



Loch Etive Hydro Developments
Subsea Cable Installation
Initial Consultation Document
April 2017

Report Title: Loch Etive Cable Installation – Initial Consultation Document

Client: Green Highland Renewables (Argyll) Ltd

Report Reference: 10033_LE Cable Installation_GHR_JW_20170324

Principal Author: [Redacted]

Reviewed By: [Redacted]

Issue Date: 07 April 2017

Version Number	Reason	Date
1	Issue for QC	24/03/2017
2	Issue for final QC	03/04/2017
3	Final	07/04/2017



Contents

- 1. Introduction..... 4**
 - 1.1. Marine Licensing in Scotland 4
- 2. The Loch Etive Hydro Schemes 5**
- 3. Grid Connection Method..... 5**
 - 3.1. The Proposed Submarine Cable / Route 8
- 4. Cable Design 9**
- 5. Installation Process 9**
- 6. Cable Repair or Replacement 10**
- 7. Decommissioning 10**
- 8. Project Schedule 11**
- 9. Consultation Process 11**

Appendix	Content
A	Site Images



1. Introduction

This pre-consultation document gives details of a proposed High Voltage (HV) power cable to be laid on the seabed in upper Loch Etive by Green Highland Renewables (GHR) to connect a hydro scheme to the electrical grid. GHR is an established and prolific developer of small hydro-electric schemes in Scotland. Since the company was founded in 2009 GHR have developed and consented over 60 hydro schemes with a total capacity exceeding 40MW. The company employs 19 staff in offices at Dingwall and Perth.

Over the past year GHR has evaluated the potential for hydro schemes in the mountains which surround Loch Etive. Three potential schemes have been identified and the business hopes to take these schemes through the planning process with Argyll and Bute Council during 2017. One of the schemes identified is at Allt Easach on the west side of Loch Etive while two others exist in Glen Kinglass. Whilst there is an existing 11kV overhead line running along the east side of Loch Etive to Glenkinglass Lodge, the electricity network on the west side of the loch terminates at Bonawe Quarry some 8.5km southwest of the Allt Easach. As a result, GHR are considering laying a power cable across the bed of the loch to connect the Allt Easach scheme to the electrical network at the foot of Glen Kinglass.

This paper gives further information about the cable crossing to allow interested parties to understand the proposal and engage with GHR where necessary.

1.1. Marine Licensing in Scotland

All development activities carried out in Scottish Inshore Waters are controlled under the Marine (Scotland) Act 2010. Responsibility for administration of the Marine Planning Process in Scotland is the responsibility of Marine Scotland, part of the Scottish Government. The scope of the legislation includes the laying and operation of submarine cables for electricity transmission/distribution or telecommunications. Guidance on compliance with the 2010 Act is provided in Scotland's National Marine Plan and Section 14 provides guidance on the installation and operation of submarine cables. Cable and network owners are encouraged to engage with decision makers and potentially affected parties at an early stage to minimise any impact on the environment and other users. The design of cable systems and their location on the seabed must take account of fishing, aquaculture and leisure activities which may take place in the area, and mitigate any impact as far as possible. Proposed submarine cable routes which exceed 1853m in length (equivalent to one nautical mile) are required to undertake pre-application consultation with potentially affected parties and representative bodies. The proposed cable route across Loch Etive is approximately 1660m in length so there is no legal requirement for pre-application consultation, however GHR is committed to identifying a route which has minimal impact on the environment and those who use the loch for commercial or leisure purposes. The decision to engage with all potential users of the Loch, even though there is no legal requirement to do so, has been made to ensure all interests are accommodated in the design, installation and operation of the cable. GHR will engage with potentially affected parties and elicit responses to the consultation.



All responses will be discussed and considered in the design, with the final submission to Marine Scotland reflecting the outcome of this process.

2. The Loch Etive Hydro Schemes

Table 1 provides information on the identified schemes, including an initial power output and location of the powerhouse. These details are preliminary at this point and depend largely on the outcome of the development phase (including Environmental Appraisal).

Table 1 – Development details				
Site Number	Name	Capacity	Powerhouse Grid Ref	Location
1	Allt Hallater	2000kW	NN 15349 37578	Approximately 7.5km east of Loch Etive
2	Glenkinglass Lodge	1800kW	NN 16954 38177	Around 500m east of Glenkinglass Lodge
3	Allt Easach	2000kW	NN 07073 39449	West side of Loch Etive, approximately 8.5km northeast of Bonawe.

The schemes are of the “run of river” type, without storage reservoirs or large dams. A weir, incorporating an intake screen, is constructed on each burn to remove a proportion of the water. This water is conveyed by an underground pressurised pipeline down to an appropriately designed power house containing the turbine and generating equipment where the energy in the water is converted to electricity. The power houses are connected to the electrical grid via an underground HV cable. This type of construction minimises the visual impact of the schemes which is an important consideration at these locations. The 3 sites would have a combined rating of approximately 5.8MW. Separate planning applications to Argyll and Bute Council would be made for each scheme. Each scheme would be connected to the National Grid in order to export the generated electricity.

3. Grid Connection Method

A point of connection (PoC) to the existing 11kV overhead line has been selected on the east side of Loch Etive at Ardmaddy close to where the River Kinglass meets Loch Etive. Figure 1 shows the PoC, and Figure 2 shows the proposed connection method for Glenkinglass Lodge and Allt Hallater.



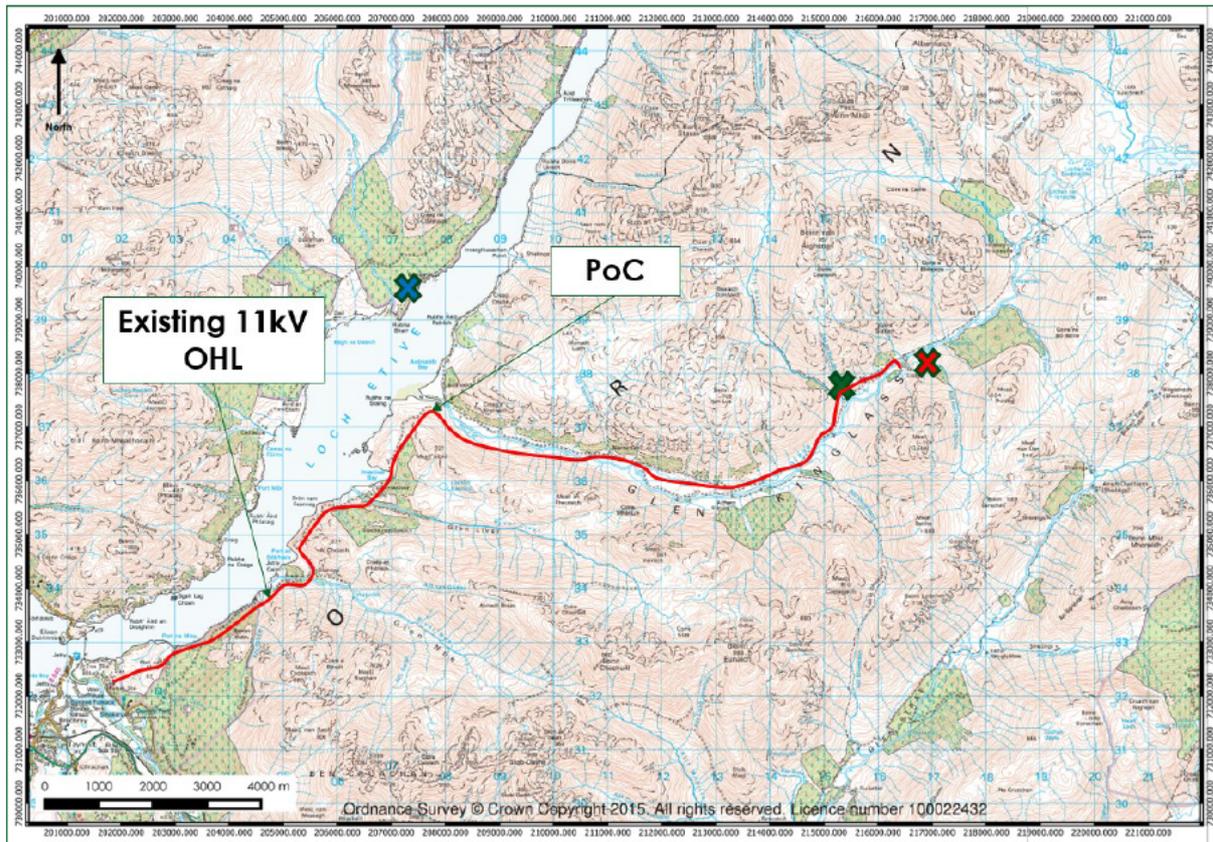


Fig 1 – PoC Location

To provide a connection of sufficient capacity, SSE Electricity Distribution would need to reinforce and upgrade the existing network which currently supplies the properties in and around Glen Kinglass. This would be achieved by converting the existing two wire, single phase, 11kV line to operate as a three wire, 33kV overhead line. An additional wire has to be installed and all of the insulators changed, but the new line would look very much like the line that's there at the moment. A number of pole mounted transformers at each property would also need to be swapped for slightly larger 33kV units. At the point where the connection is provided, a small substation building, designed to fit in with the existing structures, would be erected to contain switchgear used for metering the supply. The electrical connections from this point to each of the generating stations would be by underground cables and this network would be owned and operated by GHR. The electrical supplies to Glenkinglass Lodge and other properties would continue to be provided by SSE Electricity Distribution using the existing overhead line.



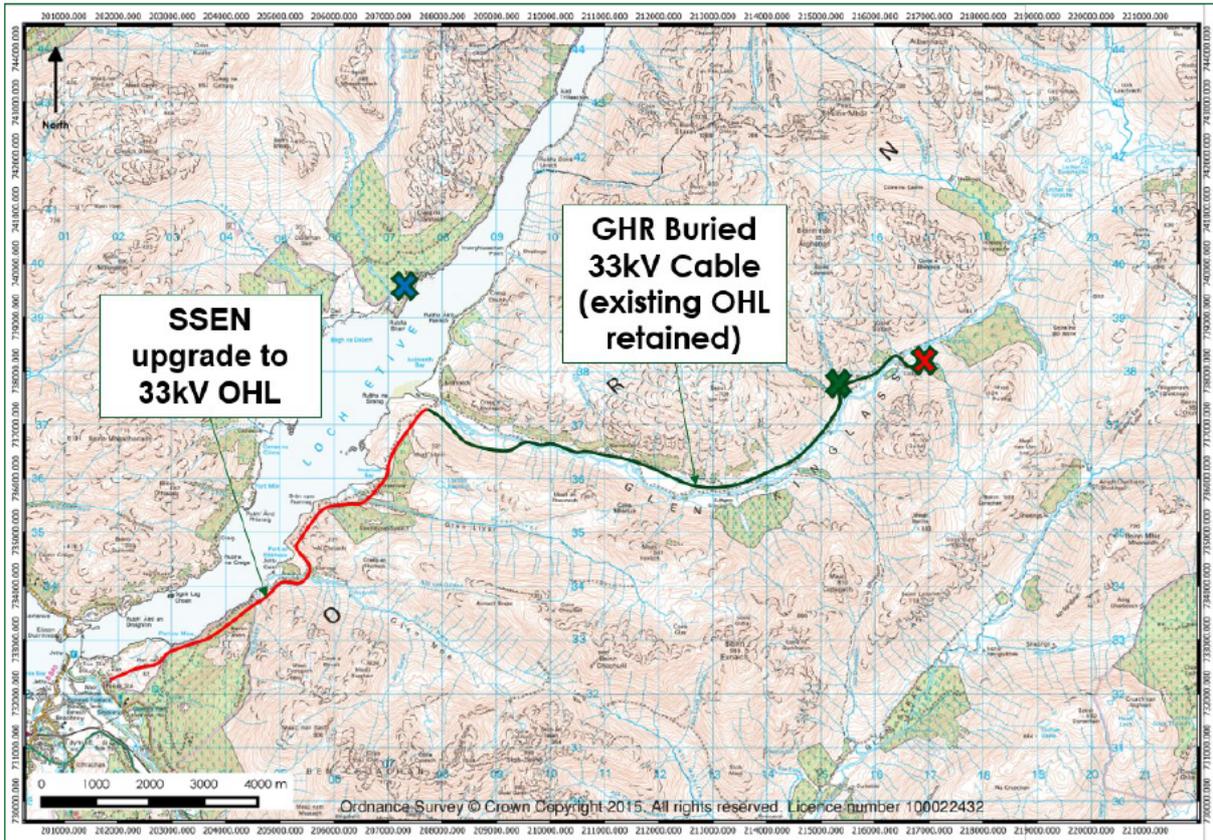


Fig 2 – Glenkinglass Connection



3.1. The Proposed Submarine Cable / Route

Loch Etive is a natural sea loch on the west coast of Scotland with relatively low salinity due to the constriction at the entrance caused by the Falls of Lora. Connection of the Allt Easach hydro scheme would require the installation of a 33kV cable from the powerhouse to the PoC, including a section on the seabed of Loch Etive. In choosing a route for the cable GHR have looked at a number of options before deciding on the proposed route. Navigational charts and sonar surveys suggest a suitable route exists between the headland on the south side of Ardmaddy Bay and the beach immediately to the west of Rhubha Bharr as shown in Figure 3. The route has been selected to try and avoid steeper slopes on the sea bed as far as possible. The landing positions or “shore ends” on either side of the loch have been selected at locations where it would be possible to bury the cable down to below the low water mark to avoid it being exposed to erosion through wave action or present a tripping hazard to anyone using the foreshore. The shore ends are more precisely shown in Figure 4.

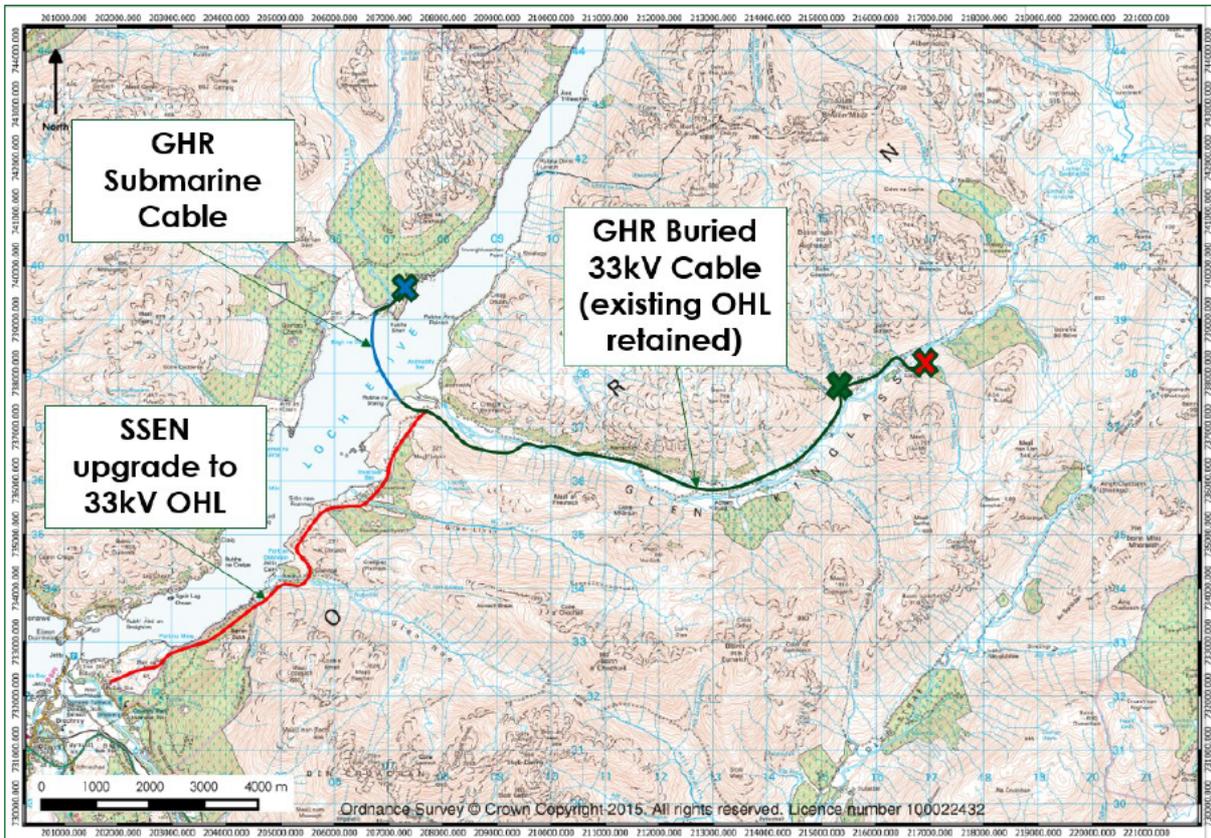


Fig 3 – Location Plan for Proposed Cable Route Across Loch Etive





Figure 4 – Proposed Cable Route Across Loch Etive

4. Cable Design

The type of cable proposed for use in Loch Etive is a standard submarine cable design that has been used extensively around Scotland. The same cable was also used by GHR during the installation of a private cable across Loch Tay in 2015 to connect a hydro scheme at Ardtalnaig. The cable is a 3 phase 33kV cable with copper cores and cross linked polyethylene insulation. The three cable cores are bundled together and held in place by polypropylene serving tape. A small 3 core communications cable is also included within the cable bundle and this cable would be used to open and close a circuit breaker at the Allt Easach site. The complete cable has a protective layer of galvanised steel wire armour laid over the outside to protect the cable from abrasion during installation and operation. A further layer of polypropylene is wound over the armour to give a black and yellow striped appearance which makes the cable easier to find on the seabed. The completed cable is approximately 95mm in diameter.

5. Installation Process

The submarine cable type used by GHR is currently manufactured in Japan. The completed cable is shipped to the UK and delivered by a low load HGV to Burntisland in Fife where Briggs Marine (the proposed contractor) is based. They have significant experience installing cables in Scotland for SSE Electricity Networks and for GHR. Their cable installation Vessel "Forth Guardsman" would be fitted out to accommodate the cable drum. Once loaded aboard Guardsman the vessel would sail around the



North of Scotland and pass below the Connel Bridge into Loch Etive. The Guardsman is fitted with two retractable piles which can be lowered to the seabed in relatively shallow water to hold the vessel in place without any need for setting a pattern of anchors and moorings. The vessel would position itself within 100m of one of the shore ends in approximately 5m of water depth before deploying the "spud legs" to hold her in position. One end of the submarine cable would be pulled ashore by a small winch onshore with floats attached to the cable to keep it above the seabed. Having completed the shore end the vessel raises the spud legs and then transits across the loch paying out the cable as she goes, to the other shore end. This transit closely follows the agreed cable route and the actual "as laid" position of the cable is recorded. The maximum depth likely to be encountered is approximately 70m over the proposed route. Once the vessel is in position at the second shore end the spud legs are once again deployed. A measurement is made between the cable drum and a suitable position well above the high water mark ashore. The same length of cable is then taken off the drum and coiled on the deck before the cable is cut. This cable is then winched ashore with floats just like the other shore end. Once the cable is installed the shore ends are buried to below the low water mark and a yellow diamond beacon is installed on both shorelines to mark where the cable comes ashore. The as laid position of the cable is notified to the UK Hydrographic Office who mark the position on Admiralty Charts and advise other suppliers of marine mapping software of the new cable. The European Subsea Cables Association and The Crown Estate are also notified.

6. Cable Repair or Replacement

Submarine cables do occasionally become faulty but they are generally very reliable, with most damage actually caused during installation or attempted burial. The type of repair carried out on a faulty cable depends on a number of factors including the age and condition of the cable and whereabouts on the cable route the fault has occurred. If a cable has faulted relatively close to the shore then it would be normal practice to renew the section of cable from the fault back to the shore, using methods very similar to those described previously for installation. Were the cable to fault near the middle of the route and the point of fault can be clearly identified, then it may be possible to cut the cable on the seabed and bring the faulted end to the surface. The faulty section of cable is removed and a piece of new cable jointed on. The other end is then retrieved from the seabed and jointed on to the new "pieced in" section. The complete cable is then returned to the seabed and re-energised. Where the cable is in very deep water or cannot be cut for whatever reason then the only option is to abandon the cable and lay a new one on a similar route. This is obviously expensive and would mean the output from the Allt Easach scheme could not be exported until the circuit was restored. The delivery and installation time for a new cable from when an order is placed would be approximately 1 year.

7. Decommissioning

Submarine cables have been in use around the UK for 150 years and some cables owned by SSE are still operational after 60 years. GHR cannot imagine circumstances which would result in a hydro scheme being closed down. Normally a scheme is refurbished after 40 years or so, giving it a new lease of life. If for some reason the



cable did become surplus to requirements then the cable could be removed in a similar way to how it was installed. It may also be acceptable to leave the cable disconnected but still in position on the seabed and this has until now been the generally accepted practice. Discussions with Marine Scotland and The Crown Estate would occur at the time to agree on a solution, but the schemes around Loch Etive are expected to deliver renewable energy to the grid indefinitely.

8. Project Schedule

GHR plan to submit planning applications for the three hydro schemes towards the end of 2017. To ensure the design of the cable accommodates all concerns and reflects the details of the anticipated discussions, it is hoped that consultation could be concluded by the end of May 2017. The cable installation would then likely take place in the autumn of 2018 or summer of 2019 in line with the construction of the proposed Hydro schemes.

9. Consultation Process

A list of consultees for the proposed cable installation project is included as Table 2.

Table 2 – Proposed consultees	
	Organisation
1	Scottish Fisherman's Federation
2	Mallaig and North West Fisherman's Association
3	Northern Lighthouse Board
4	Royal Yachting Association
5	Marine Coastguard Agency
6	Scottish Environment Protection Agency
7	Scottish Natural Heritage
8	Friends of Loch Etive
9	Muckairn Mussels Ltd
10	Dawnfresh Ltd
11	Landowners at each end of the cable route

GHR would be happy to speak to or meet with any individuals who have concerns about the proposal or require further information about any aspect of the plans. Information can be obtained by contacting one of the individuals named below.



Subsea Cable Installation / Marine Operations:

- [Redacted]

Hydro Scheme Consenting and Construction:

- [Redacted]



Appendix A - Site Images

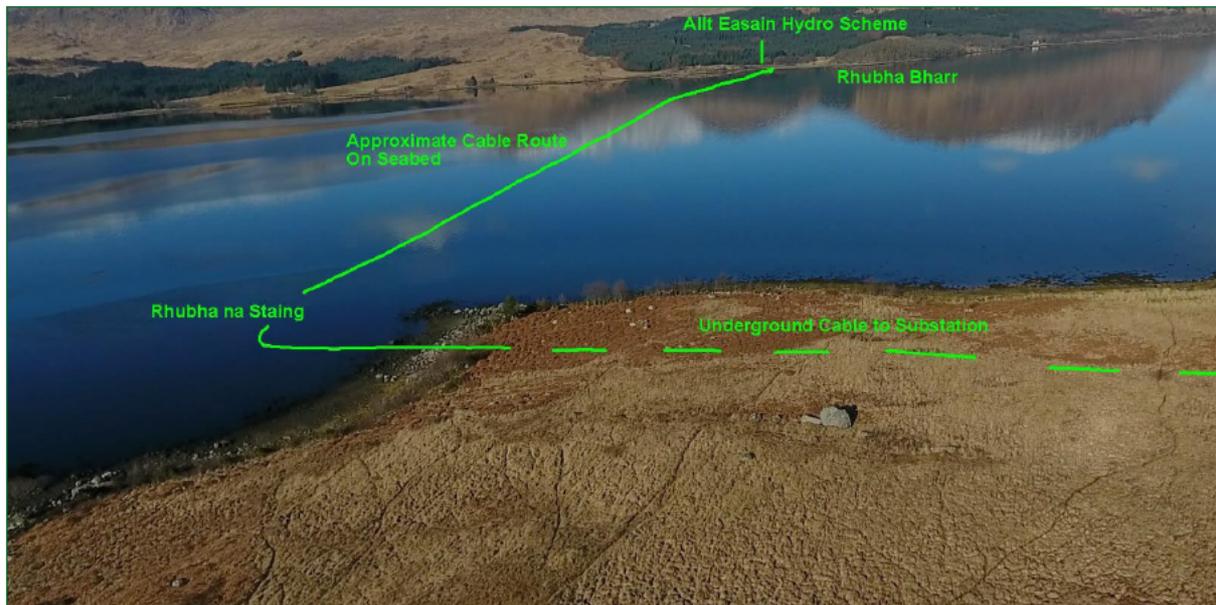


Image 1 – Cable route Viewed from East side of Loch Etive



Image 2 – Rubha na Staing Shore End on East Shore of Loch Etive





Image 3 – Rubha Bharr Shore End on West Side of Loch Etive



Image 4 – Forth Guardsman – Briggs Marine

