Request for Proposals (RFP) 2021-003847
Subsea Power Cable Manufacture, Delivery, and Installation: PacWave South

RFP #2021-003847

ADDENDUM NO. 6

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NOTE: Supporting documents for this RFP are available at:
https://oregonstate.box.com/s/w6ak5y176s2mcgjd85u77nju26shnqfv

This Addendum is hereby issued to inform you of the following revisions and or clarifications to the above-referenced RFP and/or the Contract Documents for the Project, to the extent they have been modified herein. Any conflict or inconsistency between this Addendum and the Solicitation Document or any previous addenda will be resolved in favor of this Addendum. Proposals shall conform to this Addendum. Unless specifically changed by this Addendum, all other requirements, terms and conditions of the Solicitation Document and or Contract Documents, and any previous addenda, remain unchanged and can be modified only in writing by OSU. The following changes are hereby made:

QUESTIONS:

1. **Q: If the Jones Act does apply will the main lay vessel need to be US flagged then as it relates to dropping off spares etc.?**

   A: The spare cables will not be required at the time of cable installation. For this proposal, it should be assumed that spare cable delivery to a Port in Oregon is part of the scope of supply. However, in the event that delivery of spare cable impacts installation vessel options, suppliers are free to specify shipment and delivery of cable via separate means within 18 months of cable system acceptance.

2. **Q: Please provide cable alignment or north up charts for the five cable routes with panels for**

bathymetry and seabed features (with main geological features) and a seabed profile and geologic information panel (vertical:depth, horizontal:KP). Common chart scale is 1/5000 scale and comprehensive legend on the alignment charts is paramount.

This information is needed to issue a target cable burial depth profile along the routes, and it will allow PacWave to understand and to compare bidders cable burial methods and target burial depth. It will also make it easier to work on cable route changes or adjustments and help reduce the number of proposal pages.

A: North up charts are not available at this time. It should be noted that georeferenced sub-bottom profile data is available in the ArcMap GIS project contained in the PacWave Marine Geophysical and Geotechnical Survey 2018 zip file available via the link at the top of this document. In ArcMap, the profiles can be accessed by turning on the SUB BOTTOM LAYERS and clicking on the survey lines using the "Hyperlink" tool.

The 2018 survey sub-bottom data is also discussed in Sections 7.6, 8.3 and 8.6 of the PacWave Marine Geophysical and Geotechnical Survey Report 03142019 PDF file available via the same link.

3. Q: Where will the spare cable be delivered/stored? Are we responsible for delivery?

A: See Question 1.

4. Q: It appears there are areas along the cable route, primarily at the end of routes, where no bathymetric or geophysical data have been collected. If available, please provide current bathymetry and bottom characterization data for these area. Refer to the area outlined in red to the right that does not does not a digital elevation model. Also please provide the electronic deliverables and GIS for the 2014 geophysical survey.

A: The 2014 geophysical data has now been provided (see link at top of the document). Additional geophysical data from the area around the nearshore HDD breakouts will be provided in the next few weeks. No additional data from out at the test site is expected. If proposer finds that existing data gaps need to be filled for a successful project, proposers should specify and include additional survey work as part of the proposed scope of supply.

5. Q: Please clarify if the functionality of the 30m test cable length is identical to the 5 x subsea cables?

A: Yes, the 30m length of cable should be identical to the subsea cables and should be delivered fully terminated to the connector mating half as defined.

6. Q: Please clarify if the HDD conduit's on-shore vault ends have a flange with a bolt pattern? If yes, please provide detail dimensions i.e. Flange OD & thickness, bolt hole positions & ø.

A: Yes, the end of the conduit inside the vault will be terminated with a steel flange.

NOTE: engineering drawings should be available in early December and will be posted alongside the other supporting documents currently available via the link at top of this Addendum.

7. Q: Section 4.2 WEC Interfaces – Offshore Dry Mate Connectors states:

Each dry mate connector will provide connectivity for full cable system power transmission and twelve single mode fibers.

DWG-1027-10300, 36 KV SUBMARINE POWER CONNECTOR PIN OUT - REV A - 200916:

Depicts a subsea export cable containing a single FO Tube containing 12 SMF.

However, RFP 2021-003847 PacWave Subsea Cable Supply and Install Section 4.4 Cable System Specifications Summary states:

Optical fiber connectivity

- **o 12 each single mode fibers per berth circuit**
  - **▪ Dry mate connector limit**
- **o 24 each total Large Effective Area Fiber ("LEAF"), Single Mode ("SM") fibers per cable**
  - **▪ Two each (minimum) fiber tubes per cable**
  - **▪ 1x 12 live fiber tube**
  - **▪ 1x 12 spare fiber tube**

DOC-1004-10300 36 KV SUBSEA POWER TRANSMISSION CABLE SPECIFICATION - REV G - 201013 Section 3.5 Fiber Optic Elements states: The cable shall be configured with a minimum of two (2x) separate fiber optic elements, each containing twelve (12) individual fibers. A third optical fiber cable element may be provided as an option as insurance against fiber element damage during cabling operations.

For clarity, please clarify the number of fiber optic cables to be included in the subsea export, auxiliary export, spare export & test cables?

Additionally, please clarify if the 2 x FO cables containing LEAF fibers are to be terminated in dry mate optical connectors?

A: The cable shall include two (2) fiber optic elements, each containing 12 LEAF fibers. One of these fiber elements shall be terminated to connectors and shall pass through the dry mate connector. This fiber element shall be considered as "live". The remaining fiber element shall serve as a spare in the event of damage or failure of the "live" element (i.e. there will be 12 live and 12 spare fibers). This spare fiber element does not need to pass through the connector. These 12 spare fibers shall be internally fusion spliced in loopback pairs to allow for testing of all spare fiber from the shoreside facilities.

8. **Q: Please clarify the number of fiber optic cables to be included in the subsea export, auxiliary export, spare export & test cables?**

   A: 24 fibers total, configured in two (2) 12-fiber optical elements (fiber tubes). One "live" fiber element (12 live fibers) and one spare fiber element (12 spare fibers). The RFP makes note of a third, identical fiber element at manufacturers discretion. The purpose of the language is to make it clear that final acceptance of installed cable is contingent on a finding of two fiber elements and a total of 24 working fibers. A third fiber element, if added at supplier's discretion, would provide supplier insurance against potential damage to a fiber element during manufacturing or installation.

9. **Q: 90°C max is the standard value. If the project requirement is above that, we will need to specify the 105°C grade of material. Please clarify the maximum conductor operating temperature rating.**

   A: Conductors should be rated for 90 deg. C. Actual operating temperature is expected to be significantly lower.

10. **Q: This bid is based on the {Company Name} Document Control system. {Company Name} controlled documents are sent electronically and published in a .pdf format. The controlled documents are accompanied with a transmittal advising what documents are being sent and status of the document (i.e. approval or information). The final documentation is the latest revision of the .pdf that was provided during the life of the project.**

A: Manufacturer's document and quality control standards shall conform with accepted industry practice. Details of standard practices shall be included as part of the proposal response.

11. Q: Data books are sent electronically, published in a .pdf format accompanied with a transmittal advising what documents are being sent and status of the document. {Company Name} standard practice is to provide data books and dossier's in an electronic form. External drives can be provided in place of hard copy data books.

A: See Question 10.

12. Q: If the product is API compliant and within customer specification then {Company Name} will disposition the NCR. If the product is out of API compliance or customer specification, a customer concession will be submitted for approval.

A: See Question 10.

13. Q: Please confirm documentation related to the umbilical and associated hardware is excluded from having a professional engineer's ("PE") review, agreed to, signature and stamp.

A: We are not requiring stamped engineering drawings for manufactured products. An Oregon PE stamp would be required for aspects within the State of Oregon (e.g. the shore landing vault).

14. Q: Please provide surface finish of the internal bore of the conduit, any internal upsets? Please also clarify is the subsea end of the conduit(s) will have a bell-mouth feature?

A: Please refer to Addendum #4, Question m, which provides the following information. Note that nominal ID will be 6.56" ID vs. 6.435" incorrectly specified in Addendum #4. A detailed drawing of the casing is forthcoming and will be provided in a future addendum.

"The shore landing conduit will be new API 5 CT, 7-3/4" OD, 0.595" wall, Grade P110. Casing joints will feature a matching ID such that there are no ID variations throughout the length. Minimum clear ID will be ~~6.435"~~ 6.56". The bores will be drilled using drill string. The drill string will be removed and the permanent shore landing conduit installed (pushed in) using the shore side drilling rig. The total length of conduit will vary between 5,200 and 5,500 feet. The shore landing conduit will be Epoxy painted to prevent corrosion and provide a smooth surface for cable installation. Conduits will likely be filled with dry air and vapor corrosion inhibitor on completion of installation. On arrival for cable installation, installers will find the offshore ends of the shore landing conduits buried approximately 3 feet below local seabed and sealed at the offshore end with a check valve. Conduits will be marked with a submerged, near bottom buoy and will initially be located by applying air pressure at the shore landing vault location. Installers are expected to dredge the immediate area around conduit exit, remove the end termination check valve, attach a flange fitting (via API Casing thread) to the end of conduit. Installers shall then attach a split bellmouth or roller assembly to accept cable. On completion of cable installation, installers shall attach cast iron split pipe to the conduit flange. Split pipe length shall be sufficient to protect pipe on exit from conduit, a minimum of 100 feet. Split pipe, and cable will then be jetted or dredged to a minimum depth of 3 feet (1 meter) following exit from shore landing conduit."

NOTE: engineering drawings should be available in early December and will be posted alongside the other supporting documents currently available via the link at top of this Addendum.

15. Q: Please clarify the aux cable scope of supply for the Pac Wave project as the RFP does not include the various Aux cable lengths, trunk adapter, branch unit, LV cable etc. shown on sheet 2 of DWG-101-10300

A: Trunk adapter, branching units and LV cables shown on Sheet 2 of DWG-1001-10300 are not included in the scope of supply for this RFP. For the purpose of this RFP and scope of supply, the auxiliary cable will be identical to the 4x power cables, consisting of installed subsea cable with terminated and capped dry mate connector half. Mating equipment beyond the dry mate connector half will be the subject of a future RFP, the full scope of which is not yet determined.

16. Q: Please clarify client expectation of where (physical location) the Final Testing and Acceptance tests are to be performed e.g. installation vessel?

A: OSU expects that cable health will be monitored during lay operations, including measurement of DC resistance, insulation resistance, repeated TDR measurements (from each end) and OTDR monitoring of fiber elements. OSU further expects that the capped and submerged dry mate connector half shall be configured and rated for high voltage and TDR acceptance testing of MV cores and loopback testing of fiber optics (OTDR & power meter) from the shore landing vault.

OSU's expectation for final acceptance testing is that final cable health measurements (lay operation measurements) will be taken and accepted prior to capping and submersion of the dry mate connector and cable quadrant assembly. Final acceptance testing is then expected to occur at the shore landing vault after the offshore end of cable is submerged and landed in its final location. This Final Acceptance Testing from the shore landing vault shall be in accordance with the details provided in Section 7 (Final Testing and Acceptance) of DOC-1029-10300, PacWave 36 kV Subsea Cable Installation Specification - REV D – 201013.

Please note that final acceptance will not occur until completion of the tests detailed in Section 7. This will allow testing of cable #1 while cable #2 is installed etc. but will require cable lay vessel standby until all five cables have successfully completed acceptance testing as agreed by OSU's designated on-site representative.

17. Q: Please clarify client expectation of on-shore installation as the vaults are 100' below ground, the conductor & optical pigtails would have to go from the vault to the surface manhole and beyond = >100' conductor & optical pigtails required. This also has an effect on the installation pull-in grip length which has to be secured at a point beyond the pigtail length = >100'.

Therefore, vendor requests that Client allow alternative methods for this part of the on-shore installation.

A: The shore landing vaults will NOT be located 100 feet below ground level. The vaults will be 10.5 feet tall internally, including a 1-foot thick lid. Therefore, the bottom of the vault will be located 10.5 feet below grade level. NOTE: engineering drawings should be available in early December and will be posted alongside the other supporting documents currently available via the link at top of this Addendum.

OSU expects that pigtails will be required to reach out of the shore landing vault and into nearby termination vans for termination to dead break terminations.

18. Q: Please clarify if an API Casing thread can be added to the vault end of the conduits to allow post installation fitting of an API flange in order to allow the use of a typical umbilical armor pot and split hang-off flange to terminate the umbilical strength members @ this interface?

A: The end of the conduit will be outfitted with a flat flange face. NOTE: engineering drawings should be available in early December and will be posted alongside the other supporting documents currently available via the link at top of this Addendum.

19. Q: Per IEC 60228, the maximum DC resistance of a 50mm² Class 2 annealed plain copper conductor at 20

degC is 0.387 Ω/km.

A: Agreed. Please refer to Addendum #4, question bb. The response to this question is as follows:" This value (0.34 Ohm/km) is in error. 0.387 Ohm/km per IEC 60288, Class 2 / Table 2 is the correct value for DC resistance at 20 deg. C vs. the value specified in sections 3.3 and 3.4."

20. Q: LEAF NZDSF fibers within the to be quoted FO cable are proof stressed to 100 kpsi. Please confirm if fibers are required to be proof stressed at a higher rating.

A: Agreed, 100 kpsi proof stress per ITU G.655.D, table 2 which defines proof stress as 0.69 GPa, which is equivalent to 100 kpsi.

21. Q: Some fiber optic vendors helically apply armor wire over the metallic buffer tube and then extrude a polyethylene jacket over the armor wire. Please clarify whether this is acceptable.

A: Yes, this configuration would be acceptable assuming that the actual fibers are "loose" in the metallic buffer tube such that fibers are not subjected to tensile strain under rated operating conditions.

22. Q: Vendor informs that PD, DCR, and IR tests are performed on complete lengths of MV cores instead of samples as per IEC 60502-2. This allows detection of any insulation defects/anomalies along the entire length of core rather than a section from the beginning and end of the manufactured length.

A: Understood. Please specify test plans in proposal.

23. Q: Please clarify whether the Lightning Impulse Test indicated is to be an additional test performed at FAT or part of the verification tests from a cable sample removed from the Mechanical Tests.

If required at FAT, Vendor requests a deviation to conducting this test at FAT as this test is a destructive test and is already part of the Sample Tests that is to be conducted at an external laboratory on a 10 m cable sample with a factory core splice listed in Section 11 of IEC 63026.

A: Lightning Impulse testing was incorrectly listed in Section 5.1.3 (Completed Cable) of the RFP. Impulse testing should be included in conductor type testing (Section 5.1.1) in accordance with IEC 60502-2, section 18.2.2 and the referenced IEC 63026. It is understood that this is a destructive test used to qualify the cable design and construction.

24. Q: IEC 63026 requires that all LWP and RWP testing be performed in saltwater with the same salinity level as the operating field. Cigre TB490, which is referenced is Cigre TB623 and called out in the PacWave specification, allows all LWP and RWP testing to be performed in freshwater. Please clarify which water conditions the testing is to be performed in.

A: The conflict is noted. The requirements to utilize salt water per IEC 63026 shall take precedence. Given local salinity levels will vary, 3.5% NaCl saltwater solution shall be used.

25. Q: Please clarify at what specific wavelengths OTDR is to be tested to. Vendor assumes to perform OTDR testing at 1550 nm and 1625 nm.

A: Correct. OTDR testing shall be performed at 1550 and 1625 nm and shall be shown to meet or exceed the requirements specified by ITU G.655.D. No other wavelengths are specified.

26. Q: Vendor assumes to perform OTDR, insertion loss and return loss testing at 1550 nm and 1625 nm. If other wavelengths are to be tested, please clarify which specific wavelengths.

A: Please see Question 25.

27. Q: Typical pre- and post-loadout testing and post-installation testing that Vendor performs for submarine cables consists of IR, DCR, and TDR for MV Cores and OTDR for Fiber Optic cables. Transportation and lay monitoring consist of continuity testing of the MV Cores.

Please clarify whether the typical Vendor tests mentioned above are acceptable to perform at post-loadout testing, lay and installation monitoring, and post-installation testing or if other tests are required.

A: Final acceptance testing requirements are detailed in Section 7 of the installation specification (DOC-1029-10300 PACWAVE 36 KV SUBSEA CABLE INSTALLATION SPECIFIATION - REV D – 201013) and are per the requirements detailed in of IEC 63026, Section 13.

Intermediate testing after each handling step is not specifically detailed in IEC 63026 and it is requested that the vendor provide a reasonable testing plan in order to monitor cable health. It is OSU's expectation that all tests detailed in IEC 63026, Section 13, which are not damaging to the cable should be performed during/after each handling operation. AC voltage testing at levels exceeding the cable rating (Section 13.3, 3x Uo) should be reserved for final acceptance testing. Insulation resistance testing is an acceptable method to monitor cable health during/after handling.

28. Q: Please clarify if final acceptance testing will be conducted on land or at the back of the vessel.

If AC Voltage testing is to be performed on the back of the vessel, this is considered unsafe to perform given the high voltage ratings required to conduct the test and sea conditions.

A: Reference the response to Question 16.

29. Q: Request for Deviation:

Vendor requests a deviation to the 5% voltage drop of AC power transmission per circuit. Past analysis supplied has shown that the subsea cable voltage drop is at 7.4% which exceeds the 5% maximum.

Analysis on the subsea cable with new 50mm² 18/30 (36) kV MV core designs will be performed to confirm the percentage of voltage drop however pre-analysis calculations conducted shows that the voltage drop still exceeds 5%.

A: This was addressed previously in Addendum #4, Question q: The following response was provided: "Understood. Proposers shall specify 50 mm^2 or 1/0 size conductors and provide performance analysis."

To further clarify, please consider this response as waiving the 5% voltage drop criteria. The PacWave project team has reviewed cable impacts to the power system and are requesting 50 mm^2 / 1/0 size power conductors be specified. Vendors are requested to consider actual operating temperature in voltage drop analysis and understand that given the types of power generation equipment expected to be deployed at this site, maximum power throughput values specified are peak vs. continuous.

Please further note that voltage drop considerations are only applicable for 60 Hz operation. Operation at any frequency other than 60 Hz nominal would be a low power test operation and should be considered as a requirement that the cable system be suitable for the frequency vs. defined performance requirements. (reference section 3.3, "AC Operating Frequency 10 to 120 Hz")

30. Q: We would like to clarify if the thermal conductivity is a typo of thermal resistivity. Thermal resistivity of seabed is generally 0.7~0.9 K.m/W. In case thermal conductivity is 0.9 W/(m.℃), thermal resistivity shall be calculated as 1.11 K.m/W. It is larger than general.

A: The value given as 0.9 W/(m ℃) is not a typo, but is not an actual measurement and is understood to be a conservative value. Given that the maximum current specified for these cable systems is low relative

to maximum ampacity values allowable for this size cable, operating temperature of the buried section of cable has been analyzed using the 0.9 W/(m ℃) conductivity value and found to be low relative to the 90 ℃ rating specified. Analysis to date has highlighted the HDD conduit section of cable as the highest temperature section with the zone above the water table being the worst case for consideration of maximum cable temperature.

A core geotechnical core drill has been taken in the parking lot at the shore landing site and a report covering this work is now available on the project data website listed at the top of this addendum, in a folder titled ""NEW Terrestrial Geophysical and Geotechnical Surveys". Included in this report is thermal resistivity data which shows thermal conductivity of the saturated sands at approximately 1.2 W/(m ℃). However, when dry these near surface sands may be as low as 0.2 W/(m ℃). This section of conduit will be back filled with CLSM (Concrete, low strength mix) for the purpose of stabilizing the conduit and providing a minimum thermal conductivity of 0.9 W/(m ℃) for a 16" diameter around the conduit.

Should these specified values be found to result in excessive cable temperature, respondent should specify in proposal response.

31. Q: In general, non-zero type fibers are applied for projects whose cable length is quite long such as over 100km/1circuit and large amount of information transmission is required. If such high spec. is not required for this project, single mode FO cables in accordance with ITU-T 652 is recommended as it is widely used for renewable energy project.

A: Understood. Potential applications for this system include requirements for DWDM transmission systems. LEAF fibers as specified shall be provided.

END OF ADDENDUM NO. 6