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Statement of Work

Advanced Test Reactor Risk Monitor System

REVISION LOG

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1. SCOPE

1.1 Introduction

The Advanced Test Reactor (ATR) is a Department of Energy (DOE) owned pressurized water reactor whose principal function is to provide a high neutron flux for experiments involving reactor fuels and materials. The ATR is an important and unique national resource. It is the premier test reactor in the United States and plays a central role in nuclear energy research and development missions for military, space and civilian applications. The ATR is located at the Advanced Test Reactor Complex (ATR Complex) at the Idaho National Laboratory (INL)

A level 1 ATR Probabilistic Risk Assessment (PRA) for power operations is nearing completion. It is desired to acquire the capability to use this PRA model to provide online risk monitoring for ATR daily operations.

1.2 Work Included

The Subcontractor shall furnish software, training, and documentaion necessary to implement an online risk monitoring system for ATR operations as detailed below. The provided software shall be preapproved by the Contractor and made available to the Contractor following task execution.

1.2.1 Performance requirements

It is our intention to become capable of making risk-informed decisions regarding changes to plant configuration due to design and procedural changes as well as maintenance activities. To that end, a system that allows conformity with the guidance such as that given in Regulatory Guide 1.174[1] and others would be desirable.

The risk monitor system shall perform the following tasks as a minimum:

a. Provide near real-time monitoring of risk metrics during various plant operating states, including power operations, outages, refueling and testing. Risk metrics to be calculated include:

    a. Core damage frequency (CDF)

    b. Large early-release frequency (LERF)

    c. One or more user-defined frequency calculations. These calculations are envisioned to be based on different endstates or groups of endstates, sequence partitions, or event susceptibilities.

b. Provide the capability to determine and graphically plot future changes in the risk metrics due to maintenance activities, including providing (for example) shiftly values to coincide with maintenance schedule fluctuations.

c. Provide methods to easily compare results from different plant configuration scenarios and return to the "baseline" plant state.

1.2.2 Inputs to the risk monitor

The provided risk monitoring system shall accept input from the following applications, which are currently in use by ATR:

1.2.2.1 Maintenance scheduling program, Primavera

The online risk monitor system shall be compatible with and accept input from the maintenance scheduling program Primavera Project Planner P6, Release 6.2[2].

a. The online risk monitor system shall accept Primavera P6 data files directly or shall accept the Primavera P6 export files directly.

1.2.2.2 PRA analysis program, Saphire

The online risk monitor system shall be compatible with and accept input from the PRA modeling program Saphire, version 7.2.7[3], which was used to develop the ATR PRA model. Specifically, the following attributes of the current ATR PRA model shall be accommodated:

a. The online risk monitor shall accept Saphire data files directly or shall accept the Saphire text-based export files directly.

b. The online risk monitor shall be able to read and understand the model customization features of the current Saphire model, such as the following:

    a. event trees with associated linkage rules,

    b. logical flags and flag sets for enabling and disabling fault logic,

    c. sequence recovery rules,

    d. endstate gathering and differentiation

c. The risk monitor system shall be able to take advantage of the switching capabilities of the current PRA model when performing the configuration manipulations necessary to achieve near real-time risk output.

1.2.3 Output requirements

a. The risk monitor system shall produce a variety of electronic and hard copy reporting features for communicating and documenting the results of the activities listed in section 1.2.1 above.

b. The risk monitor system shall be capable of producing an electronic listing of component states on demand.

1.2.4 Data and software security

Provisions shall be included to secure the data and software from unauthorized use and modification. The user authorization and authentication process is to include categorization of users based on task requirements.

1.2.5 Training

Upon delivery of the accepted product, Subcontractor shall provide initial training to Contractor personnel on operation of the online risk monitor system.

1.2.6 Safety Monitor System Operation

The Subcontractor shall provide draft procedure(s) for operating the risk monitor system for PRA practitioners, engineers, project and operations personnel. One or multiple procedures are acceptable as needed based on the user.

1.2.7 Validation and Verification

The Subcontractor shall provide a validation and verification package for the risk monitor system similar in requirements and content to that completed for SAPHIRE.[4] Other commercial nuclear power plant standards may be used, with the concurrence of BEA technical contact.

1.3 Work Excluded

Any scheme to convert the Saphire PRA models to another PRA program will not be accepted if it includes any one of the following additional conditions:

a. Purchase of a license to use the additional software

b. Manual file conversion activities

c. The new scheme does not have all the system analysis capabilities of Saphire (including those listed in section 1.2.2.2 above).

2. APPLICABLE CODES, PROCEDURES, AND REFERENCES

The subcontractor is expected to apply additional or recommend changes to the codes, procedures, and references as dictated by his judgment and experience, with concurrence of the BEA technical contact.

ASME NQA-1-2000, Quality Assurance Requirements for Nuclear Facility Application, and Subpart 2.7 Quality Assurance Requirements for Computer Software for Nuclear Facility Applications

NUREG-0800, "Standard Review Plan", Chapter 19.1, "Determining The Technical Adequacy Of Probabilistic Risk Assessment Results For Risk-Informed Activities" Rev. 2, June 2007.

USNRC, Regulatory Guide (RG) 1.174, "An Approach For Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" Rev. 1, November 2002.

USNRC, RG 1.175, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Inservice Testing," August 1998.

USNRC, RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998.

USNRC, RG 1.178, "An Approach for Plant-Specific, Risk-Informed Decisionmaking for Inservice Inspection of Piping," Rev. 1, September 2003.

USNRC, RG 1.182, "Assessing and Managing Risk Before Maintenance Activities," May 2000.

PLN-2047, "Advanced Test Reactor Probabilistic Safety Assessment Update Plant, Revision 1, September 27, 2007.

3. TECHNICAL AND FUNCTIONAL REQUIREMENTS

As identified in Section 1.2.

4. ENVIRONMENTAL, SAFETY, HEALTH, AND QUALITY ASSURANCE REQUIREMENTS

4.1 Environmental

None

4.2 Safety and Health

While working on INL premises, the Subcontractor shall meet federal, state, and local regulations and requirements during the performance of the work.

4.3 Quality Assurance/Control

The items and/or services the Subcontractor will provide under this SOW have been determined to affect safety at a DOE facility designated by DOE to be a category 1 "nuclear facility." While performing work for this type of facility, the Subcontractor and any sub-tier Contractors shall follow the Contractor work processes, except for validation and verification processes. Acceptable validation and verification processes are stated in Section 1.2.7.

5. RESPONSIBILITIES

5.1 Subcontractor

5.1.1 Perform all tasks as outlined in Section 1.2.

5.1.2 Action Item List

Maintain a current action item list showing responsibilities, status, and forecast completion dates. Each action item shall have a unique number. Update, identify with the current date, and transmit the list to the Life Extension Program (LEP) Project Manager after adding action items biweekly (every other week). Include the final closure status of each of the action items as completed.

5.1.3 Progress Reviews

Provide biweekly (every other week) schedule updates to the LEP Project Manager including percent complete, actual start, and expected finish dates. Meet with the LEP Project Management on a monthly basis (during regular on-site visits) to conduct periodic progress reviews.

5.1.4 Submittal of deliverables

The Subcontractor shall submit draft deliverables to the appropriate LEP Project Management staff for review as established for the specific assigned tasks.

The Subcontractor shall work with the LEP Project Management staff to resolve review comments and incorporate into the documents that will be issued in final form as agreed to with the LEP Project Management staff.

5.1.5 On-site Presentations

The Subcontractor shall perform the following activities during on-site visits to the INL.

- Attend a kickoff meeting.
- Present the draft final report. The audience may include INL representatives and other parties, such as regulators, stakeholders, and oversight bodies.

5.1.6 Training

The Subcontractor shall possess all appropriate training for access to INL facilities including but not limited to INL Access and ATR Complex access.

5.1.7 The following information shall be provided by the Subcontractor to the Contractor for any personnel visiting the INL:

Full Name
Home Address
Home Telephone number
Work Address
Work Telephone Number
Date of Birth
Social Security Number
Citizenship
Company affiliation
DOE clearance level, if any.

5.2 Contractor

The Contractor will provide a single technical point of contact to supply requested available reference material and technical information (e.g. drawings, system design descriptions and engineering design files) to the supplier.

The Contractor will provide the Subcontractor with SAPHIRE (PRA software), power operations model, and access to reference materials as needed.

The LEP Project Management contacts are as follows:

Project Manager and Technical Lead:
Bentley Harwood
208 526-8609 (phone)
208 526-9259 (fax)

6. DELIVERABLE SCHEDULE

ACTIVITY	DUE DATE
Attend an on-site kickoff meeting at the customer specified location to present a cost and schedule estimate for the work scope presented in Section 1.	Approximately 2 weeks after contract award.
Submit a cost estimate and resource-loaded schedule for performing the tasks in Section 1.2.	Approximately 4 weeks after contract award and bi-weekly schedule updates thereafter for the duration of the tasks.
Attend an on-site meeting to present the risk monitor system identifying the performance and functional capabilities as described in Section 1.2 are met.	Per the Contractor accepted project baseline schedule.
Delivery of the risk monitor system including software, documentation, verification and validation package after either incorporating or formally resolving any Contractor comments made during the performance and functional capabilities presentation.	Per the Contractor accepted project baseline schedule.

7. SUBMITTALS

The Subcontractor shall provide a detailed, resource loaded Primavera (P6) schedule for performing the work described in Section 1. The schedule shall be broken down into the discrete tasks and shall show logic (predecessors and successors). The schedule will be baselined, and all reports generated in the future shall be compared against the baseline. The schedule shall be updated biweekly, and progress reports sent to the Contractor Project Manager showing percent complete compared against the baseline schedule. In addition, earned value management concepts will be applied to the schedule on a biweekly basis i.e. Budgeted Cost of Work Scheduled, Budgeted Cost of Work Performed, and Actual Costs will be assessed to determine biweekly and project-to-date cost and schedule variances.

The Contractor will review and comment on the proposed schedule. All comments arising from the Contractor review will be considered and either incorporated or formally resolved with the final approval of the Contractor.

Completion of identified activities for each task shall be documented and any Contractor comments will be considered and either incorporated or formally resolved with final approval of the Contractor.

The Subcontractor shall submit the risk monitor system software, documentation, verification and validation package on completion of the final milestone in MS Office format on CD or in another mutually acceptable format.

The Contractor reserves the right to visit vendor location at any time during the project to review and discuss project status.

8. SPECIAL CONDITIONS

None

9. ACCEPTANCE

Acceptance of Subcontractor's work scope occurs upon successful delivery and demonstration of the installed product, comment resolution, initial training and delivery of the final product and documentation in MS Office electronic files on CD or in another mutually acceptable format.

10. APPENDICES

None

11. ATTACHMENTS

None

12. REFERENCES

1. USNRC, Regulatory Guide 1.174, "An Approach For Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" Rev. 1, November 2002.

2. Primavera Project Planner P6, Release 6.2.

3. Systems Analysis Program for Hands-on Integrated Reliability Evaluations (SAPHIRE) Version 7.2.7, Idaho National Laboratory.

4 NUREG/CR-6688, "Testing, Verifying, and Validating SAPHIRE Versions 6.0 and 7.0," October 2000.