

Scottish Hydro Electric Power Distribution

Operation, Inspection, Maintenance and Decommissioning Strategy

Carradale – Arran North Replacement



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| SHEPD | Operation, Inspection, Maintenance and Decommissioning Strategy | | Applies to | |
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| Revision: 1.00 | External use | Issue Date: November 2019 | Review Date: n/a | |

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1. Definitions and Abbreviations

The following definitions are used within this document:

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| SHEPD | Scottish Hydro Electric Power Distribution plc |
| SSEN | Scottish and Southern Electricity Networks |
| Cable | SHEPD submarine electricity cable network |
| Coiling | Where the submarine cable is wrapped in a circular manner for storage or transportation |
| Mechanical Strength | The physical capacity of the submarine cable to undergo forces generally in tension (horizontal, lifting) or compression (vertical weight above the cable) |

The following abbreviations and definitions may be used within this document:

| | |
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| AUV | Autonomous Underwater Vehicle |
| CFLO | Company Fisheries Liaison Officer |
| HDD | Horizontal Directional Drill |
| KIS-ORCA | Kingfisher Information Service Offshore Renewables and Cable Awareness |
| LAT | Lowest Astronomical Tide |
| MBES | Multibeam Echosounder |
| MCA | Maritime and Coastguard Agency |
| MLWS | Mean Low Water Spring |
| NLB | Northern Lighthouse Board |
| ROV | Remotely Operated Vehicle |
| RPL | Route Position List |
| SBP | Sub Bottom Profiler |
| SSS | Side Scan Sonar |
| UKHO | United Kingdom Hydrographic Office |

2. Introduction

- 2.1. SHEPD propose to install a 33kV cable from Carradale to Arran in proximity of the existing subsea cable to replace the existing Carradale to Arran North submarine circuit which has been identified for replacement based on asset integrity inspections.
- 2.2. The purpose of this document is to outline our strategy in relation to the following aspects of the project:
- Operation: Following installation of the cable, connection and energisation to the SHEPD network.
 - Inspection: The visual inspection or tracking of the cable following installation.
 - Maintenance: Remedial works driven by condition-based information following inspections in the marine, inter-tidal and/or land environments.

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- Decommissioning: Follows de-energisation of the cable at the end of its operational life.

2.3. This document should be read in conjunction with the Marine Construction Licence pack.

3. Operation strategy

- 3.1. Following successful completion of cable installation within both marine and land environments, the cable will be commissioned and energised onto the SHEPD network. Under normal operation, the cable will remain energised until replaced or following a fault occurrence on the cable or network itself (this includes onshore faults). The cable may also be de-energised to carry out planned maintenance on the cable or SHEPD network.
- 3.2. The effects of cable operation on the environment are covered within the *Marine Environmental Appraisal* (Xodus report A-303128-S00-REPT-002).

4. Inspection strategy

General

- 4.1. As part of the planned cable replacement, as-built records will be prepared and recorded as part of the project handover documentation. This will form the baseline data for the cable. This is also applicable for any planned maintenance or emergency repairs on the cable.
- 4.2. Following installation of the cable, our inspection strategy will be used to monitor the behaviour and integrity of the cable. Each subsequent inspection will help to build a better understanding of operational risk and condition of the cable. This will therefore dictate the ongoing maintenance plan and influence cable replacement decisions.

Cable inspections - Offshore

- 4.3. Cable inspections in the marine environment allows us to record:
- accurate cable position
 - any degradation, damage, exposure, suspensions, burial or other significant events which may affect the integrity of the cable
 - external condition of the cable, including any external protection in place
 - condition of any cable crossings including third party crossings
 - depth of burial, both in terms of adjacent seabed levels and absolute levels
 - visibly locate any debris in contact or close proximity to the cable
- 4.4. Asset monitoring inspections include geophysical surveys comprising the following methods:
- Multibeam Echosounder (MBES)

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- Side Scan Sonar (SSS)
- Video and still images
- Magnetometer
- Cable tracker

- 4.5. The surveys and inspections will utilise either vessel-based instruments or traditional methods such as divers. Survey platforms may also include Remotely Operated Vehicles (ROVs), Unmanned Surface Vehicles (USVs) or Autonomous Underwater Vehicles (AUVs) which have been equipped with suitable sensor packages.
- 4.6. The frequency of marine inspections will be risk dependant; based on ongoing gathering of asset data and network operational risks. We anticipate that the first cable inspection is carried out within a period of eighteen months after cable energisation and commissioning to firstly ensure the installation meets the expectations of our own internal standards and specifications and those of Marine Scotland but also to ensure the safety of navigation for legitimate users of the sea.
- 4.7. All subsequent inspections are proposed to take place within a period of four to eight yearly intervals¹. Following any evidence of wear/abrasion or interference, the frequency of inspections may be increased.
- 4.8. Survey timing within any year may be influenced by restrictions relating to environmental considerations including breeding seasons for marine and coastal ecological features. An assessment of potential impacts of survey operations on marine and coastal ecological features and designated sites will be undertaken with appropriate mitigation measures identified where necessary. The assessment will be used to support applications for European Protected Species (EPS) and Basking Shark (BS) licenses where a requirement for these has been identified.
- 4.9. Route Position Lists (RPLs) of cable and landfall locations will be communicated to the UKHO and KIS-ORCA in order that relevant charts are updated and disseminated.
- 4.10. Prior to the commencement of, during and after any route surveys or cable inspections, the Company Fisheries Liaison Officer (CFLO) shall establish and maintain effective communications between SHEPD, any contractors or sub-contractors, and legitimate sea users and this will be documented in the *Fishing Liaison Mitigation Action Plan*.

Cable inspections – Onshore

- 4.11. We will ensure that shore end condition inspections are undertaken for all our cable locations. This will include the warning signs/beacon. For cable shore ends, or landfalls, inspections are proposed to take place twice per year throughout the operational life of the cable. The inspection will be undertaken during a period of low water after spring tides to ensure that any cable exposure has been captured down to the MLWS limit.

¹ Details of how we manage our cable can be found here: <http://news.ssen.co.uk/media/261770/SSEN-Submarine-Electricity-Cable-Replacement-Programme-Booklet.pdf>

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- 4.12. During this inspection, the cable warning markers at the landing sites will be inspected for condition to ensure that they are fit for purpose and if necessary, replaced and thereafter maintained in good condition.
- 4.13. Where we observe a requirement for increased shore end inspection frequencies, we shall modify our practices as required.

5. Maintenance strategy

- 5.1. Maintenance requirements are driven by physical information gathered on our assets. This information is obtained through inspections of our cable both in the marine environment and at shore end landfall locations where the cable come ashore.
- 5.2. Maintenance solutions will be project dependant on the nature of the issue. We will enter into discussion with Marine Scotland and relevant parties to determine the licencing and communication requirements for undertaking any maintenance or remedial works where necessary through the operational life of the cable.
- 5.3. Where our inspection programme identifies that the cable has become a danger to navigation or protection of legitimate users of the sea, we will immediately inform Marine Scotland, Maritime and Coastguard Agency (MCA), UKHO, Northern Lighthouse Board (NLB) and KIS-ORCA to communicate the hazard to the maritime community.
- 5.4. Where shore end landfall inspections reveal that the cable is exposed down to the tidal level of MLWS, we will enter into discussion with Marine Scotland and relevant parties to determine the licencing and communications required for undertaking any remedial works where necessary.
- 5.5. We will ensure that appropriate steps are taken to minimise disruption and damage to the beach, foreshore and seabed by any remedial works and aim to restore to the current condition prior to the works commencing.

6. Decommissioning strategy

- 6.1. The existing cable has been identified for replacement based on asset integrity inspection and full end to end replacement has been identified as the best option. The existing cable was installed in 1993 and was most recently inspected in 2017, following which it was identified for replacement due to its poor physical condition.
- 6.2. Notwithstanding the above, at the time of application the existing cable is operational and has potential therefore to be used as a spare installed asset should a fault develop on either the Carradale – Arran South cable or the Carradale – Arran North replacement cable. This scenario has previously arisen on another part of the SHEPD network where re-energisation of a previously de-energised subsea circuit enabled full network capacity to be restored following a fault on another subsea circuit.

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- 6.3. Where the cable is in poor condition, cable recovery operations are very difficult due to a lack of mechanical strength and coiling ability. Where mechanical strength of the cable is compromised the lifting operation will likely cause the cable to break.
- 6.4. The operations are time consuming to undertake resulting in increased offshore working for personnel involved and vessel presence in the marine environment.
- 6.5. The physical cable handling on board the vessel is hazardous to personnel involved with the recovery operations. It is not possible to re-coil the cable on board the recovery vessel. Once the cable is recovered on-board a vessel, this would need to be cut into shorter, manageable lengths.
- 6.6. In situations where the existing cable is not recovered, there is the potential for the cable to present a navigational hazard to mariners and sea users. To manage this potential health and safety issue, periodic inspections are required to ensure the cable does not pose a risk to snagging. The position of the cable can also be accurately recorded and updated onto navigational charts. The expenditure incurred through continued inspection of the cable is assessed in relation to the cable recovery costs within the Cost Benefit Analysis model.
- 6.7. Similarly, to cable recovery, cable dismantling is a difficult and hazardous task requiring a large space on land. With the cable cut into sections, there will be numerous lifting operations to deliver the cable to a disposal contractor. The dismantling of the cable is difficult due to the cable's physical construction and layered design. The costs incurred for dismantling of the cable greatly outweigh the conductor material scrap value.
- 6.8. With the high costs associated with a cable recovery and disposal operation, the overall project costs would increase and the representative element of SHEPD distribution customer's bills. The socio-economic impact of this has been modelled in the Cost Benefit Analysis and informs our engineering decision making.
- 6.9. An additional important consideration for the removal of cable is the environmental impact and disruption that can be caused by the cable recovery process due to the length of time that the asset has been in place. We have heard conflicting views from statutory stakeholders in relation to cable recovery operations. Stakeholders have recognized that recovering cable may lead to more damage to the environment than leaving the cable in-situ particularly in areas with sensitive habitats and marine features.
- 6.10. A grapnel (cable hooking device) will likely be needed to intentionally snag the cable for recovery to the vessel. The grapnel is much smaller than most commercial fishing gear and is pulled across the seafloor. If existent, seabed vegetation may be uprooted in a very narrow corridor defined by the grapnel size.
- 6.11. In summary, based on these issues and impacts, we do not propose to recover the existing cable at the end of its operational life following the installation of the replacement cable. We propose to continue to inspect the existing cable within the marine environment and at shore landfall locations in accordance with inspection requirements for the replacement cable.