing Operations Team,

I am writing to you on behalf of Scottish Hydro Electric Transmission Plc (SHE Transmission Plc) regarding the Shetland High Voltage Direct Current (HVDC) Link.

SHE Transmission were awarded the following Marine Licences for the construction of the Shetland HVDC Link in July 2020:

- Licence Number 07357/20/0 – issued under Part 4 of the Marine and Coastal Access Act 2009 for waters outside the 12 the Nautical Mile (NM) limit; and
- Licence Number 07203/20/0 – issued under Part 4 of the Marine (Scotland) Act 2010 for waters inside the 12 NM limit.

As construction of the Shetland HVDC Link progresses, it is predicted that rock deposit quantities for waters outside the 12 NM limit will exceed the consented limits under Marine Licence 07357/20/0. SHE Transmission are therefore seeking to vary Marine Licence 07357/20/0 to increase the rock deposit quantity to circa 318 617 tonnes. SHE Transmission do not wish to vary any other elements of Marine Licence 07357/20/0 or Marine Licence 07203/20/0.

The requirement for the additional rock deposit quantities is outlined in Appendix A which supports this letter. This application is also supported by a Cable Burial Protection Plan (CBPP) which has been updated to reflect the required increase in rock deposit quantities. A cheque for £41,710 has been sent to cover the cost of this licence variation request.

Yours sincerely

*E W Douglas*

Edward W Douglas
Marine Consents Manager
**M:** [Redacted] **E:** Edward.Douglas@sse.com

# Appendix A - Supporting Information

## Introduction

The following Marine Licences were issued to Scottish Hydro Electric Transmission plc (SHE Transmission) in July 2020 for the construction of the Shetland High Voltage Direct Current (HVDC) Link (Figure 1):

- Licence Number 07357/20/0 – issued under Part 4 of the Marine and Coastal Access Act 2009 for waters outside the 12 the Nautical Mile (NM) limit; and
- Licence Number 07203/20/0 – issued under Part 4 of the Marine (Scotland) Act 2010 for waters inside the 12 NM limit.

NKT were appointed by SHE Transmission to supply and install the Shetland HVDC Link across three campaigns (Figure 1). All construction activities for Campaign 1 were successfully completed by the end of 2022 and all activities for Campaign 2 were completed in September 2023. The only remaining construction activity for Campaign 3 is rock placement.

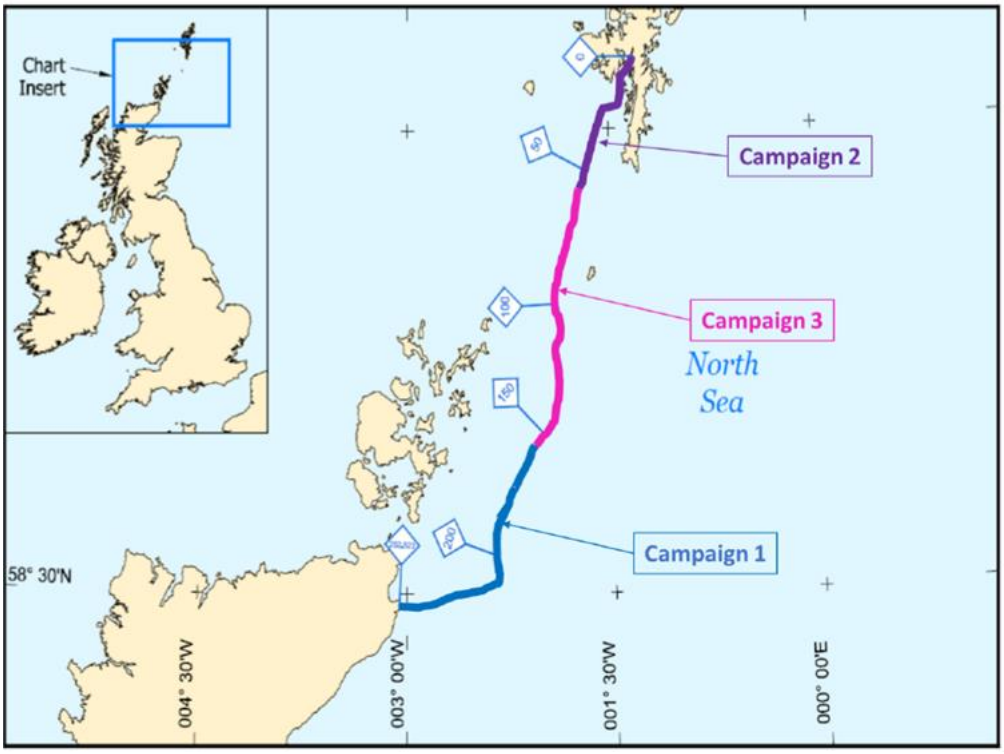


*Figure 1 Shetland HVDC Link location*

## Purpose of this Document

This document is being issued to Marine Directorate – Licensing Operations Team (MD-LOT) to provide the necessary supporting information for an application to vary the rock deposit quantities consented under Marine Licence 07357/20/0 for the section of the Shetland HVDC Link outside the 12 NM limit. SHE Transmission do not wish to vary any other elements of Marine Licence 07357/20/0 or Marine Licence 07203/20/0.

This document accompanies a revised Cable Burial and Protection Plan (CBPP)[1] (originally submitted to MD-LOT in May 2021) which details the revised rock deposit quantities reflected in this letter.

[1] *NKT (2023). Cable Burial and Protection Plan. Doc ID 1AA0395404.*

## Marine Licence Variation Request

Table 1 outlines the forecasted rock quantity requirements for the Shetland HVDC Link. Values are provided for the rock deposited to date and forecasted quantities of rock have been estimated for the remainder of Campaign 3. The forecasted values represent the realistic maximum worst-case scenario. Please also refer to the updated CBPP which shows a comparison of the planned rock placement locations vs as-installed rock placement locations.

*Table 1 Rock placement requirements compared with the consented[2] quantities*

| Rock Parameter | Region | | |
|---|---|---|---|
| | Inside 12 NM limit | Outside 12 NM limit | Total |
| Consented quantity (tonnes) | 287,975 | 245,090 | 533,065 |
| Quantity deposited to date (tonnes) | 150,255 | 122,732 | 272,987 |
| Forecasted remaining quantity (tonnes) | 103,869 | 195,885 | 299,754 |
| Total anticipated quantity (tonnes) | 254,124 | 318,617 | 572,741 |
| Consented quantity vs required quantity (tonnes)<br>* Values are estimated & projected to be worst case for Campaign 3. | -33,851<br><br>(12% consented quantity remaining) | +73,527<br><br>(30% exceedance of consented quantity) | +39,676<br><br>(7.4% exceedance of consented quantity) |

As shown in Table 1, the total forecasted rock requirements for outside the 12 NM limit exceed the consented quantity for Marine Licence 07357/20/0. SHE Transmission are therefore seeking to vary Marine Licence 07357/20/0, to increase the consented rock quantities for Marine Licence 07357/20/0 from 245,090 tonnes to 318,617 tonnes (i.e. an increase of 30% of the consented quantity), as detailed in Table 2.

The following sections of this document provide a summary of the requirement for the additional rock quantities, together with a summary assessment of the potential associated environmental effects.

*Table 2 Marine Licence (07357/20/0) Variation Request*

| Marine Licence | Region | Consented Rock Quantity (tonnes) | Variation Request (tonnes) | Difference (tonnes) |
|---|---|---|---|---|
| 07357/20/0 | Outside 12 NM limit | 245,090 | 318,617 | + 73,527 |

## Background

The rock protection requirements for the Shetland HVDC Link, as presented in the Marine Licence applications, were determined based on the results of the Cable Burial Risk Assessment (CBRA), a Burial Assessment Study (BAS) and also the Marine Environmental Assessment (MEA). As per standard industry practice, the target Depth of Lowering (DoL) and Depth of Cover (DoC) was determined through a consideration of seabed conditions and potential threats to the cables (such as anchor strike, and interactions with fishing gear) along the cable corridor. Significant efforts were made by SHE Transmission to maximise the potential for cable burial in seabed sediment, and reduce the requirement for rock protection as far as practicable, including:

- Route engineering and micro-siting to avoid areas of seabed which would pose challenges to cable trenching, insofar as was practicable[3];
- Reduction of target DoLs or DoCs where possible to maximise the potential that the requirements would be successfully met by trenching, whilst ensuring the cables are sufficiently protected. This was achieved using the findings of the CBRA;

[2] *As per Marine Licence 07357/20/0 and 07203/20/0.*
[3] *NKT (2023). Route Review and Engineering Report. Doc ID 1AA0491280.*

- Selection of the Jet Trencher T1500 as the most effective cable burial tool based on a review of the seabed conditions within the cable corridor;
- Implementation of route preparation activities including Pre-Lay Grapnel Runs (PLGRs) and boulder clearance campaigns to remove obstructions to cable trenching along the cable route; and
- Use of remedial jetting passes, where necessary / beneficial to maximise the potential for successful trenching to the target DoL and DoC.

The updated CBPP provides further detail on the cable burial and protection requirements.

The development of a live CBRA Tool was also commissioned by SHE Transmission to enable data from each trenching pass to be reviewed to determine if DoL and DoC targets had been met. This tool allows for a risk assessment approach to be taken with regards to identifying the requirement for rock placement in areas that do not meet the target DoL and DoC, with the aim of reducing remedial rock protection requirements where possible. For example, where the achieved DoL was only marginally less than the target DoL, the CBRA Tool allowed SHE Transmission to determine whether the cables were sufficiently protected, thereby avoiding or limiting the need for remedial rock protection.

## Requirement for Additional Rock Quantities

The drivers for the exceedance of the rock tonnage above the consented limits, outside the 12NtM Limit are detailed in Table 3, which sets out the trenching performance, rock placement requirements and control measures used by SHE Transmission.

*Table 3 Additional rock requirements*

| Campaign | Status | Trenching & rock placement performance | Action taken by SHE Transmission |
|---|---|---|---|
| 1 | Complete | CP1 was delivered circa 15K Te (approx. 9%) under the predicted rock tonnage, however SHE Transmission recognised that this could be further improved.<br><br>Initially SHE Transmission utilised a remote offshore installation engineering system, whereby data was reviewed by a team of engineers ashore, maximising available resource, however a lag was identified between data becoming available from the vessel and a response being issued to the vessel. This resulted in rock being placed at the conservative end of the tolerance range. | In order to improve rock placement efficiency further SHE Transmission recognised that it would be more beneficial if an Offshore Installation Engineer was onboard to manage the trenching review process and improve efficiency in remedial rock placement requirements. SHE Transmission have since ensured that an Offshore Installation Engineer was onboard during trenching operations for Campaigns 2 and 3. This enabled real time communication and decision making, which in turn resulted in less conservatism and reduced rock requirements, informed by the live CBRA tool. |
| 2 | Complete | More challenging ground conditions were present than those predicted by the survey data. Despite utilising secondary trenching passes remedial trenching was less successful than that seen in Campaign 1. This resulted in circa 10K Te of rock being required above that predicted in the BAS.<br><br>Additional rock quantities were required at the crossing point with the recently installed BT R100 fibre optic cable. The BT R100 cable was found to be surface laid rather than buried as expected, as such an additional three concrete mattresses and associated rock was required mattresses and complete the crossing. | An additional circa 9km of secondary trenching was undertaken to maximise burial in seabed sediments.<br><br>An Offshore Installation Engineer was on board during trenching operations to optimise the remedial rock requirements, informed by the live CBRA tool, as described above.<br><br>Implementation of an engineering design change to measure berm height either from the top of the cable (where visible) or the seabed level directly above the cable, rather than mean seabed, to either side of the trench. This reduced the rock protection requirements in areas of cross slope where trenching backfill was unsuccessful. This design change was implemented during Campaign 2 and will remain in place for the rest of the rock placement activities. Since this |

| Campaign | Status | Trenching & rock placement performance | Action taken by SHE Transmission |
|---|---|---|---|
| | | | change was implemented, the rock protection requirements have reduced from circa 8.74 Te/m to 5.42 Te/m (38% reduction). |
| 3 | Ongoing | More challenging ground conditions were present than those predicted by the survey data, as such circa 27Km of secondary and tertiary trenching was undertaken to optimise burial in seabed sediments.<br>The lessons learned from Campaign 1 and 2 were implemented, however remedial trenching passes were not sufficiently successful to adequately protect the cable.<br><br>An additional in-line joint and associated rock placement was required at KP70, as such a section of the cable route that had previously been identified as trench able was subsequently not suitable for trenching and required additional rock placement. | As above for Campaign 2, an Offshore Installation Engineer was on board during trenching operations to reduce the remedial rock requirements, informed by the live CBRA tool.<br><br>The control measures set out above will continue to be implemented, however, Campaign 3 includes several areas unsuitable for trenching (i.e. where the cable will be surface laid with rock placement). As such circa 70K te of additional rock will be required |

## Environmental Effects

The increase in rock quantity is not considered to represent a material change to the potential effects of the Shetland HVDC Link, as assessed in the MEA that supported the Marine Licence applications submitted in 2020. The main reasons for this are as follows:

- Despite the increase in rock quantity outside the 12 NM limit, the total length and footprint is expected to remain within the worst-case scenarios assessed in the MEA (see Table 4);
- Rock berm height remains within the consented design envelope of the MEA;
- Despite the 30% increase in the rock quantities for outside the 12 NM limit, when considering the rock requirements across the entire Shetland HVDC Link the total quantity is expected to be exceeded by less than 10%; and
- The quantities and footprints of other cable protection materials (concrete mattresses, rock bags, articulated half shells etc.,) deposited to date are significantly below the consented limits, and there is no requirement for further other protection materials to be installed (Table 5).

The primary measures for assessing environmental impacts of rock berms are the length and footprint of the berms, hence the amount of seabed affected, and not the quantity of rock required to create the berms. The original MEA did not identify any significant impacts on marine environmental receptors resulting from the predicted lengths or footprints of rock berms which were considered by the assessment. Despite the requirement for an additional quantity of rock, the actual as built rock berm lengths and footprints will be significantly less than those considered during the original Marine Licence applications, and as such a smaller area of the seabed will be affected. Therefore, the potential impacts on marine environmental receptors from rock berms installed as part of the Shetland HVDC Link will be less than those identified by the MEA.

*Table 4 Rock placement requirements compared with the consented[4] footprint and length*

| Parameter | Region | | |
|---|---|---|---|
| | Inside 12 NM limit | Outside 12 NM limit | Total |
| **Length** | | | |
| Consented length (m) | 45,075 | 45,840 | 90,915 |
| Length deposited to date (m) | 19,519 | 19,120 | 38,639 |
| Forecasted remaining length (m) | 14,301 | 20,680 | 34,981 |
| Total anticipated berm length (m) | 33,820 | 39,800 | 73,620 |
| Total length vs consented length (m) | 11,255 (25% of consented length remaining) | 6,040 (13% of consented length remaining) | 17,295 (19% of consented length remaining) |
| **Footprint** | | | |
| Consented footprint ($m^2$) | 447,263 | 393,090 | 840,353 |
| Footprint deposited to date ($m^2$) | 154,625 | 123,970 | 278,595 |
| Forecasted remaining footprint ($m^2$) | 87,718 | 176,726 | 264,444 |
| Total anticipated footprint ($m^2$) | 242,343 | 300,696 | 543,039 |
| Total footprint vs consented length ($m^2$) | 204,920 (46% of consented footprint remaining) | 92,394 (24% of consented footprint remaining) | 297,314 (35% of consented footprint remaining) |

[4] *As per Marine Licences 07357/20/0 and 07203/20/0 and the Shetland HVDC Link MEA (https://marine.gov.scot/datafiles/lot/HVDC_Caithness/EA_HVDC_Link_Caithness_07203.pdf).*

*Table 5 Other cable protection material requirements compared with consented limits*

| Cable protection measure | Region | | | | | |
|---|---|---|---|---|---|---|
| | Inside 12 NM limit | | Outside 12 NM limit | | Total | |
| | Consented | Forecast | Consented | Forecast | Consented | Forecast |
| No. of concrete mattresses | 20 | 7 | 30 | 5 | 50 | 12 |
| Teckduct / Uraduct / Duraguard half shell cable protection | 3,900 m | 2,947 m | 0 | 0 | 3,900 m | 2,947 m |
| No. of Grout / rock / sand bags | 400 | 0 | 100 | 0 | 500 | 0 |
| No. of Clumpweights | 5 | 1 | 7 | 4 | 12 | 5 |
| No. of Landfall ducts | 5 | 4 | 0 | 0 | 5 | 4 |
| No. of Pipeline crossing / support bridges | 0 | 0 | 3 (15 Te) or 12 (10 Te) | 0 | 3 (15 Te) or 12 (10 Te) | 0 |

## Conclusions

This letter supports SHE Transmission's request to vary the rock deposit quantities consented under Marine Licence 07357/20/0 for the section of the Shetland HVDC Link outside the 12 NM limit. SHE Transmission have made significant efforts to reduce rock placement requirements through comprehensive engineering assessments conducted ahead of construction and through the implementation of adaptive mitigation measures that have been put in place to further reduce rock requirements during construction.

Despite the increase in rock quantity, the rock protection footprint and length remains within consented limits. Combined with the fact that the requirement for other cable protection methods is expected to be less than the consented limits, the increase in rock protection quantity is not considered to represent a material change in the environmental effects of the Shetland HVDC Link.