

**Statement of Work  
for  
Norman A. Eisenberg  
for  
FY03 Support to the CNWRA**

***1. Background***

During FY02 substantial progress was made in enhancing the PCSA Tool by adding capabilities for: (1) Qualitative analysis of human reliability, (2) Qualitative analysis of software reliability, and (3) Quantitative determination of human error rates. In addition a letter report was prepared on software reliability that supplemented the report on software reliability issued in the FY01.

The new modular design proposed by DOE at the NRC/DOE technical exchange held in November, 2002, consists of two dry transfer facilities and one remediation building. The remediation building will have a limited capacity pool to handle damaged fuel, and casks and WPs that need remedial measures, while bulk of the waste handling operations would be conducted in the dry transfer facilities. The transfer facilities would be used to transfer the canisters and assemblies and the two buildings would be constructed in a phased manner. DOE discussed operations related to the conceptual design using a 3-D rendering of the facility structure and general arrangements. DOE also provided sketches of a flow diagram. From these discussions it is becoming increasingly clear that the proposed modular design will have substantial remote handling operations, although at this stage no details are available. In addition, welding of the WP closure lid would be done remotely, either by human operators or by robotic systems. The PCSA Tool is being developed to conduct preclosure safety analysis. Currently the tool has the methodologies in place to identify the hazards and failure data of components related to hardware systems.

***2. Scope***

Based on recent information regarding plans for the preclosure design and operation of the repository, remote operations, conducted by human operators or robotic systems, are expected to play a major role in repository operations. Therefore, these remotely operated systems have the potential to significantly influence the safety of the repository. The safety and reliability aspects of these remote systems need to be investigated in a general manner with the intent of ensuring that the PCSA Tool can evaluate such systems and their impact on preclosure safety. This capability for the PCSA Tool might be added by incorporating new capabilities or by applying existing capabilities in a manner appropriate for these remote systems.

***3. Objective***

Identification of issues involved with remote systems in GROA operations and evaluation of how a capability to analyze remote systems may be added to the PCSA Tool.

## **4. Tasks**

### **4.1. Remote Systems Investigation**

The following tasks should address remote systems broadly and should include the following aspects:

- a. Remote handling systems and their controls
- b. Programmable logic controllers
- c. Operating systems, control software, and hardware components
- d. Safety related instrumentation, controls, and supporting systems including alarms, communication devices, and various types of displays
- e. Use of remotely operated or robotic equipment (such as welders, wrenches, cutting tools)

1. Assemble information on the failure modes and the reliability of remote systems in nuclear facilities and their controls, including potential interactions of these systems with human operators.
2. Investigate and describe techniques for analyzing the safety and reliability of these remote systems and their controls.
3. Explore whether the current capabilities of the PCSA Tool are sufficient to evaluate the impact of remote systems on repository safety, as part of a safety review.
4. Investigate available regulatory guidance on remote systems.
5. Investigate available ANSI, ANS, and other applicable standards on remote systems.
6. If appropriate, propose approaches to using the current PCSA Tool capabilities to analyze these remote systems or propose approaches to enhancing the PCSA Tool to permit such analyses.
7. Document the research and findings on remote systems in a letter report.

### **4.2 Support to CNWRA for Interactions**

#### **SCOPE**

It is anticipated that the CNWRA will have interactions with the NRC, DOE, and other parties regarding preclosure safety and, in particular, aspects of preclosure safety related to human reliability, software reliability, and remote systems.

#### **OBJECTIVE**

Provide technical and programmatic support to the CNWRA for interactions with other parties that relate to aspects of preclosure safety related to human reliability, software reliability, and remote systems. Such support could include some or all of the following: (1) assist the CNWRA in defining and articulating concerns related to human reliability, software reliability, and remote systems for preclosure safety; (2) participate in teleconferences with NRC and/or DOE; (3) attend and participate in technical exchanges with DOE; (4) prepare and/or give presentations on work performed.

The following tasks and time estimates are based on the two planned events cited; if additional events are added, additional time will be needed.