

**Engineering Review and Consulting Service for the Offshore Wind
Turbine Substructures and Foundations of Jeju Hanlim Offshore
Wind Farm Project**

2020.06

TABLE OF CONTENTS

CHAPTER I - GENERAL

1. BACKGROUNDS
2. OBJECTIVES
2. PROJECT DESCRIPTION

CHAPTER II - TECHNICAL SERVICE

1. SCOPE OF SERVICES
2. CONTRACTOR'S WORK SCHEDULES
3. METHOD OF DESIGN REVIEW AND ADDITIONAL TECHNICAL SUPPORT
IMPLEMENTATION
4. ATTACHMENTS

CHAPTER I

GENERAL

- 1. Backgrounds**
- 2. Objectives**
- 3. Project Description**

1. Backgrounds

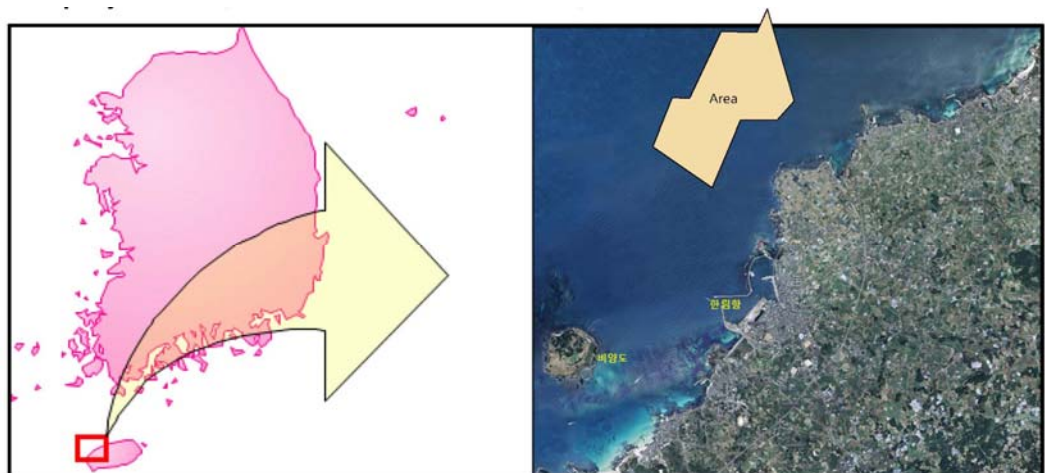
KEPCO E&C (hereinafter referred to as 'KEC') has implemented Jeju Hanlim Offshore Wind Farm Project as a main developer since 2011. This EPC project is scheduled as a consortium project which is called 'Jeju Hanlim Offshore Wind Power Plant Construction EPC'. The owner of this EPC project is Special Purpose Company which is called JEJU HANLIM OFFSHORE WIND Co. Ltd. This SPC is consisted with KEPCO, KOMIPO, KEC, DAELIM and BARAM. KEC will perform the Engineering and Procurement of Offshore Wind Turbine (OWT)

2. Objectives

The objective of this consulting service is to review and perform the technical advices related to Concept Design, Basic Design and Detail Design for Offshore Wind Turbine Substructures of the Jeju Hanlim Offshore Wind Farm Project in Korea.

3. Project Description

- | | | |
|----|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) | Project Name | : Jeju Hanlim Offshore Wind Farm Project |
| 2) | Project Owner | : JEJU HANLIM OFFSHORE WIND Co. Ltd. |
| 4) | Service Name | : Consulting Service for Offshore Wind Turbine Substructures Design |
| 4) | Engineering | : KEC (KEPCO E&C) |
| 5) | Review & Additional Technical Support Period | : 40 months after contract (execution) signing Date
Consist of Design Review (execution ~12months)
+ Additional Technical Support (execution~40months) |
| 6) | Location of site | : Suwon-ri, Hanlim Eup, Jeju-do, Korea |
| 7) | Capacity | : 100.08MW (5.56MW x 18) |
| 8) | First Commercial Operating Date | - July 01, 2023 |
| 9) | Project Location | : |



CHAPTER II

TECHNICAL SERVICES

- 1. Scope of Services**
- 2. Contractor's Work Schedules**
- 3. Method of Design Review and Additional Technical Support Implementation**
- 4. ATTACHMENTS**

1. Scope of Services

The work scopes are divided into 2 Tasks.

Task 1 is a review services for the OWT Substructure design. KEC will request to review the design deliverables at each stage. Then the Contractor shall submit the electronic files of design document or technical report to KEC when the Contractor completes the each item in Task 1.

When the Contractor completes the each phase in Task 1. KEC will review the outcomes and send comments and/or questions. The Contractor shall prepare final suggestion documents or drawings containing the outcomes performed in the work activities from Task 1.

Task 2 is an additional technical support for the Hanlim OWF project including meetings, On the Job Training (OJT) and additional consulting upon KEC request a solution to the technical problem or engineering.

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

1.1 Task 1 (Design Review for the OWT Substructures design) – Lump Sum

The contractor shall submit the technical review reports supported by hand calculations and potentially simple sketches or drawings where required by reviewing following items

(1) Conceptual Design Review

- Conceptual design of OWT Substructures on initial OWT design load cases (Adequacy of the natural frequency of the substructures, etc.)
- Interpretation & set-up of design soil profiles

(2) Basic Design Review

- Basic site condition check (Bathymetry, Wind, Wave, Layout, etc.)
- Substructures type selection
- Code and standards for substructure design of pre-service and in-service stages
- Design procedure (ULS, FLS, SLS, ALS, Seismic Analysis, etc)
 - ULS : Ultimate Limit States •FLS : Fatigue Limit States
 - SLS : Serviceability Limit States •ALS : Accidental Limit States
- Corrosion protection (painting, excluding cathodic protection - anode)
- Adequacy of basic design substructure
- Problems that may occur during assembly and installation stage

(3) Detail Design Review

1) In-Service Analysis

- Scour analysis report considering site terrain
- Detail
 - At least 3times Substructures calculation(ULS, FLS, SLS, ALS, Seismic Analysis) and drawings based on load iteration including seismic aspects
 - Pile design based on geotechnical design, structural design
 - Mid section (transition piece) finite element model design(ULS, FLS. etc)
 - Grout, Jacket / pile connection
 - secondary steel design(temporary steels, hand rail, access structures & work platforms, reinforcing stiffeners, boat landing, j-tubes, door frame connection points, etc)

2) Pre-Service Analysis

- Jacket load-out, Transport & installation structural analysis

1.2 Task 2 (Additional Technical Support) – Reimbursable

(1) Meetings

- Kick Off Meeting to execution the review and consultation for initial design information exchange and set the detail schedule of review and consultation
- Progress Meeting to check the progress of design review
- Closing Meeting to finalize the review report

(2) On the Job Training(OJT) Program

- OJT on design criteria and modeling analysis process for offshore wind turbine substructures
- OJT on Contractor's standard documents and previous projects document
- OJT program shall include trainee's right to attend Contractor's internal meetings for Jeju Hanlim OWF substructure review or other similar projects

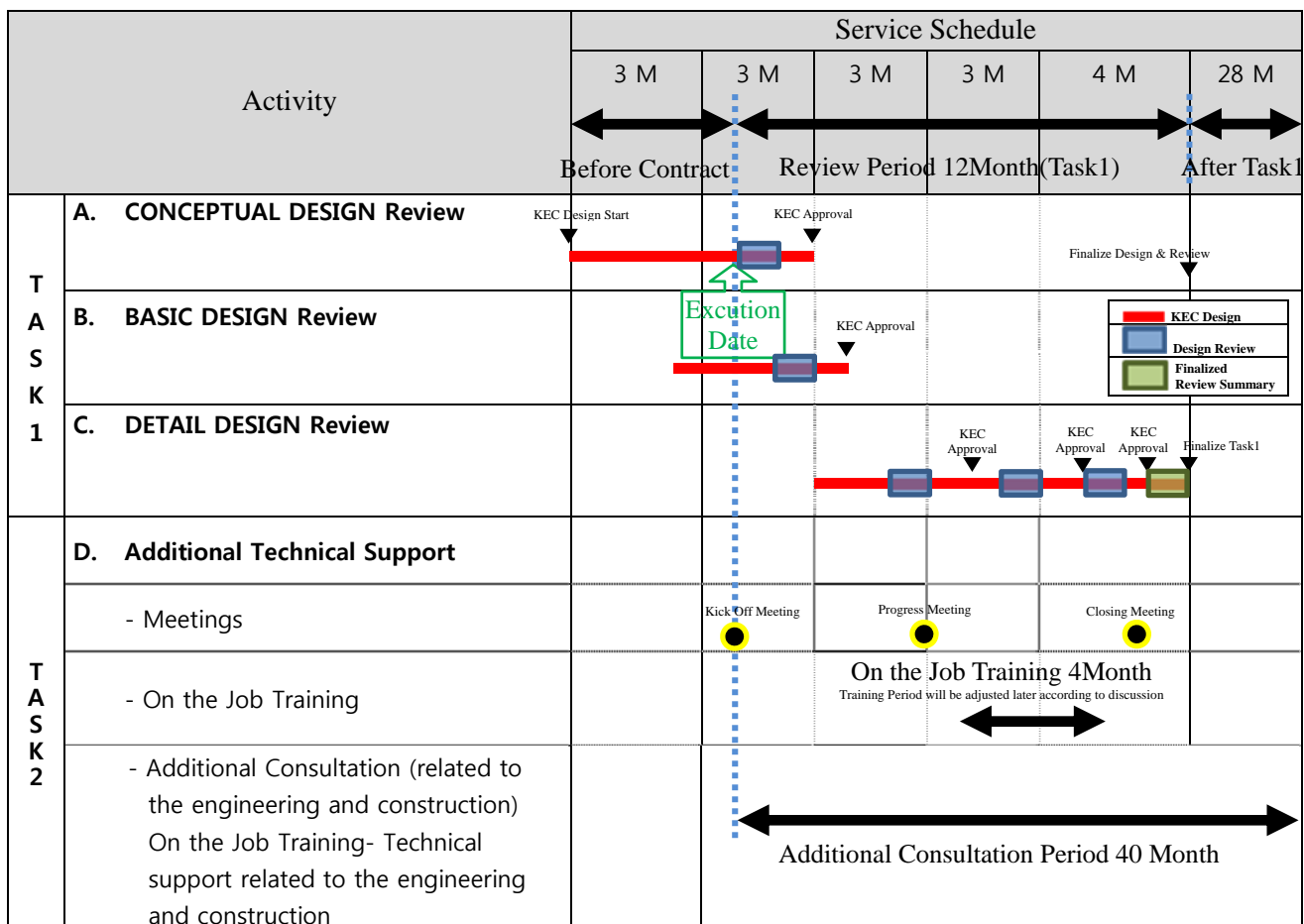
(3) Additional consultation related to the design and construction

Additional consultation related to the design and construction is an additional engineering consulting for the Hanlim OWF project on design and construction stage to provide technical assistant when KEC requests a solution to the technical problem or engineering

The Contractor shall perform the work on the performance settlement basis for the additional technical support requested by KEC. The contractor and KEC shall negotiate the schedule requirements, required man-hours and make a Work Order for the additional activities in advance. The detail procedure and method in regards to issuing and performing the Work Order are described in section 3.6 Work Order.

2. Contractor's Work Schedules

KEC will send the engineering results following the schedule below to request a review by contractor for each activities and contractor shall keep the following schedule. (Activities and Schedule can be changed with project schedule) After each reviews, Contractor shall send the reply report within 1 month. However, if KEC requests a quick reply for each reviews for specific issue, Contractor shall reply within 10 days.



Followings are a tentative milestone schedule for all activities for Jeju Hanlim OWF Project.

Work Start

- Concept Design Review
- Basic Design Review
- Detail Design Review (3 phases)

- ; Execution Date (Contract signing date)
- ; After providing related data
- ; After providing related data

- Finalized Review summary ; After Detail Design Review approved
- On the Job Training(Task 2) ; Specified by discussion
- Additional Consultation (Task 2) ; Specified in the work order

Finalize Work

- Concept Design Review ; 1 month after work start
- Basic Design Review ; 1 month after work start
- Detail Design Review (3 phases) ; 1 month after work start
- Finalized Review summary ; 1 months after work start
- On the Job Training(Task 2) ; 4 months after work start
- Additional Consultation (Task 2) ; Specified in the work order

All review steps can be adjusted according to KEC's revised engineering schedule.

When KEC is inevitably urgent to request a review of a specific design issue, the contractor shall cooperate to finalize the Design Review within 10 days.

3. Method of Design Review and Additional Technical Support Implementation

3.1 General

- KEC will provide prepared engineering results and necessary reference files required to perform engineering review service to the Contractor after signing the Contract.
- The Contractor shall perform the reviewing and consulting complying with the schedule and work scope requested by KEC.
- Q&A correspondence via E-mail shall not be limited by the number of times

3.2 Kick-off Meeting (1 working day)

- Kick-off meeting shall be held at KEC office (Gimcheon, Korea) within 10days after signing the Contract.
- At least two actual participating engineers and one agent who can communicate in Korean must attend in this meeting.
- Necessary reference files for this meeting shall be provided by the Contractor and KEC.
- The Contractor shall prepare a meeting minutes and submit the minute with KEC within 5 days after the meeting.
- Meeting can be replaced by online meeting (via e.g. Skipe) at the request of KEC.

3.3 Engineering Progress Meeting (1 working day)

- Offline engineering progress meeting shall be held at KEC office(Gimcheon, Korea) within 10 days after the submission of the first detail design review.
- Contractor shall summarize the Q&As, review and consultation on design results of each design phases.
- 3 times of additional online (via skype or other equivalent) engineering progress meetings shall be held upon KEC's request without any additional cost.
- At least two actual participating engineer and one agent who can communicate in Korean must attend all meetings.
- KEC can request the Contractor to attend additional meetings, at an additional cost following the mutual agreement between Contractor and KEC on the conditions covering such additional services.
- The Contractor shall prepare a meeting minutes and share the minute with KEC within 5 days after the each meeting.
- Meetings can be replaced by online meeting (via e.g. Skype) at the request of KEC.

3.3 Closing Meeting for Task 1 (1 working day)

- Closing meeting shall be held within 10 days after submission of the last detail design review.
- Contractor shall summarize the Q&As, review and consultation on all design results of Task 1 for closing the review.
- At least two actual participating engineer and one agent who can communicate in Korean must attend all meetings.
- The Contractor shall prepare a meeting minutes and share the minute with KEC within 5 days after the meeting.
- Based on the results of the close meeting, the contractor shall submit the Finalized Review summary.

- Meeting can be replaced by online meeting (via e.g. Skype) at the request of KEC.

3.4 On the Job Training Program on OWT Substructure design review

- Contractor shall conduct On the Job Training on OWT Substructure design review as follows:
 - Trainee: 1 person from KEC
 - Duration: 4 months(Training Period will be adjusted later following the mutual agreement with the contractor)
 - Location: Contractor's office
 - Minimum Condition: Work space for the trainee (Desk, internet access, etc.)
1 copy of engineering software(SACS) for structural analysis training.
- OJT program can be canceled at the request of KEC.

3.5 Submission of Deliverables

- Contractor shall submit deliverables as below.
 - Concept Design Review Report
 - Basic Design Review Report
 - Detail Design Review Reports (x 3ea.)
 - Finalized Review summary Report
 - Meeting minutes
 - Additional Consultation Report (in accordance with each Work Order)
- All deliverables have to be written in English or Korean.
- SI-units shall be used.
- The Contractor shall submit deliverables as soft copy (PDF files) with original files (Microsoft office files for documentations including, but not limited to, Structural Modeling Data and/or Auto-cad files for drawings if required).
- Due dates of deliverables shall follow Contractor's Work Schedule of Chapter 2 and Method of Design Review and Additional Technical Support Implementation of Chapter 3.. However the due dates may be adjusted with KEC as per the status of project progress.
- For Additional Consultation(related the engineering and construction)(Task2) deliverables, the specific service required by KEC shall be made after discussion with KEC by work order(See 3.6 Work Order).
- Deliverables revision requested by KEC shall be submitted in 10 days from the date of the request and the Contractor shall request for approval to KEC.
- The Contractor shall prepare the meeting minutes after on/off-line meeting and share it with KEC in 5days after the each meetings.
- The Contractor shall actively respond to requests from KEC for description or reference data of the Contractor's design output.

3.6 Work Order

The Contractor shall provide additional service to KEC based on KEC's request. Request for the services shall be made by KEC in writing in the form of "Request for the Services". Upon receipt of requests for specific Services to be performed by the Contractor, the Contractor 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 as a binding document on Contractor or KEC.

Adjustments as agreed upon by both Parties, the requests shall be formalized as "Work Order" upon which Contractor shall initiate the requested services. The deliverables for authorized services shall be presented to KEC for acceptance based on the conditions specified in the relevant Work Order. Refer to the Attachment form 1-1.

4. Attachments

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.	Cost	Issue Date	Remark
[] JEJU HANLIM 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

E&C EGS

Discipline :

Name :

Signature :

Coordination

Position

Name

Signature

EGS

APM

Authorized by KEPCO E&C PM

(Name)_____
(Signature)_____
(Date)

Consent of Contractor's Representative

(Name)_____
(Signature)_____
(Date)

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

Request For the Service

To :

Project : [] JEJU HANLIM 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 Contractor's responses and revision of the deliverables to incorporate KEPCO E&C's additional comments within the scope of work.

After receipt of the submitted deliverables the KEPCO E&C EGS shall notify the Contractor'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 E&C by ____ 2019.

Requested by

KEPCO E&C EGS

Name

Discipline

Signature

Date

To : _____ (KEPCO E&C 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