Specification for the Maintenance of and Associated Support for the SCADA System at Wave Hub Hayle Towans Substation

Tender Number – WHL/2017/TEN/03

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1 Project Background

1.1 Introduction

Wave Hub is the world's largest and most technologically advanced site for the testing and development of wave energy devices. It allows developers the opportunity to test arrays of wave energy devices over several years in a realistic, fully monitored marine environment.

Wave Hub Limited (WHL) is a private company limited by shares and the operating company of the Wave Hub facility. WHL's principle objectives are to:

- Accelerate and support the development of wave energy technology;
- Drive research and innovation to address the challenges of deploying at large-scale;
- Overcome the final hurdles to full commercialisation;
- Foster a growing marine renewables industry in the regions WHL is active in; and
- Secure the UK's position as a global leader in marine energy.

1.2 Wave Hub System Description

1.2.1 Infrastructure

Wave Hub comprises of a 25 km armoured subsea cable, an onshore substation and 8 sq km consented area of sea, 10 nautical miles off the north coast of Cornwall in the eastern extremes of the Atlantic Ocean.

The subsea power cable (SPC) consists of twin 300mm² 33kV power triads and two 24 core fibre optic cables, and is terminated onto two isolated busbars within the Hub chamber. The Hub sits on the seabed in approximately 50 metres of water and each busbar services two berthing areas via 300m 'tails' made up of three core 120 mm² 33 kV cable. The purpose of the Hub is to provide a watertight connection between the cable tails and the SPC. The fibre optic cables are split out from the SPC within the Hub and joined to those running to each wave energy array via the cable tails.

Each device developer will connect to the Wave Hub system by means of a subsea cable that will run from the lead device of each array to a connection point on one of the four cable tails that run from the Hub. The connections to the tails will be made above water using a dry-mate connector or cable splice. The connectors or splices provide electrical and fibre optic connection.

The SPC runs for approximately 17 km on a rocky seabed and then runs 8 km on a partially covered sand seabed until the shoreline is reached. The main cable is rock dumped for protection, stabilisation and span correction along the rock seabed section of the route, supplemented by concrete mattresses for additional stability. The cable is trenched and buried where possible along the sandy section of the route. Additional rock dump and concrete mattresses have been deployed where trenching is not possible.

Onshore, the SPC is trenched and buried across the beach area and is then jointed to a pair of 400mm^2 33kV onshore cables on the beach which pass through 2 directionally drilled 355mm polyethylene ducts under a series of sand dunes to exit into the purpose built substation which links Wave Hub to the UK's electricity grid.

The system is designed to operate at either 33kv, 11kV or with one circuit at 33kV and the other at 11kV, therefore the substation includes an 11kV/33kV transformer, shunt reactors, associated 33kV and 11kV switchgear and power factor correction equipment to ensure delivery to the grid within specification. Grid connection is made via the Western Power Distribution 132/33kV Bulk Supply Point, [BSP], at Hayle.

Control and monitoring of the wave energy convertors (WECs) will be performed remotely via a high speed broadband connection from the substation using data transmitted via fibre optic cables within the SPC. Power metering will be performed at the lead device on each WEC array and at the substation exit breaker. The WEC array meters will be provided by the WEC operators in line with the requirements of the Berthing Agreement.

Wave Hub has a 25-year lease from The Crown Estate and the consented area is subdivided into four berths that are capable of accommodating a generating capacity nominally of 4MVA at 11kV and 12MVA at 33kV, within the constraints of WHL's Connection Agreement with WPD of 30MVA. The Wave Hub infrastructure has the potential to be upgraded to 48MVA in the future, subject to consent.

A schematic of the Wave Hub system is presented in Figure 1.1

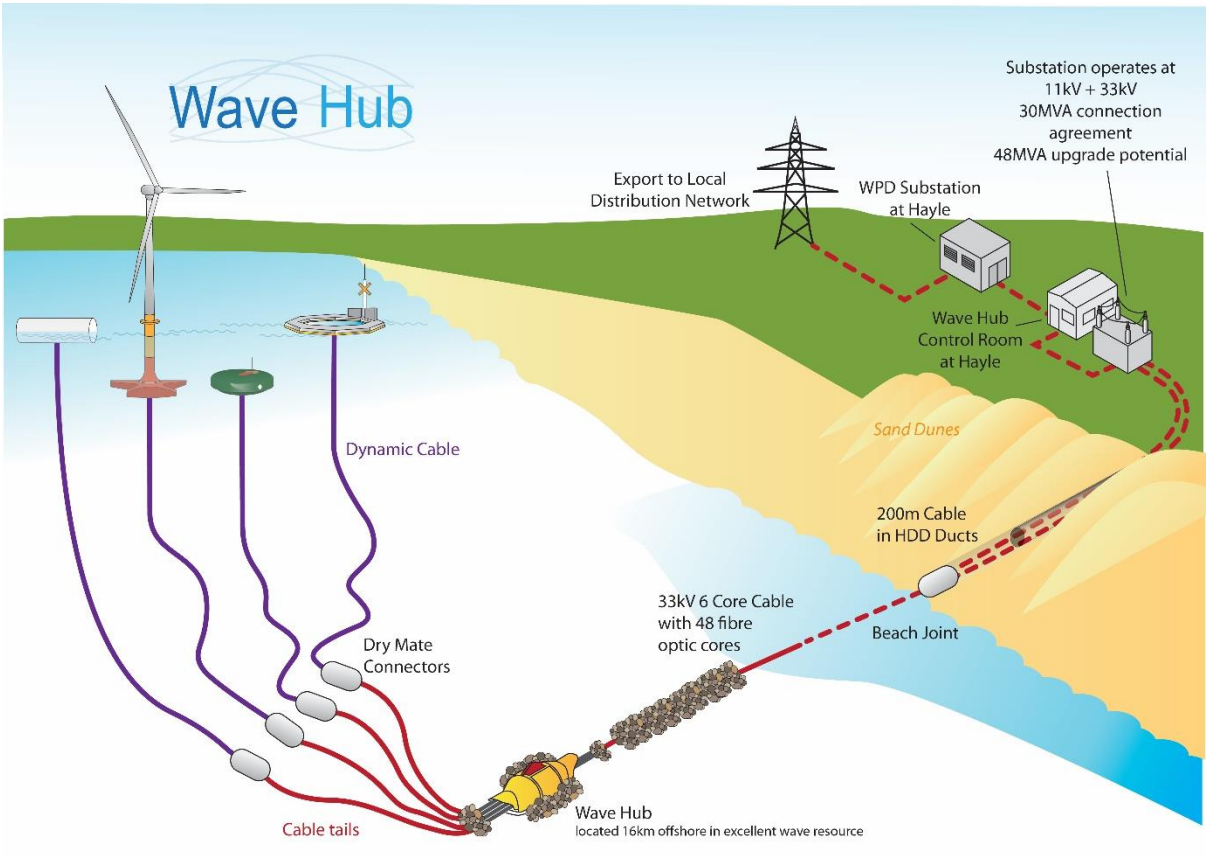


Figure 1.1

1.2.2 Wave Energy Converters

Wave Hub will accommodate a wide range of WEC devices, with up to four WEC arrays connected to Wave Hub at any one time. The WEC operator/developer will be responsible for the provision of moorings and the installation of the WEC arrays. Details of the operational constraints that each WEC will have to satisfy are included in the WEC Connection Specification. WEC owners will also be required to comply with the Wave Hub's Operational Management System that details procedures for access to the site.

1.2.3 Consents

Wave Hub has a consent under Section 36 of the Electricity Act 1989 that allows up to 120 wave energy converters and anchoring equipment to be deployed at the site with a combined capacity up to 20MW. This consent has been designed to accommodate a wide range of wave device technologies.

1.2.4 SCADA System Description.

<u>Introduction.</u>

Described below is an outline description of the Wave Hub Controls and Monitoring System and SCADA communications arrangement and is intended as an overview of the systems to as an aid to understanding how the system is configured and how communication between a Device and the Wave Hub onshore SCADA system is achieved.

The main objectives of the Wave Hub SCADA system are:

- Monitoring and control of onshore electrical network breakers,
- Communication to offshore WEC PLCs for acquisition of status data,
- Communication to offshore WEC Meters for acquisition of meter readings,
- Disconnection of onshore power circuits, and transmitting breaker OPEN requests to WEC PLCs,
- Acquisition of system data for the SCADA,

- Fault condition and alarm annunciation to the SCADA,
- Automated control actions when certain alarm conditions are recognised.

System Architecture.

The system comprises of an onshore and an offshore element, the onshore element is provided by Wave Hub Limited and the offshore element is provided by the Device Developer. Communication between the two elements is via the fibre optic cables installed within the subsea cable.

The onshore equipment consists of the following:

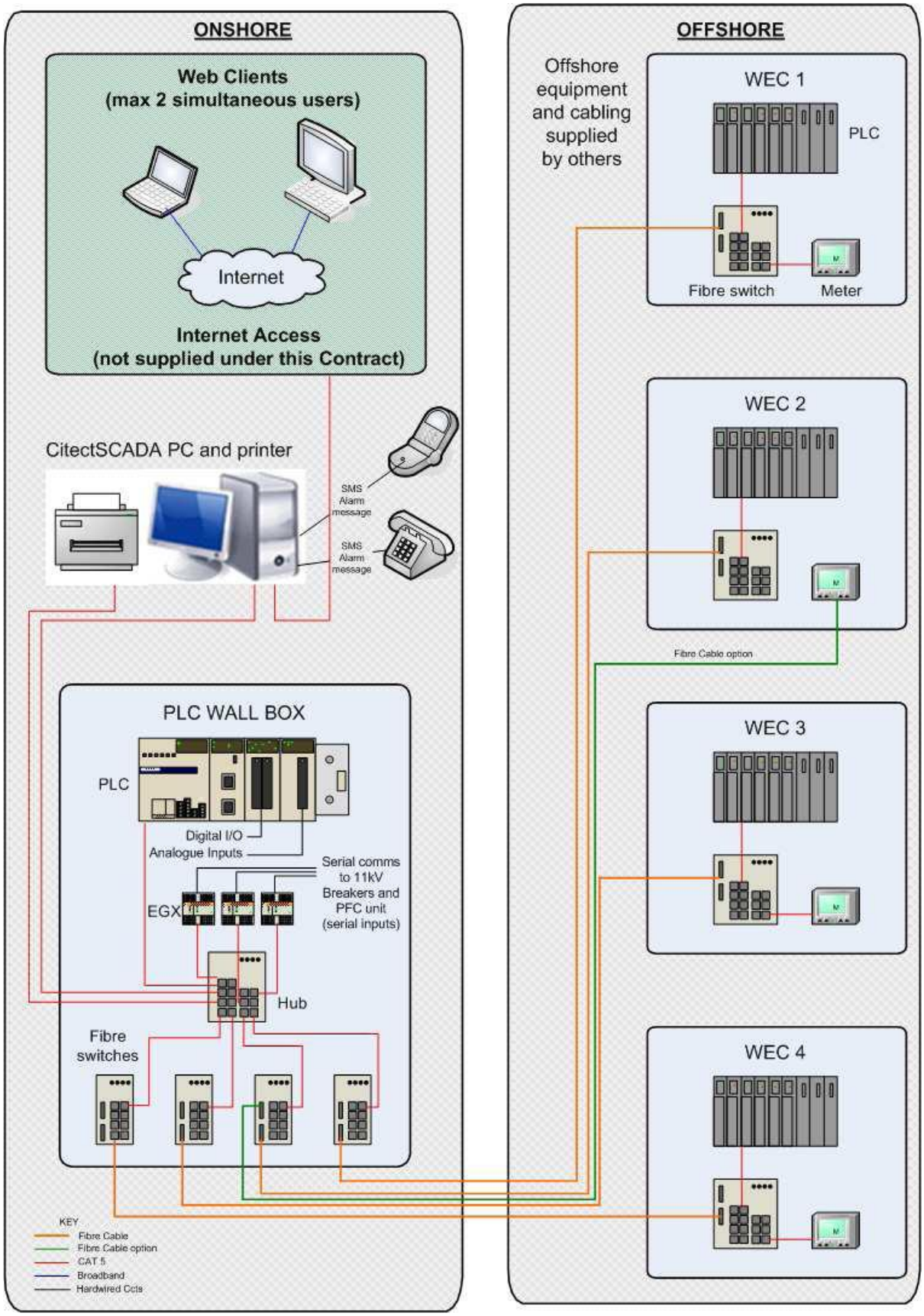
- The Primary SCADA Server, PC, [IOS1].
- Secondary SCADA Server, PC, [IOS2], this serves as a dual hot standby server.
- The Controls and Monitoring System, [CAMS] Cabinet.
- The field devices within the Wave Hub substation.

The offshore equipment will consist of the following:

- The device PLC.
- A fibre switch
- An electricity meter.
- Any other equipment required by the Device Developer for the operation of their device or array.

It should be noted that at the present time there is no offshore equipment. This will be required when a WEC is deployed and will be provided the Device Developer.

The following diagram shows the architecture of the system:



Document Title	Date	Revision No	Prepared By	Approved By
SCADA System Maintenance Contract	21/02/2017	2	Rob McConnell	Claire Gibson

The Onshore System.

The SCADA Servers.

The SCADA I/O servers are based on desktop PCs. Two servers are installed, IOS1 and IOS 2. IOS1 is the primary server and is located within the onshore substation Comms Room. IOS2 is the secondary server and functions as a dual standby hot server in the event of a failure of the primary server. IOS2 is located within the onshore substation Comms Room. Both servers are designed to have the same look and feel.

The SCADA servers are the human machine interface, [HMI], from which the system is controlled via screen graphics and commands. All graphical information is displayed on the SCADA power management control system. The system will allow all breaker statuses and meter readings to be displayed on a number of purpose-built screens. The SCADA package displays any operational alarms that may occur on the system to indicate a fault or failure. It also provides a system hardware and device alarm list and full trending and archiving facilities.

M340 PLC

The onshore control and monitoring system, [CAMS] cabinet houses a M340 PLC, which acts as a data concentrator for the SCADA system. The M340 communicates with EGX Gateways in order to communicate to RS485 devices [33kV and 11kV switchgear]. There is also local I/O fitted to interface to hardwired contacts.

The PLC is programmed specifically to gather data and present it to the SCADA system in a contiguous list of registers to aid system performance.

The PLC is connected to the offshore devices via the fibre optic switches and the fibre optic cables. The PLC will monitor the integrity of this connection. Should any failure of the fibre optic cable occur or communications lost, the WEC HV breaker will automatically open to a safe condition via the WEC fail-safe PLC.

EGX Gateways

The EGX100MG uses TCP/IP MODBUS communications via a CAT5e LAN cable and transforms this to RS485 MODBUS. Each one of these devices is programmed using an Internet Explorer web page which allows separate addressing of each device through a daisy chained communications line, as well as setting up the ports properties and communications settings.

The unit can support up to 32 devices on the serial connection line.

The unit is powered by 24VDC, derived from the equipment in which it is fitted, and its communications port wiring must be wired as two wire RS485.

Fibre Optic Switch

The onshore fibre optic connection is via a Schneider Electric Ethernet fibre switch. This is an industrialised intelligent device capable of identifying and routing traffic, and detecting and advising of faults that may occur on the network itself.

Each Offshore WEC point will be connected by means of the fibre optic cables to a Fibre Optic switch installed within the CAMS cabinet. The switch allows communications to each WEC, at 10MBs or 100MBs.

The units are configured to monitor the incoming fibre for any fault conditions. This common fault indication is hard-wired back to the local PLC. Any communication fault detected will cause the PLC to respond as per the control philosophy.

There is one fibre switch per WEC. Each fibre switch has two fibre ports and both ports are connected to form a redundant ring. This allows comms to be maintained even if one segment of the fibre cabling is faulty. Configuration in a redundant ring will only be possible if two fibre cables are available and the fibre interfaces at the WEC end support a ring configuration. All fibre faults will be alarmed.

The Fibre Optic Switch will be powered by 24VDC; this supply is provided within the CAMS cabinet and has battery backup.

The Offshore System interface with Wave Hub.

The Device Developer's PLCs will provide an interface to the hardwired breakers for tripping purposes and provide a gateway for information to be ported from the WEC equipment for display on the Wave Hub SCADA.

The system will also interface to a power meter installed in each WEC. This meter will provide energy and power quality data to the SCADA. It will also monitor the WEC HV isolator to provide impendent verification of the status of this equipment.

The substation and WEC equipment will be connected to the CAMS Ethernet network.

The WEC PLCs and power quality meters are to be equipped with the necessary Modbus TCP/IP interfaces and have the required protocols enabled. These are to be connected to shore via two pairs of fibre cables.

The equipment at the WEC needed to connect this fibre to the WEC PLC and power quality meters is the responsibility of the Device Developer.

The WEC PLC and power meter at the WEC need to be connected to the Substation PLC via an Ethernet network running Modbus TCP protocol. These items may be connected either through a shared pair of fibres (and network hub provided by the WEC manufacturer) (Type 1) or over individual pairs of fibres (Type 2).

The Wave Hub PLC and SCADA Server will monitor selected data points from the WEC PLCs.

To ensure consistency, a standard power meter is specified within the Device Developers Connection Specification for incorporation into the WEC equipment. These shall be from the Schneider PowerLogic range, either an ION7650 or ION7350.

The WEC incoming circuit breaker states at the substation will be remotely operated by providing a permissive close and an open signal.

The Wave Hub system shall instruct the WEC PLC to close its WEC HV breaker. Once it has verified that the WEC is able to generate it forwards a permissive close of the WEC LV breaker.

On loss of connection with the WEC PLC, the Wave Hub PLC may disconnect the WEC by opening the onshore breaker, should it determine (through the I/O on the WEC power meter) that the WEC's HV breaker is still closed.

On loss of connection to both the WEC PLC and WEC power meter, the system will open the onshore circuit breaker.

<u>Optical fibre network.</u>

The subsea cable provides 6 pairs, [12 fibre cores], to the lead device via the cable tails, extensions and the dynamic cable. Two pairs are routed back to the Wave Hub CAMS cabinet for the Wave Hub controls and monitoring , and the remaining four pairs are routed to a Comms Cabinet dedicated to the berth.

The network can be re-configured to facilitate shared fibres, but this will require the installation of an additional router, [open protocol controller], to enable this connection arrangement.

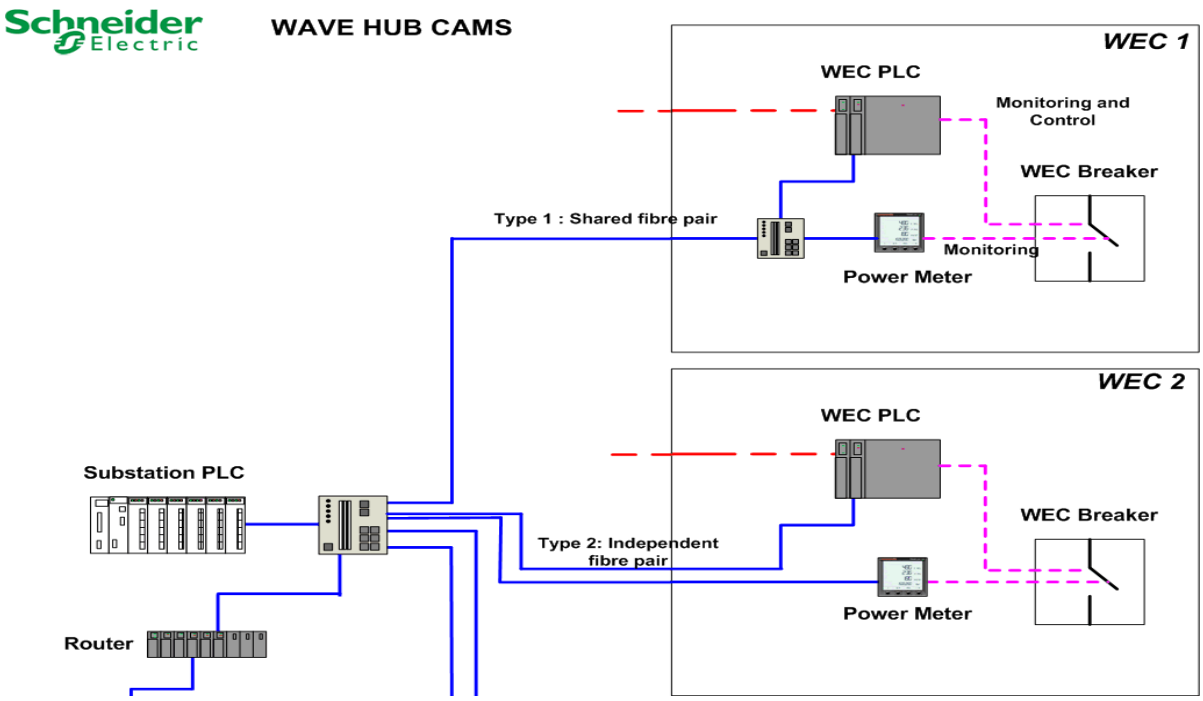
The Wave Hub system requires a guaranteed bandwidth of 2Mbs. If the network is shared with other services, Wave Hub will require a suitable Quality of Service regime to be implemented. This is paramount in ensuring that the system response is not compromised through excessive traffic flows.

Due to the nature of the site Single Mode Fibre communication will be used. Multi Mode Fibre communications are restricted to up to 5,000 metres (typical 2,000 metres), dependent on the attenuation analysis and attenuation of the fibre optic installed, before the need for a repeater station.

Single Mode Fibre communications are restricted to up to 32,500 metres, with a typical 15,000 metres dependent on the attenuation analysis and attenuation of the fibre optic installed.

The diagram below shows the connection arrangement for shared and independent fibres for the Wave Hub system. A similar arrangement can be adopted for a system comprising of shared fibres between Wave Hub and a Developer, although the preference is for separate systems.

It should be noted that for the system to be configured for a shared fibre arrangement between Wave Hub and a Developer additional equipment and re-routing of the fibre optic cabling will be required within the Wave Hub substation.



2. Particular Specification

2.1 Introduction

This section sets out the scope of maintenance work and additional support services that WHL are procuring.

This Specification is intended to define and outline the minimum standards, workmanship, safety and deliverables expected from the appointed Maintenance Contractor (the Contractor) for the SCADA system installed at the Wave Hub Hayle Towans Substation.

2.2 SCADA Maintenance Contract - Scope of Work

WHL requires all its electrical systems to be maintained and be subject to regular condition assessment and maintenance in accordance with the systems manufacturing manuals and recommendations as well as industry best practice. This has been reflected in the requirements given below.

If the contractor finds or knows of discrepancies between the systems operational and maintenance manual and new Industry standards or requirements it is expected that the contractor will notify the client to discuss with the system provider.

The maintenance work to be undertaken as part of this Contract is as follows:

2.2.1 Annual Maintenance Visit.

The Contractor shall visit the Wave Hub Site on an annual basis to undertake the following as a minimum:

Carry out an initial system health check and metering COMMs integrity check in order to gather an overview of the status of the SCADA system.

Investigate any system alarms raised since previous visit and advice of strategies on reducing or eliminating these alarms either during the visit or within a post visit report.

Perform a full database backup, to help to prevent potential catastrophic system failure from losing essential data, potentially being used for reporting or billing purposes.

In addition to the above and time permitting, the Contractor will provide the following services:

Undertake any changes/enhancements to system set-ups. To be advised by the Client prior to the maintenance visit.

Undertake Client and client's agent refresher training. Requirements to be advised prior to the maintenance visit.

The maintenance periods for the system shall not be exceeded. However, within the duration of the Contract it may be found necessary to shorten these periods after experience to cater for operation under adverse conditions etc. The Contractor shall therefore provide within the Tender Return a Schedule of Rates for each item of equipment detailing the cost associated with each maintenance item associated with the item of equipment.

All works to the equipment shall be undertaken to the Manufacturer's requirements as detailed within the relevant Operation and Maintenance Manual.

If the contractor finds or knows of discrepancies between the plants operational and maintenance manual and new Industry standards or requirements it is expected that the contractor will notify the client to discuss with the equipment provider

The Contractor shall prepare a maintenance programme for the equipment detailed within this Specification based upon the maintenance periods indicated. A copy of this programme shall be included within the Tender Return.

Within the Tender Price the Contractor shall allow a visit to the site within fourteen days of being awarded the Contract to familiarise themselves with the system and to undertake an inspection of the system and to provide a report to the Engineer of any defects noted during the inspection.

2.2.2 Monthly Support

The Contractor is to provide a monthly maintenance check via a remote desktop connection, reporting any defects or issues with the system to the Engineer.

2.2.3 Off Site Support.

The Contractor shall provide general telephone, support via the Designated Site Engineer during "normal" working hours, 09:00 to 17:00 for the duration of the contract.

2.2.4 Remote Call Out.

The Contractor shall have the facility to provide a 24hr 365 day / year emergency cover to Wave Hub on a call out basis.

The Contractor shall indicate within the Tender Return how their call out system shall operate, i.e. point of contact, telephone support, time to attend site etc.

In the event of a call out, engineer call back to confirm receipt of the call out, advice primary action, take the agreed technical response and or dial up response shall be undertaken within 1 hour of the call out.

The Contractor shall indicate within the Tender Return the costs associated with the provision of the call out service.

2.2.5 Software Updates.

The Citect SCADA software installed is version 7.1 and the Contractor shall allow within the Tender Sum to upgrade and install the latest version of the Citect software, version 8.1

The Contractor shall provide and install all updates to the Citect SCADA software as released by the system manufacturer. It is envisaged that this will be undertaken remotely via a dial up facility. Installation of software upgrades must not interrupt the operation of the Wave Hub System.

2.3 Additional SCADA System Support Duties

2.3.1 Operational Support

WHL shall require, from time to time, assistance with the operation of the SCADA System. This is generally envisaged to be, but not limited to, during the deployment of a WEC and could involve testing of systems and equipment.

Unlike a call out this work will be planned in advance and be carried out to a programme. The Contractor shall indicate within the Tender Return the costs associated with the provision of the Operational Support Service on this basis.

2.4 Personnel

The following personnel shall be provided by the Contractor for the implementation of this contract:

2.4.1 Contract Manager

The duties of the Contract Manager are described below:

- Shall be in a senior position within the Contractor's Company, and shall be the first point of contact between WHL and the Contractor.
- Shall be in such a position to be able to make all commercial decisions on behalf of the Contractor in relation to the Contract.
- Shall be responsible for the overall implementation and administration of the Contract.
- Should have experience of the renewable energy industry.

Details of the proposed Contract Manager, including a CV and details of relevant experience, shall be provided with the Contactor's Tender Return.

2.4.2 Designated Site Engineer

The duties of the Designated Site Engineer are described below:

- Shall be a senior engineer within the Contractor's Company, and shall be responsible for the site operations required for the Maintenance Contract.
- Shall be responsible for all works undertaken as part of this Contract.
- Shall have sufficient qualifications and experience to undertake the role in respect of the type of installation installed at Wave Hub.
- Should have experience of the renewable energy industry.

Details of the proposed Designated Site Engineer, including a CV and details of relevant experience, shall be provided with the Contactor's Tender Return.

2.4.3 Installation Technicians

The Contractor shall provide sufficient Installation Technicians to undertake the works described within this Specification.

The Installation Technicians shall:

- Be under the control of the Designated Site Engineer.
- Be sufficiently skilled and experienced to undertake the tasks required.
- Have sufficient qualifications and experience in respect of the type of installation installed at Wave Hub.

Details of the Electrical Engineering Technicians required for the Contract shall be provided with the Tender Return.

2.5 Contract Schedule

Within the Tender Proposal the Contractor shall indicate the period of time required for maintenance of the system. These time periods will be used by WHL to advise the WEC Developers of the shutdowns of the system that will be required for maintenance of the system.

3. Service Level Agreement

The Contractor shall be aware that the following items may result in termination of the Contract:

- Non-compliance with the WHL Operational Management System.
- Failure to attend a call out within specified time.
- Failure to comply with the requirements of this Specification.

In the event of the occurrence of any of the above, WHL shall immediately advise the Contractor's Contract Manager, in writing, who shall arrange for the necessary remedial actions to take place without delay.

Any costs associated with these remedial actions shall be borne by the Contractor.

4. Instructions to Tenderers

4.1 Introduction

Failure to comply with any of these instructions may lead to tenders being rejected.

4.2 Clarifications

If there is any query regarding the meaning of the Tender Document the Tenderer shall set out such queries in writing, by e-mail, for clarification and address them to Rob McConnell, Wave Hub Electrical Engineer at clarifications@wavehub.co.uk, quoting the Tender Reference Number WH/TEN/2017/03.

Requests for clarification shall be submitted in writing, by e-mail, in sufficient time to allow a response and at least two working days before the final date for submission of Tenders.

4.2.1 Tender Amendment

During the tender period WHL may issue Tender Amendments to clarify, modify or add to the Tender Document. A copy of each Tender Amendment will be issued via the Contracts Finder Portal and the Wave Hub Website. No addition or alteration shall be made to the Tender Document unless it is the subject of a Tender Amendment.

4.2.2 Conditions for Tendering

WHL does not bind itself to accept the lowest or any Tender nor shall WHL be liable for any expenses incurred by the Tenderer in preparation of the Tender. Tender qualifications are to be avoided by prior clarification of requirements or interpretation with WHL. A qualified Tender may be rejected.

4.2.3 Information to be Returned with Tender

The following information is to be returned in the order specified in a single folder containing the relevant files in pdf format.

- Project Organisation setting out the proposed team along with details of any sub contractors to be appointed.
- Experience of the company in maintenance of SCADA systems with a particular emphasis on renewable energy systems, in particular offshore wave and wind energy.

- List of key personnel that you are proposing to deliver the maintenance along with CVs for key staff. The CVs should show how the proposed individuals have the necessary skills and expertise to meet the requirements of this specification.
- A detailed method statement setting out as a minimum your approach to managing this appointment.
- A maintenance programme for the equipment detailed within this Specification based upon the maintenance periods indicated.
- Details of the operation of the call out system as proposed by the Contractor.
- A schedule of staff resources (with hours/days by activity) required to complete the work described to tally with the lump sum submitted as part of the tender.
- The Contractor's Risk Assessments and Method Statements for undertaking work on a Client's SCADA system.
- The completed QHSE Tender Questionnaire, see Appendix B.
- The completed Form of Tender, Appendix C. The Contractor shall note that this document is to be returned both in pdf and Exel formats as per the files provided with the Tender Invitation.

Tenders should be returned by e-mail to:

tenders@wavehub.co.uk with the subject line Tender Number WH/TEN/2017/03, by 12.00 hrs on the 13th April 2017. Tenders should not bear any identification of the sender.

Tenders received after the time stated for return will not be considered.

5. Evaluation

5.1 Evaluation Criteria

Submissions will be assessed based upon the most economically advantageous tender. There will be a quality/price split of 70/30. The following assessment criteria will be applied to the submissions:

Quality – 40 points

Project organisation	5
Company experience	10
Detailed maintenance proposal	25

Team composition/roles – 30 points

Contract Manager.	10
Designated Site Engineer.	15
Installation Technicians.	5

Price – 30 points

Commercial Offer (Price)	30

This is the Tendered rates from the Form of Tender. 30 Points will be awarded for the lowest price for the delivery of the Maintenance Contract. The number of points will be awarded such that the lowest Tenderer for the project receives 30 points, others will receive points based on their percentage above the lowest tender, eg:

Lowest tender rate - £1m, 1/1 x 10 = 30

Next lowest tender rate - £1.2m, 1/1.2 x 10 = 25.00

5.2 Award of Contract

If and when it is decided to award a contract, a written notification will be sent to each of the Tenderers advising of our decision.

Appendix A – Standard Specification Clauses

Definitions

In applying the Specification the following words shall have the following meanings assigned to them unless there is something in the subject matter of context inconsistent with such construction.

"CLIENT" shall mean the Person, Persons, Company, Authority and their Representatives who have instructed that the works shall be carried out.

"ENGINEER" shall mean the person representing Wave Hub Limited.

"CLIENT REPRESENTATIVE" shall mean the person appointed to supervise the works.

"CONTRACT" shall mean the Contract made between the Client and the Contractor.

"CONTRACTOR" shall mean the Person, Firm or Company whose quotation for Specialist Engineering Works forming the subject of this Specification has been accepted and who has entered into a Contract with the Client and shall include his or their successors, heirs, executors and administrators.

"SPECIFICATION" shall mean the Specification on which the Tender is based.

"MATERIALS" shall mean all plant, materials and equipment for incorporation in the works.

"WORKS" shall mean and include all materials to be used and work to be done by the Contractor under the Contract and shall include supplying, fixing, testing, regulating and commissioning of the installations described in the Specification.

"SUPERVISING OFFICER" shall mean the person appointed by the Client who is responsible for the administering of the Contract.

"SITE" shall mean the actual place or places to which the materials shall be delivered to where work shall be done by the Contractor, together with so much of the area surrounding the said place, or places, as the Contractor shall actually use in connection with the Works as otherwise than merely for the purpose of access to the said place or places.

"WRITING" shall mean any manuscript, typewritten or printed statement under seal or hand as the case may be.

"SHALL" shall mean mandatory.

"SHOULD" shall mean optional.

"WILL" shall mean informative.

"DATE OF TENDER" shall mean the date nominated in the enquiry document for the return of tenders.

"BRITISH STANDARD SPECIFICATION" The term "BSS" or "BS" shall mean British Standard Specification, current edition.

"OTHER DEFINITIONS" OR "EXPRESSIONS" shall have the meanings respective assigned to them in the Contract Terms and Conditions. Work importing persons include Firms and Corporations.

Words importing the singular only also include the plural and vice versa where the context requires.

The terms "APPROVED" and "DIRECTED" herein shall mean approved and directed in writing by the Client or the Client's appointed representative.

"OMS" shall mean the Operational Management System of Wave Hub Limited.

Tender Drawings

The drawings provided as part of the enquiry documentation shall be treated as confidential documents and must not be loaned or copied to any other party without the express permission of the Engineer.

The drawings provided (together with this Specification) are intended to provide sufficient information to enable tenders to provide estimates for the required work and provide the basis for working drawings, if required. Not all items or matters referred to in the Specification are indicated on the drawings and similarly not all items detailed on the drawings are described in the Specification.

Unless previously advised by the Engineer the tender drawings are not intended for use as working drawings.

The Contractor to Inform Himself Fully

The Contractor shall be deemed to have examined the site, the Specification, drawings and any other documents which form part of the Contract or describe the works.

In the case of an existing installation the Contractor shall be responsible for visiting site to carry out a pre-tender survey to ascertain the conditions under which the work is to be carried out, means of access, requirement for scaffolding, building structure and obtaining full particulars of any part or parts of the existing installation and make full allowance in his Tender for all such like factors.

No allowance shall be made for ignorance due to the Contractors neglect in this respect.

Conflict

Any contradiction between the Specification and drawings must be brought to the attention of the Engineer during the tender period when a ruling will be given.

A discrepancy between the Specification and drawings will not be accepted as a basis for additional payment after receipt of tenders.

If the details given in the Specification conflict in any way with manufacturers installation instructions or the requirements of British Standards or Codes of Practice, then the relevant section of the Specification will not be adhered to. Any such conflicts shall immediately be brought to the attention of the Engineer.

Dimensions

The Contractor shall take his own dimensions of the buildings or structures for the purpose of installing any plant and materials to be supplied to fixing under the contract and shall be responsible for the accuracy of such dimensions. These dimensions shall be used in preference to any supplied the Engineer.

Dimensions written on drawings shall in all instances, be taken in preference to those measured on a drawing to a given scale.

Any such discrepancies shall be notified to the Engineer before action is taken.

Connection to Equipment

The Contractor shall be responsible for the satisfactory reconnection of any existing plant or equipment which he disconnects during the course of the work.

Supervision

The Contractor must, during the period of the works, engage a suitably qualified person on site to supervise the work, whose identity shall not be changed without the written agreement of the Engineer.

The suitably qualified person must be capable of taking decisions and receiving instructions which are binding on the Contractor.

Specialist Trades Attendance on Equipment

The Contractor shall arrange and make all payment for specialist tradesmen to visit the site, adjust and put into working order all items of specialist plant and equipment, as detailed in the Specification.

Noise and Vibration

The work is to be undertaken in the vicinity of occupied buildings, the Contractor shall arrange this work so that the minimum noise and inconvenience is caused to the occupants of the buildings.

Fire Hazard

The Contractor shall be responsible for ensuring that proper precautions are taken to protect the building and its contents where naked flame is used in the course of the work, commissioning or testing.

He shall ensure that fire extinguishers, fire blankets or other devices required by the local Fire Officer are available in areas where such hazards exist.

Standard of Installation

A suitably high standard of installation shall be maintained to comply with the requirements of this Specification and those of the relevant bodies as published in the latest editions of their standard requirements and/or regulations.

For example:-

i) British Standards issued by the British Standards Institute
ii) Building Regulations
iii) Requirement of the Health and Safety Executive and CDM Regulations
iv) Regulations under the Electricity Acts issued by the Department of Energy
v) Requirement of the Local Fire Officer and/or Building Control Officer
vi) Current IEE Wiring Regulations for Electrical Installations and current amendments
vii) Requirements of the Local Electricity Distribution network Operator
viii) CIBSE Recommendations

Any installation or parts thereof installed by the Contractor deemed by the Engineer to be untidy, installed incorrectly, not in accordance with the above will be removed and correctly installed to the satisfaction of the Engineers at the Contractors cost.

Materials

All the required materials and equipment shall be new unless otherwise stated in this Specification. Where detail or descriptions are given, these are for guidance only, and the Contractor shall ensure that full allowance is made for all associated materials and equipment to provide a fully complete and operational installation.

The Contractor must prepare his Tender based upon the material specified but may offer alternative materials to those specified by listing them on a supplementary sheet to his Tender.

Any alternative material offered shall not form part of the Tender offer but will be considered provided there is a benefit to be gained either in cost, quality or delivery.

If alternative materials to those which are specified are accepted, any time spent by the Engineer in changing the installation to accommodate the alternative materials will be paid for by the Contractor.

The design responsibility for the change will be rested with the Contractor who will be required to confirm to the Engineer via the Main Contractor, that he (the Contractor) indemnifies the Engineer for any time spent and costs incurred by the Engineer as a direct result of changing from the materials originally specified.

The Contractor must ensure that all specified materials are correctly applied and installed strictly in accordance with the manufacturer's advice and requirements. Any conflict between information given in the Specification and that given by the manufacturer must be brought to the attention of the Engineer before tenders are submitted.

Any costs incurred by the Contractor through not installing materials in accordance with the manufacturers requirements will not be reimbursed through the Contract.

Ordering of Materials

The Contractor should obtain the specified materials from any available source.

Should the Contractor fail to order materials immediately and as a result specified materials become unavailable, suitable alternative materials shall be detailed by the Contractor for approval by the Engineer and any additional cost shall be borne by the Contractor.

Protection of the Installation, Equipment and Materials

The Contractor shall ensure adequate, safe and suitable storage for all materials and equipment provided by, and installed by him.

All materials and equipment shall be adequately stored under cover to prevent damage to the materials.

All materials or equipment stored in an unsuitable method will be rejected by the Engineer and replaced at no cost to the Client.

The Contractor shall ensure that the condition of all materials and equipment is maintained during the course of the Contract and that no damage, corrosion, soiling or deterioration of any kind affects the materials or equipment.

Existing Materials

The Contractor shall not, under any circumstances, re-use existing materials unless permitted in writing by the Engineer or unless specifically stated in the Specification.

Where existing materials are to be re-used the Contractor shall take full responsibility for the condition, safe-keeping and satisfactory re-use of such materials.

Schedule of Rates

A schedule of rates for the project shall be provided with the Tender Submission.

Where the Engineer requests quantities to be included, the schedule shall clearly show the following:

Item

Quantity

Rate/Quantity

Total Cost

The following provides an illustration of what is required:

Item	**Quantity**	**Rate**	**Total**
Insulating Oil	100 Litres	£30/litre	£300.00

The rates given shall be inclusive of all on-costs.

The total of the schedule prices shall equal the contract price.

The prices given shall be the installed cost to the Client and shall be used for costing variations to the Contract and the evaluation of work for interim payments, if required.

When used for costing variations of a like basis it is deemed that the schedule price given includes for all costs associated with contract administration overheads and profit and that no additional charges will be levied.

Variations

General additions or omissions of work shall only be carried out on receipt of written. No order for such alterations, additions or omissions will be issued until an estimate of cost has been submitted by the Contractor unless specifically instructed in writing by the Engineer.

Interim Claims for Payment Conflict

Interim claims for payment shall include a statement indicating:-

(a) Value of work complete for each defined price section of work in the Summary of Tender.

(b) Priced schedule of unfixed materials on site.

(c) Value of work complete against each agreed variation.

(d) Value of unfixed materials on site for each agreed variation.

Materials stored off site will not normally be paid for unless specific agreement is reached between the Contractor and Client in accordance with the Contract.

Performance Tests

The Contractor shall satisfy the Engineer by means of suitable test procedures during the undertaking of and final test on completion that the whole of his work is carried out in accordance with all rules and regulations applicable to the work, and shall provide at his own expense all testing, apparatus, etc., and shall provide all labour required. The accuracy of the tests must be to the satisfaction of the Engineer whose decision will be final.

Commissioning and Completion

The Contractor shall ensure that the whole of the work are completed, tested and commissioned before the final inspection is carried out by the Engineer.

The Contractor shall clear away all rubbish and surplus materials and ensure that the whole installation is in a clean, sound and satisfactory working order.

When the Contractor is confident that the works are complete, he shall inform the Client whereupon an inspection will be carried out by the Engineer and a list of outstanding and/or remedial works prepared. The Contractor shall attend to all items noted immediately in order that the installation is completed to the Engineer's satisfaction for handover.

The Contractor shall provide attendance to all commissioning carried out by Specialist Contractors and shall be responsible for the satisfactory completion of such works. The Contractor shall also provide attendance during the commissioning of any other site works where he has had a contractual involvement.

The Engineer will not certify completion until all works under the Contract have been completed, tested and demonstrated to his complete satisfaction.

The Contractor shall advise when all listed items have been attended to such that a confirmatory re-examination may be carried out by the Engineer.

If such advice is not received, re-examination will be carried out to suit the Contract requirements, before handover. If the re-examination determines that the Contractor has not successfully cleared the list of items, all costs incurred by the Engineer in subsequent inspections will be the responsibility of the Contractor and be debited from the Contract Sum.

Final Inspection and Handover

Upon completion of all outstanding works and/or remedial works the Contractor shall notify the Client that all works are ready for handover. A final inspection will then be carried out at an agreed date to suit all parties. The inspection will be carried out by the Engineer or his representative and a responsible representative of the Contractor shall be present. If the work has been completed to the satisfaction of the Engineer or his representative, a Hand Over Certificate will be issued.

The Construction (Design & Management) Regulations 2015

The Contractor shall, before submitting a Tender, be fully aware of the requirements of the above Regulations.

The Contractor shall include in his Tender for fully complying with all requirements of the current UK Health and Safety Legislation, Regulations and Codes of Practice, including the 2015 CDM Regulations and any transitional provision of the regulations and subsequent amendments.

The Contractor shall include for all liaison and co-ordination required by the CDM Regulations and for the production of all Method Statements, Health and Safety Plans, details, documents, information, etc., such that the Health & Safety Plans as required under the CDM Regulations can be produced and the requirements of the Regulations can be met.

The Contractor shall include for the continual update of documents, etc. as necessary, and for the provision of all record drawings, plans, maintenance procedures, O & M Manuals, details and locations of all materials used during the maintenance works, etc., as required by the Health and Safety Executive and any other documents that may be required such that the system Health and Safety Manual can be updated and handed to the Client in order that the Client has final documentation to satisfy the CDM Regulations and to enable the Client to operate and maintain the "Works" in accordance with HSE Legislation.

Appendix B – QHSE Tender Questionnaire

	Question	**Response**
1.	Does the Contractor have an implemented Quality Assurance scheme?	
2	Does the Contractor have an implemented Safety Management System?	
3.	Does the Contractor have an implemented Environmental Management System?	
4.	Does the Contractor have a hazard/risk management plan in place?	
5	Does the Contractor have a waste handling plan / recycling facilities in place?	
6.	Please provide incident statistics for the last 5 years, including: • Number of fatalities • Number of lost time incidents • Number of environmental incidents • Number of near miss reports	
7	Please provide details of any criminal prosecutions or HSE enforcement proceedings for the last five years, or currently pending.	

Appendix C – Form of Tender