**Technical information**

**(Technical Service for the Operation, Maintenance and Commercialization of the**

**Ulsan Floating Offshore Wind Farm Project)**

**2019. 04.**

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**CHAPTER Ⅰ**

**GENERAL**

 **1. Backgrounds**

 **2. Objectives**

 **3. Project Description**

**1. Backgrounds**

KEPCO E&C (hereinafter referred to as ‘KEC’) has implemented “Technical Service for the Operation, Maintenance and Commercialization Review of the Ulsan Floating Offshore Wind Farm Project”. This Ulsan Floating Offshore Wind Farm project is located in 58km far from the East Sea shoreline. The 1st phase project will be 200MW capacity, but it will be extended to the 2GW project.

**2. Objectives**

The objective of this technical project is to perform the high level strategy related to the operation and maintenance survey of offshore wind farm project, operation and maintenance Strategy of Ulsan 200MW Floating Wind Farm Project and the commercialization history survey for the Floating Offshore Wind Farm Project.

**3. Project Description**

1) Plant Name : Ulsan 200MW Floating Offshore Wind Farm Project

2) Owner : Korea East-West Power Company

3) Location of site : East Sea, 58km far from the Ulsan, Korea

4) Capacity : 200MW

5) First Commercial Operating Date

* Later to be determined

6) Project Location :

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**CHAPTER Ⅱ**

**TECHNICAL SERVICES**

**1. Scope of Service**

**2. Bidder’s Work Schedules**

**3. Method of Project Implementation**

**4. Deliverables**

**5. WORK ORDER**

**6. ATTACHMENTS**

**1. Scope of Services**

The work scopes are divided into 2 Tasks. Task 1 is an Engineering services for the floating offshore wind farm. The Bidder shall submit the electronic files of technical service reports to KEC when the Bidder completes each item in Task 1. KEC will review the outcomes and send comments and/or questions. The Bidder prepares final technical service reports containing the outcomes performed in the work activities from Task 1. Task 2 is additional services for the Ulsan floating offshore wind farm project in the case that KEC request a solution to the technical or engineering problem.

All data and drawings provided from KEC should only be used in this technical service and leakage to the outside is prohibited without permission by KEC. In principle, all provided data and drawings shall be discarded after completion of consulting services work.

**1.1 Task 1 (Technical Services for floating offshore wind farm)**

The Bidder shall submit the technical report regarding following three Tasks:

(1) Task 1-1: O&M case study, etc.

(A) For Fixed Offshore Wind Farms app. 50km far from the coast in Europe: O&M case study including the followings;

 (a) Major failures/faults/damages statistics of those fixed OWFs

 (b) O&M procedure, frequency, manpower and OPEX of Jacket foundation offshore wind farm(s) in Europe

(B) Design/Technical Requirements of WTG and Floating Body for Floating OWF

(2) Task 1-2: Operation & Maintenance High Level Strategy of Ulsan 200MW Floating OWF, CAPEX and OPEX estimation

For Ulsan 200MW Floating OWF using the following WTGs (WTGs can be changed)

- SWT 6.0-154

- MHI-Vestas 8.33MW

(A) High level O&M Strategy preparation including the followings:

 (a) O&M Procedure, Frequency, Manpower, Equipment Strategy for WTG and Floating Body

* Shore based O&M Strategy
* Offshore based O&M Strategy
* Hybrid based O&M Strategy

 (b) Preventive, Predictive and Failure Maintenance Strategy

 (c) Spare Parts Management Strategy

 (d) Monitoring and Control (Wind Farm SCADA and CMS System) system setup Strategy

 (e) Maintenance Personal Training Strategy

 (f) Health, Safety and Environmental strategy

(B) OPEX Estimation (for 1 type of WTG model, 1 type of floating foundation type and 3 cases of O&M base <Shore based, Offshore based, Hybrid based>)

(C) CAPEX Estimation (for 1 type of WTG model and 1 type of floating foundation type)

KEC will provide the data that are required for the activities as above items. The Bidder shall submit the report or documents.

(3) Task 1-3: Commercialization and Expansion Case Study

(A) 2 Case Studies of commercialized Floating OWF Projects

(a) Case1: Introduction to a Floating OWF having future expansion plan and Description of its expansion plan.

(b) Case2: Introduction to major project development and execution history of a Floating OWF Project sample (from the FS phase to COD)

(B) Case Studies of 2 Fixed OWF Projects have been expanded by Phase 1, 2 and 3.

**1.2 Task 2 (Additional Works based on Work Order)**

- Additional Works and technical support for the mother project: The Bidder shall perform the work on the performance settlement basis for the additional Work Order requested by KEC. The Bidder and KEC shall negotiate the schedule requirements, required man-hours and make a Work Order for the additional activities in advance.

**2. Bidder’s Work Schedules**

KEC will send the data that are required for the each activity and Bidder has to keep the following schedule.

|  |  |
| --- | --- |
| Activity | Service Schedule |
| 4month | 8month | 12month |
| Task1 | Task 1-1: O&M Strategy case study, etc. |  |  |  |
|  |  |  |
| Task 1-2: Operation & Maintenance High Level Strategy of Ulsan 200MW Floating OWF, CAPEX and OPEX estimation |  |  |  |
|  |  |  |
| Task 1-3: Commercialization and Expansion Case Study |  |  |  |
|  |  |  |
| Task 2 | Additional Works based on Work Order  |  |  |  |
| Activities and Schedule can be changed with project schedule. |

Followings are a tentative milestone schedule for all activities for Ulsan Floating OWF Project.

Work Start

* O&M Case Study for Offshore Wind Farm ; After signed contract
* O&M High Level Strategy of Ulsan OWF ; After providing related data
* Commercialization Case Study for European OWF ; After signed contract

Finalize Report

* O&M Case Study for Offshore Wind Farm ; 3 month after work start
* O&M High Level Strategy of Ulsan OWF ; 4 month after work start
* Commercialization Case Study for European OWF ; 4 month after work start

**3. Method of Project Implementation**

**3.1 General**

- KEC will provide necessary reference files required to perform this technical service to the Bidder after contract.

- The Bidder shall perform this project complying with the schedule and work scope requested by KEC.

**3.2 Kick-off meeting**

- Kick-off meeting shall be executed and necessary reference files for this meeting shall be provided by the Bidder.

- This meeting shall be held in KEPCO E&C before 10days after signing the contract.

- At least one actual participating engineer must attend in this meeting.

- All cost for this meeting is uncompensated.

**3.3 Submission of Drawings and Documentation**

- All drawings and documentation have to be described in English.

- SI-units are to be used.

- Especially, all drawings and documentation for As-Built have to be described in English.

- The Bidder shall submit Drawings and Documentation as soft copy (PDF files) with original files (Auto-cad files for drawings and Microsoft office files for documentation).

- Due dates of Drawings and Documentation follow the Chapter 2 Bidder’s Work Schedule of the Chapter 2. Additional Works Report based on Work Order shall be made after discussion with KEC. The due date could be adjusted by discussion with KEC as per the status of project progress.

- Drawings and documentation revision requested by KEC shall submit in 10 days from the date of the request and the Bidder shall request for approval to KEC.

- Drawings and documentation requested by KEC shall review and submit in 10 days from the date of the request.

- The Bidder shall actively respond to requests from KEC for description or reference data of the Bidder’s design output.

**4.** **Deliverables**

The report shall be distributed as both word-files and pdf-files, submitted by e-mail.

**4.1 O&M Strategy case study, etc.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Items** | **Type** | **Schedule** | **Remarks** |
| Final Report | Electronic File | 3 month after contract | By e-mail |

* Operation & Maintenance Case Study Report for OWF

**4.2 O&M High Level Strategy of Ulsan 200MW Floating OWF, CAPEX and OPEX estimation**

|  |  |  |  |
| --- | --- | --- | --- |
| **Items** | **Type** | **Schedule** | **Remarks** |
| Final Report | Electronic File | 4 month after providing related data | By e-mail |

* O&M High Level Strategy Report for Ulsan 200MW Floating OWF

**4.3 Commercialization and Expansion Case Study**

|  |  |  |  |
| --- | --- | --- | --- |
| **Items** | **Type** | **Schedule** | **Remarks** |
| Final Report | Electronic File  | 4 month after contract | By e-mail |

* Commercialization and Expansion Case Study Report

**4.4 Additional Works based on Work Order**

|  |  |  |  |
| --- | --- | --- | --- |
| **Items** | **Type** | **Schedule** | **Remarks** |
| Final Report | Electronic File | \* | By e-mail |

\* The schedule for additional works shall be determined by discussion with KEC for each work order

**5. Work Order**

The Bidder shall provide Additional Service to KEPCO E&C based on KEPCO E&C’s request. Request for the Services shall be made by KEPCO E&C in writing in the form of “Request for the Services”. Upon receipt of requests for specific Services to be performed by the Bidder, the Bidders shall review such requests based on schedule requirements, required manhours and price. The request for Services is for informational purposes only, and shall not be considered a binding document on Bidder or Client.

Upon acceptance by the Bidder, or adjustment as agreed upon by both Parties, the requests shall be formalized as “Work Order” upon which the Bidder shall initiate the requested services. The deliverables for authorized services shall be presented to KEPCO E&C for acceptance based on the conditions specified in the relevant Work Order. Refer to the Attachment A-1.

Exhibit 1

**WORK ORDER**

|  |
| --- |
| To : I, the undersigned, hereby authorize this Work Order under which you shall provide the required Services described below in accordance with the terms and conditions of the Contract. |
|  | Project | Work Order No. | Issue Date | Remark |  |
|  | [ ] Ulsan Floating OWF |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |
| Type of Service [ ] OTS at Contractor’s Office [ ] TRM [ ] SV OTS : Oversea Technical Service, TRM : Technical Review Meeting, SV : On-the-Job Training via Short Visit |
| MH Budget : (including Grade)Task Trip Expenses: | Assignment Start Date :  |
| Assignment Duration :  |
| Scope of Work : [ ] Safety-related |
| Delivery Requirement : |
| Any Other Special Requirement : |
| Name(s) of Personnel to Carry Out the Work :   |
| References : | Initiated by KEPCO ENC EGSDiscipline : Name : Signature : | Coordination |
| Position | Name | Signature |
| EGS |  |  |
| APM |  |  |
|  Authorized by KEPCO ENC PM  (Name) (Signature) (Date) |

Note: The actual end date of assignment shall be determined within above assignment duration.

Exhibit 2

**Request For the Service**

|  |
| --- |
| To : Project : [ ] ULSAN FLOATING OWF Request No. : 🞎 - 🞎🞎🞎 Date : Contractor: Scope of work : [ ] Safety-related    Type of Service [ ] OTS at Contractor’s Office [ ] TRM [ ] SV  Manhour Budget(including Grade): Delivery Requirement: Task Trip Expenses: Any other special Requirement:References:Please review this service request based on the schedule requirements in terms of manhours and delivery date, acceptance criteria and your available resources.Allocated manhour budget covers Contractor’s manhours to complete the scope of work specified in this Request, including Bidder’s responses and revision of the deliverables to incorporate KEPCO ENC’s additional comments within the scope of work.After receipt of the submitted deliverables the KEPCO ENC EGS shall notify the Bidder’s Representative that the completed work is acceptable or identify the reasons and changes needed to make it acceptable.Please return this request form by facsimile or E-mail (PDF File) with your acceptance or comments if adjustments are necessary. Your response shall reach KEPCO ENC by 2019.Requested by KEPCO ENC EGS  Name Discipline Signature Date |
| To : (KEPCO ENC Responsible EGS)[ ] The requested services are acceptable[ ] Adjustments are necessary (See attached sheet for explanation) Manhour Budget(including Grade): Delivery Requirement:  Task Trip Expenses: Reason for Adjustment:Contractor's Representative  Name Signature Date |