1. **TITLE : Multiple Spurious Operations (MSO) and Detailed Circuit Analysis Support**

**for SHN 1&2**

1. **ITB No. : ITB16-KCN-01**
2. **Submission Due : Feb. 18. 2016**
3. **General Scope of Work**

**Task 1 (Conduct MSO Expert Panel Review)**

**Task 2 (MSO Analysis and Detailed Circuit Analysis)**

**Task 3 (Analysis of Resolutions and Documentation**

**of the MSO Evaluation)**

**Task 4 (Technical Meetings)**

**Task 5 (Licensing Support)**

1. **Type of Bid : Appoint competitive tender**
2. **Nominated Company**

**Engineering Planning and Management, Inc.**

**Nexus Technical Services Coporation, a Jansen Huges Company**

1. **Contact Point : Junghun Lee (+82-54-421-3993)**

Technical Information

**Multiple Spurious Operations (MSO) and**

**Detailed Circuit Analysis Support for SHN 1&2.**

***2016.02***



**CHAPTER Ⅰ**

**GENERAL INFORMATION**

1. **OBJECTIVES**
2. **PROJECT DESCRIPTION**

**1. OBJECTIVES**

The objective of this consulting service is to provide KEPCO E&C with a certain engineering support for the Multiple Spurious Operations (MSO) evaluation and Detailed Circuit Analysis (DCA) for Shin Hanul 1 & 2 NPPs.

**2. PROJECT DESCRIPTION**

KEPCO E&C is responsible to perform the MSO evaluation to meet the Regulator authority(KINS)’s request for SHN 1&2.

SHN 1&2 is APR1400 plant which got the construction permission in accordance with fire protection requirements effective as of June 2006.

Although SHN 1&2 NPP are basically designed to exclude the effect of spurious operation with redundant train of safe shutdown components using the concept of separation conservatively, but the multiple spurious operation caused by circuit failure is one of the issues to be further developed to improve fire safety as well as meet the requirements of regulatory authority.

In this regard, in order to develop the fire safety, KEPCO E&C aims to get the technical support from the Contractor to accomplish the following goals.

(1) Review the SHN 1&2 design against the requirements of USNRC RG 1.189 (Rev.2) and NEI 00-01 (Rev.3)

(2) Perform analysis demonstrating how SHN 1&2 plants meet current MSO

Requirements

**CHAPTER Ⅱ**

**TECHNICAL INFORMATION**

1. **SCOPE OF SERVICES**

1. **METHODS OF PERFORMANCE**
2. **CONSULTING SCHEDULE**
3. **SCOPE OF SERVICES**

To achieve the above goals, the Contractor shall provide the following engineering services to KEPCO E&C.

1. **Task 1 (Conduct MSO Expert Panel Review)**

The Contractor shall define applicable scenarios for MSO evaluation

* 1. Review and summary of the requirement and methodology related to MSO evaluation
* USNRC RG 1.189, Rev.2
* NEI 00-01, Rev.3
* NUREG-1852
  1. Perform a preliminary review of MSO concerns in preparation for the Expert Panel Review
* Perform a review of the PWR generic list of MSOs and identify any additional plant design-specific MSOs using the deterministic guidance of NEI 00-01, Appendix G.
* Identify any potential MSOs outside of Appendix G if found during a review of the plant systems.
* Review of the Electrical system per NEI 00-01, App G.
  1. Leading the Expert Panel in the review and present potential MSO concerns. The Expert Panel will decide the final list of applicable MSOs.
  2. Documentation the results of the MSO Expert Panel Review using the format of NEI 00-01 Revision 3, Table G-2.

KEPCO E&C will provide necessary information before the Contractor starts this task.

The Contractor shall provide the preliminary review results to KEPCO E&C when the above work activities are completed. KEPCO E&C will review the results and send comments and questions, if any.

1. **Task 2 (MSO Analysis and Detailed Circuit Analysis)**

Based on the information provided by KEPCO E&C, tasks to be performed by the Contractor are as follows:

(2.1) Review and confirmation of adequacy of design information

(2.2) Perform MSO scenario modeling using the final list of MSOs resulting from Task 1

(2.3) Prepare the calculation describing the setup of the MSO model providing a detailed explanation of each MSO scenario logic found applicable.

(2.4) Perform MSO technical evaluation by fire area and verify, perform and assist circuit analysis

(2.5) Development of possible resolution for each failures

(2.6) Prepare a draft report summarizing the MSO analysis and potential resolution

The Contractor shall provide the draft MSO evaluation report to KEPCO E&C when the above work activities are completed. KEPCO E&C will review the results and send comments and questions, if any.

1. **Task 3 (Analysis of Resolutions and Documentation of the MSO Evaluation)**

Tasks to be performed by the contractor are as follows:

(3.1) Confirmation of resolution based on the MSO analyses result

(3.2) Perform a preliminary fire modeling evaluation using FDT as the resolution for “important” MSOs in order to minimize changes to plant design.

(3.3) Perform a preliminary feasibility evaluation using the latest NRC guidelines and develop the MSO specific Post-Fire Abnormal Operating Procedure, if a potential resolution includes an OMA.

(3.4) Documentation of the final evaluation and resolution for MSO failure based on the analysis result

The Contractor shall provide the Final MSO evaluation report to KEPCO E&C when the above work activities are completed. KEPCO E&C will review the results and send comments and questions, if any.

1. **Task 4 (Technical Meetings)**

The contractor shall prepare several technical meetings with KEPCO E&C. KEPCO E&C staffs will visit the contractor’s office. Activities that will be done during the meeting are as follows:

(4.1) Participate in Expert panel review (Task 1.3)

(4.2) Participate in Perform the circuit analysis (Task 2.4)

(4.3) Review the draft report result and resolve the open items (Task 2.6)

(4.4) Review the final report result and resolve the open items (Task 3.4)

The contractor shall provide the presentation materials to KEPCO E&C after the meeting.

The detailed schedule of technical meetings will be discussed during the contract process.

1. **Task 5 (Licensing Support)**

The contractor should provide engineering services, analysis, and licensing support through KEPCO E&C for any MSO training, MSO inquiries, RAIs, or licensing issues that may result from the SHN utility personnel or the regulator(KINS).

**2. Methods of Performance**

* 1. **Domain of Responsibility**
* KEPCO E&C
* Provide all data so that the Contractor can perform the tasks.
* Participate in Expert Panel Review meeting
* Participate in performing the circuit analysis to reduce the analysis duration
* Reviews the reports, analysis modeling and calculations prepared by the Contractor
* Consulting company
* Provides the consulting services that are defined in Task 1 through Task 5.
* Provides the deliverables to KEPCO E&C as defined in subsection B.
  1. **Deliverables**

The following are the deliverables that are to be submitted by the Contractor to KEPCO E&C.

|  |  |  |
| --- | --- | --- |
| No | Deliverables | Date after  Contract Award |
| 1 | * Export Panel Review Report | 9 weeks |
| 2 | * Draft MSO Report | 21 weeks |
| 3 | * Final MSO Report | 27 weeks |

**3. Consulting Schedule**

Duration of the work activities is 79 weeks after the contract. Details of the schedule and milestones are delineated in the following Table. Detailed time schedule can be adjusted during the 1st technical meeting through discussion between the Contractor and KEPCO E&C taking into account the date of contract awards and work schedule.

| Activity | DOR | Week after  Contract Award |
| --- | --- | --- |
| (Task 1) Conduct MSO Expert Panel Review   * Review and summary of the requirement and methodology related to MSO evaluation * Perform a preliminary review of MSO concerns in preparation for the Expert Panel Review * Leading the Expert Panel in the review and present potential MSO concerns * Documentation the results of the MSO Expert Panel Review | Contractor  Contractor  Contractor  Contractor | 9 weeks |
| (Task 2) MSO Analysis and Detailed Circuit Analysis   * Review and confirmation of adequacy of design information * Perform MSO scenario modeling using the final list of MSOs resulting from Task 1 * Prepare the calculation describing the setup of the MSO model providing a detailed explanation of each MSO scenario logic found applicable * Perform MSO technical evaluation by fire area and verify, perform and assist circuit analysis * Development of possible resolution for each failures * Prepare a draft report summarizing the MSO analysis and potential resolution | Contractor  Contractor  Contractor  Both  Contractor  Contractor | 21 weeks |
| (Task 3) Analysis of Resolutions and Documentation of the Evaluation of MSO   * Confirmation of resolution based on the MSO analyses result * Perform a preliminary fire modeling evaluation using FDT * Perform a preliminary feasibility evaluation using the latest NRC guidelines and develop the MSO specific Post-Fire Abnormal Operating Procedure and if a potential resolution includes an OMA * Documentation of the final evaluation and resolution for MSO failure based on the analysis result | Both  Contractor  Contractor  Contractor | 27 weeks |
| (Task 4) Technical meetings   * Expert panel review * Perform the circuit analysis * Review the draft report result and resolve the open items * Review the final report result and resolve the open items | Both | During task 1~3  (200 MH)\*  (300 MH)  (100 MH)  (100 MH) |
| (Task 5) Licensing Support   * To be determined by specific Work Order | Contractor | 79 weeks (52 weeks after completion of task 3 / 500 MH) |

\* The detailed schedule and estimated MH of Task 4,5 will be discussed during the   
contract process.

**Attachments: Work Order Form for Licensing Support**

Attachment

**Work Order Form for Licensing Support**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 agreement.  W.O. No. : Issue Date:  Type of Service  [ ] RAI Response Support [ ] OTS | | | | | |
| MH Budget: MH | | Assignment Start Date: | | | |
| Assignment Period: | | | |
| Scope of Work: | | | | | |
| Delivery Requirement: | | | | | |
| Any Other Special Requirement: | | | | | |
| Name(s) of Personnel to Carry Out the Work: | | | | | |
| References: | Initiated by KEPCO E&C  Discipline:  Name:  Signature: | | Coordination | | |
| Position | Name | Signature |
|  |  |  |
|  |  |  |
| Agreed to by Contractor PM    (Name) (Signature) (Date) | | | | | |
| Authorized by KEPCO E&C PM    (Name) (Signature) (Date) | | | | | |