Technical Information

Technical Consultation for the I&C System of the Swing EDG

November 2021

KEPCO ENGINEERING & CONSTRUCTION COMPANY, INC.

Table of Contents

1. Name of Service

Technical Consultation for the I&C System of the Swing EDG

2. Objectives of Service

The standard APR1400 design basis assumption does not consider a single failure of the EDGs with a concurrent LOOP for Operating MODES 5 and 6, nor the design/licensing basis for the reference plants (Shin-Kori Units 3&4). However, UAE regulatory body (FANR) has concluded that compliance with regulatory guide, which requires that: "any non-compliance with the Single Failure Criterion shall be exceptional, and shall be clearly justified in the Safety analysis," has not been demonstrated to s satisfaction of regulatory guide.

Barakah Nuclear Power Plant Owner's (Nawah) letter entitled "Proposed Resolution to Satisfy Single Failure Criterion for Class-1E AC Electrical Power Sources in Operating Modes 5 and 6," documents Owner's commitment to undertaking a feasibility study to determine and recommend a permanent solution that would be the most effective and efficient means of satisfying the single failure criteria requirement in Operating MODES 5 and 6.

The objective of this service is to provide KEPCO E&C with a certain engineering consulting service for the design solutions and licensing support for the I&C design of Swing EDG.

3. Project Description

KEPCO E&C proposed a method not to change the current design to persuade the regulatory body, but it was not accepted by the plant owner. Nawah would like to receive the best design of safety-Swing EDG in a method that minimizes the I&C design change of the currently operating APR1400. The Barakah nuclear power plant consists of four APR1400 (one unit operating, three units mostly completed).

The plant owner considers the following approaches;

- Required quantity of Class 1E Swing EDG(s): one Swing EDG (Approach 1a, 1b), two Swing EDG (approach 2)
  - ✓ Approach 1a: Control of Swing EDG through local control. The Swing EDG is connected to only the one of eight possible electrical buses. The Swing EDG credited only for MODES 5 and 6 (LPDS).
  - ✓ Approach 1b: Control of each Swing EDG and PCB from the MCR of each unit in addition to Local Control Room. The Swing EDG is connected to only the one of eight possible electrical buses. The Swing EDG credited only for MODES 5 and 6 (LPDS).

- ✓ Approach 2c: Two Swing EDGs aligned to each division of all 4 units. (Swing EDG #1 aligned to division I of unit 1~4, Swing EDG #2 aligned to division II of unit 1~4). The Swing EDG is used not only for LPSD, but also for replacing existing EDG due to maintenance. Therefore, Swing EDG auto starting and load sequencing is required the same as the existing EDG

The project consists of three phase; feasibility study on approaches, conceptual design with the chosen approach, and technical clarifications. The scope of this project is to provide the feasibility study on three approaches suggested by the plant owner, including the technical feasibility for implementation, to determine the best approach for proceeding. The scope of this project also includes providing a conceptual design for the chosen approach. Once the best option is selected, a set of Conceptual Design for the Swing EDG system will be provided. The report will be shared with the regulatory body (FANR) as it is.

KEPCO E&C therefore aims to get a I&C technical support with respect to the above items from the Contractor.

4. Scope of Work

Task 1 Review Best Option Study for the I&C system of the Swing EDG

- KEPCO E&C will provide best option feasibility study report for the I&C system of the Swing EDG
- Contractor provides documentation with updating the I&C architecture design and review of licensing issue.

  - Method to control Swing EDG in the Main Control Room as minimizing the design change of the currently operating Barakah APR1400
  - Evaluate advantages/disadvantages of auto load sequence logic for the Swing EDG, including design, licensing, maintenance.
  - Evaluate advantages/disadvantages of MCR control vs. local control, including design, licensing, maintenance.
  - For all approaches licensing evaluation shall consider independence between each unit and each division within each unit in accordance with IEEE 379, IEEE 603, IEEE 7-4.3.2, IEEE 384, and other related requirements.

Task 2 Review Conceptual Design for the I&C system of the Swing EDG

- KEPCO E&C will provide the conceptual design report for the I&C system of the Swing EDG.
- Contractor provides documentation with updating and reviewing the I&C design of Swing EDG.
- Contractor support technical clarification for owner requests

  - Additional technical clarification of I&C design requested by the plant owner and

regulatory body including the FSAR markup if required.

5 Documentation of Consulting Results

All products for this consulting service shall be submitted in the form of electronic documents. Electronic files of review results shall be submitted by the scheduled date in section 6. The consultation documentation will include all information for KEPCO E&C's questions made within the individual consulting period. In addition, reference materials when used in doing consulting work shall be identified in each consulting products, and a relevant electronic file may be provided (excluding legally restricted material) as requested by KEPCO E&C.

The Contractor shall not use nor disclose, to any third party, all and any information provided by KEPCO E&C in connection with this Contract. The Contractor shall promptly destroy, upon completion or termination of the Contract, whichever is earlier, all such information including but not limited to prepared, developed or generated information, document, material or any tangible information by the Contractor without retaining a copy of any such information. The Contractor shall upon request, certify in writing such destruction within reasonable period.

6. Methods of Performance

All the tasks above should be performed based on technically acceptable and sound basis. The work shall be carried out in close co-operation between the Parties. All relevant initial data regarding I&C system of the Swing EDG and available to KEPCO E&C should be made available to Contractor, as may be necessary. All documents shall be made available to Contractor in soft form and all project data shall be in English language unless otherwise agreed. Final deliverables including reports should be submitted after the completion of task.

In order to discuss the matters relevant to the services, correspondences can be made via e-mail or telephone. However, official correspondences shall be communicated via letter. The correspondence containing important issues and/or decisions will be recorded.

7. Deliverables

All deliverables shall be submitted within period specified below.

1) Best option study review result: within 2 months from the Execution Date
2) Conceptual design review result: within 4 months from the Execution Date

8. Work Schedules

The task schedule for activities of Technical Consultation for the I&C System of Swing EDG is shown on the following Table.

Activity	Month after Execution Date				
	1st	2nd	3rd	4th	~March 30, 2022
Task 1. Review Best Option Study for the I&C system of the Swing EDG	■■■■	■■■■			
Task 2. Review Conceptual Design for the I&C system of the Swing EDG		■■■■	■■■■	■■■■	

■ **CONSULTATION PERIOD**

→ **Execution Date of the Contract(*) ~ March 30, 2022**