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**SUBJECT:**

WORK ORDER PROPOSAL

Validation and Approval of the Ageing Management Program

**WORK ORDER PROPOSAL**

Based on the Framework Agreement between the AEOI and the UJV from December 12, 2016, the parties agreed on following:

1. Scope of Services / Deliverables

The work order ensures review of TAVANA documents/reports developed on current AMP followed by proposals of modifications or updates with possible implementation plan and needed measures specification. The goal is current AMP enhancement. It means to clearly specify required activities for the modernized or new AMP definition and implementation.

List of draft documents and activities developed up to now by TAVANA Co. for review:

|  |  |
| --- | --- |
| Row | **Report Subject** |
|  | Development of “requirements for ageing management program implementation” |
|  | Development of organizational ageing management arrangements |
|  | Development of screening methodology for systems, structure and components |
|  | The Screening Methodology of Electrical Cables |
|  | Ageing Management Program of Cables |
|  | Ageing Management Program of Reactor |
|  | Ageing Management Program of Pressurizer |
|  | Ageing Management Program of Steam generator |
|  | Ageing Management Program of Main Coolant Pipeline |
|  | Ageing Management Program of Reactor Coolant Pump |
|  | Ageing Management Program of Steel Containment |
|  | Ageing Management Program of Concrete Containment |
|  | Methodology for Time Limited Ageing Analysis of low cycle fatigue |
|  | Methodology for Time Limited Ageing Analysis of Crack Growth |
|  | Methodology for Time Limited Ageing Analysis of Erosion-corrosion of equipment and pipelines |
|  | Methodology for Time Limited Ageing Analysis of Environmentally Assisted Fatigue |
|  | Methodology for Time Limited Ageing Analysis of neutron embrittlement in Reactor Pressure Vessel |
|  | Methodology of Time Limited Analysis of High-cycle Thermal Fatigue in T-shaped Junctions |
|  | Methodology of Time Limited Analysis of High-cycle Fatigue for Steam Generator Tubes |

UJV will be responsible for:

* review of the documents from the list
* identification and description of gaps in comparison to a good international practice represented mainly by appropriate IAEA safety documentation and UJV experience
* suggestion of modifications or updates of the documents from the list

## Review of overall AMP documentation

1. Review of basic overall Ageing management program documentation.

|  |  |
| --- | --- |
| Row | **Report Subject** |
|  | Development of “requirements for ageing management program implementation” |
|  | Development of organizational ageing management arrangements |
|  | Development of screening methodology for systems, structure and components |

Developed documents will be reviewed from the point of view of their accordance to:

| **Report** |
| --- |
| IAEA Safety Standards, No. SSG-25, Periodic Safety Review for Nuclear Power Plant, 2013 |
| WENRA Safety Reference Levels for Existing Reactors, 24th September 2014 |
| INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2, Rev. 1, IAEA, Vienna (2016) |
| INTERNATIONAL ATOMIC ENERGY, Safety of Nuclear Power Plants: Design, IAEA Safety Standards Series No. SSR-2/1, Rev. 1, IAEA, Vienna (2016). |
| INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.12, IAEA, Vienna (2009). |
| IAEA Specific Safety Guide DS485 (Draft): Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Vienna (2017) |
| IAEA, Safety Guide No. GS-G-3.1, Application of the Management System for Facilities and Activities, Vienna (2006) |

and UJV experience.

1. Gaps in comparison to a good international practice represented mainly by appropriate IAEA safety documentation and UJV experience will be identified and described.
2. Modifications and updates of the overall ageing management program documents will be suggested.

## Review of specific AMPs

1. Review of the specific ageing management programs doumentation:

|  |  |
| --- | --- |
| Row | **Report Subject** |
|  | The Screening Methodology of Electrical Cables |
|  | Ageing Management Program of Cables |
|  | Ageing Management Program of Reactor |
|  | Ageing Management Program of Pressurizer |
|  | Ageing Management Program of Steam generator |
|  | Ageing Management Program of Main Coolant Pipeline |
|  | Ageing Management Program of Reactor Coolant Pump |
|  | Ageing Management Program of Steel Containment |
|  | Ageing Management Program of Concrete Containment |

Developed documents will be reviewed from the point of view of their accordance to:

| **Report** |
| --- |
| INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.12, IAEA, Vienna (2009). |
| IAEA Specific Safety Guide DS485 (Draft): Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Vienna (2017) |

and UJV experience.

1. Gaps in comparison to a good international practice represented mainly by appropriate IAEA safety documentation and UJV experience will be identified and described.
2. Modifications and updates of the specific ageing management programs documents will be suggested.

## Review of TLAA methodologies

1. Review of TLAA methodologies:

|  |  |
| --- | --- |
| Row | **Report Subject** |
|  | Methodology for Time Limited Ageing Analysis of low cycle fatigue |
|  | Methodology for Time Limited Ageing Analysis of Crack Growth |
|  | Methodology for Time Limited Ageing Analysis of Erosion-corrosion of equipment and pipelines |
|  | Methodology for Time Limited Ageing Analysis of Environmentally Assisted Fatigue |
|  | Methodology for Time Limited Ageing Analysis of neutron embrittlement in Reactor Pressure Vessel |
|  | Methodology of Time Limited Analysis of High-cycle Thermal Fatigue in T-shaped Junctions |
|  | Methodology of Time Limited Analysis of High-cycle Fatigue for Steam Generator Tubes |

Developed documents will be reviewed from the point of view of their accordance to:

| **Report** |
| --- |
| INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.12, IAEA, Vienna (2009). |
| IAEA Specific Safety Guide DS485 (Draft): Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Vienna (2017) |

and UJV experience.

1. Gaps in comparison to a good international practice represented mainly by appropriate IAEA safety documentation and UJV experience will be identified and described.
2. Modifications and updates of the TLAA methodology documents will be suggested.
3. Deliverables

Ad 1.1 Reviewed documents:

* Development of “requirements for ageing management program implementation”
* Development of organizational ageing management arrangements
* Development of screening methodology for systems, structure and components

including evaluation of their sufficiency for development of new overall AMP consistent with today’s requirements.

List of identified gaps and suggested modifications and updates.

Ad 1.2 Reviewed documents:

* The Screening Methodology of Electrical Cables
* Ageing Management Program of Cables
* Ageing Management Program of Reactor
* Ageing Management Program of Pressurizer
* Ageing Management Program of Steam generator
* Ageing Management Program of Main Coolant Pipeline
* Ageing Management Program of Reactor Coolant Pump
* Ageing Management Program of Steel Containment
* Ageing Management Program of Concrete Containment

including evaluation of their sufficiency for development of specific AMPs consistent with today’s requirements.

List of identified gaps and suggested modifications and updates.

Ad 1.3 Reviewed documents:

* Methodology for Time Limited Ageing Analysis of low cycle fatigue
* Methodology for Time Limited Ageing Analysis of Crack Growth
* Methodology for Time Limited Ageing Analysis of Erosion-corrosion of equipment and pipelines
* Methodology for Time Limited Ageing Analysis of Environmentally Assisted Fatigue
* Methodology for Time Limited Ageing Analysis of neutron embrittlement in Reactor Pressure Vessel
* Methodology of Time Limited Analysis of High-cycle Thermal Fatigue in T-shaped Junctions
* Methodology of Time Limited Analysis of High-cycle Fatigue for Steam Generator Tubes

including evaluation of their sufficiency for review and/or development of TLAAs consistent with today’s requirements.

List of identified gaps and suggested modifications and updates.

1. Staff

*The following person shall be designated as Work Order manager*

[     ]

1. Schedule

*The scope of the Services shall be performed and deliverables made available to the AEOI by the following schedule:*

|  |  |
| --- | --- |
| * Commencement of Services: | [T0] – date of contract signature |
| * Milestones [description]:   Review of overall AMP documentation  Review of specific AMPs  Review of TLAA methodologies  Reaction of TAVANA on preliminary results and discussion  Finalization of results, final reports | [date]  T0 + 4 months .  T0 + 6 months  T0 + 6 months .  T0 + 9 months . .  T0 + 11 months |
| * Completion of Services: | [T0 + 11 months] |
|  |  |

1. Remuneration

The remuneration for the provision of the scope of the Services is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Task** | **Number of hours** | **Rate (USD/hour)** | **Price** |
| Review of the document - Development of “requirements for ageing management program implementation” | 120 | 85 | 10 200 USD |
| Review of the document - Development of organizational ageing management arrangements | 120 | 85 | 10 200 USD |
| Review of the document - Development of screening methodology for systems, structure and components | 120 | 85 | 10 200 USD |
| Review of the document - The Screening Methodology of Electrical Cables | 120 | 85 | 10 200 USD |
| Review of the document - Ageing Management Program of Cables | 160 | 85 | 13 600 USD |
| Review of the document - Ageing Management Program of Reactor | 240 | 85 | 20 400 USD |
| Review of the document - Ageing Management Program of Pressurizer | 120 | 85 | 10 200 USD |
| Review of the document - Ageing Management Program of Steam generator | 240 | 85 | 20 400 USD |
| Review of the document - Ageing Management Program of Main Coolant Pipeline | 160 | 85 | 13 600 USD |
| Review of the document - Ageing Management Program of Reactor Coolant Pump | 160 | 85 | 13 600 USD |
| Review of the document - Ageing Management Program of Steel Containment | 160 | 85 | 13 600 USD |
| Review of the document - Ageing Management Program of Concrete Containment | 160 | 85 | 13 600 USD |
| Review of the document - Methodology for Time Limited Ageing Analysis of low cycle fatigue | 160 | 85 | 13 600 USD |
| Review of the document - Methodology for Time Limited Ageing Analysis of Crack Growth | 160 | 85 | 13 600 USD |
| Review of the document - Methodology for Time Limited Ageing Analysis of Erosion-corrosion of equipment and pipelines | 160 | 85 | 13 600 USD |
| Review of the document - Methodology for Time Limited Ageing Analysis of Environmentally Assisted Fatigue | 160 | 85 | 13 600 USD |
| Review of the document - Methodology for Time Limited Ageing Analysis of neutron embrittlement in Reactor Pressure Vessel | 160 | 85 | 13 600 USD |
| Review of the document - Methodology of Time Limited Analysis of High-cycle Thermal Fatigue in T-shaped Junctions | 160 | 85 | 13 600 USD |
| Review of the document - Methodology of Time Limited Analysis of High-cycle Fatigue for Steam Generator Tubes | 160 | 85 | 13 600 USD |
| Meeting on discussion of preliminary results | 400 | 85 | 34 000 USD |
| Finalization of results, final reports | 320 | 85 | 27 200 USD |
| Project management (10%) | 320 | 85 | 27 200 USD |
| Reserve (10%) | 320 | 85 | 27 200 USD |
| Total |  |  | 370 600 USD |

At a fixed price of 370 600,- USD

On a reimbursable basis at the agreed rates and on the basis of the cost estimates in the proposal (which estimate may not be exceeded without the AEOI's prior approval).

On a reimbursable basis at the agreed rates – cost estimate to be defined.

1. Terms of Payment

The terms of payment are as follows:

* [      ]
* [      ]

1. Background Information and specification of necessary cooperation

[ ]

1. Completion and Acceptance Criteria

[ ]

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| --- | --- | --- | --- |
| **Atomic Energy Organization of Iran** |  | | **ÚJV Řež, a. s.** |
| Date: |  |  | Date: |
| Name and Surname  Position |  |  | Name and Surname  Position |
|  |  |  |  |
| Name and Surname  Position |  |  | Name and Surname  Position |