AREVA

10 CFR 70.5

July 16, 2010

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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

AREVA Enrichment Services LLC
Eagle Rock Enrichment Facility
NRC Docket No: 70-7015

Subject: Supplemental Response for NRC Request for Additional Information Number HFE-1

During a recent discussion with the NRC, AREVA Enrichment Services LLC (AES) agreed to include the Human System Interface Design Implementation Plan in the Safety Analysis Report (SAR) for the Eagle Rock Enrichment Facility (EREF). The plan was previously provided in the AES response to the NRC Request for Additional Information (RAI) (Ref. 1) for RAI Number HFE-1 on September 28, 2009 (Ref. 2). The SAR markup pages incorporating this plan are provided in Enclosure 1.

The EREF License Application will be revised to include the changes identified in the markups provided in Enclosure 1 in Revision 3 of the EREF License Application.

If you have any questions regarding this submittal, please contact me at (508) 573-6554.

Respectfully,

J. A. Kay

James A. Kay
Licensing Manager

References:

1) B. Reilly (U.S. Nuclear Regulatory Commission) Letter to Jim Kay, Licensing Manager, Eagle Rock Enrichment Facility, AREVA Enrichment Services LLC, Request for Additional Information - AREVA Enrichment Services LLC License Application for the Eagle Rock Enrichment Facility, dated August 27, 2009.
2) J. Kay (AES) Letter to the U.S. Nuclear Regulatory Commission, Response to Request for Additional Information, AREVA Enrichment Services LLC License Application for the Eagle Rock Enrichment Facility, dated September 28, 2009.

NMSS01

Enclosure:

1) Safety Analysis Report Markup Pages – Human System Interface Design Implementation Plan

Commitment:

The EREF License Application will be revised to include the changes identified in the markups provided in Enclosure 1 in Revision 3 of the EREF License Application.

cc: Breeda Reilly, U.S. NRC Senior Project Manager

Enclosure 1
Safety Analysis Report Markup Pages
Human System Interface Design Implementation Plan

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b. Electric Power and Research Institute (EPRI) NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Grade Applications," June 1988 (EPRI, 1988).

c. EPRI Topical Report (TR) -102323, "Guidelines for Electromagnetic Interference Testing in Power Plants," Revision 1, December 1996 (EPRI, 1996a).

d. EPRI TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications," October 1996 (EPRI, 1996b).

e. Regulatory Guide 1.152, "Criteria for Digital Computers in Safety Systems in Nuclear Power Plants," Revision 2, January 2006 (NRC, 2006).

f. Regulatory Guide 1.168, Revision 1, "Verification, Validation, Reviews, and Audits for Digital Software Used in Safety Systems of Nuclear Power Plants," October, 2004 (NRC, 2004b).

g. Regulatory Guide 1.169, "Configuration Management Plans for Digital Computer Software Used in Safety Systems of Nuclear Power Plants," September 1997 (NRC, 1997a).

h. Regulatory Guide 1.170, "Software Test Documentation for Digital Computer Software Used in Safety Systems of Nuclear Power Plants," September 1997 (NRC, 1997b).

i. Regulatory Guide 1.172, "Software Requirements Specifications for Digital Computer Software Used in Safety Systems of Nuclear Power Plants," September 1997 (NRC, 1997c).

j. Regulatory Guide 1.173, "Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems for Nuclear Power Plants," September 1997 (NRC, 1997d).

- For those IROFS requiring operator actions, a human factors engineering review of the human-system interfaces shall be conducted using the applicable guidance in NUREG-0700, "Human-System Interface Design Review Guidelines," Revision 2, dated May 2002 (NRC, 2002a), ~~and~~ NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, dated February 2004 (NRC, 2004a) and as described in Section 3.3.8, Human System Interface Design.
- For IROFS and IROFS with Enhanced Failure Probability Index Numbers (i.e., enhanced IROFS) that require "independent verification" of a safety function, the independent verification shall be independent with respect to personnel and personnel interface. Specifically, a second qualified individual, operating independently (e.g., not at the same time or not at the same location) of the individual assigned the responsibility to perform the required task, shall, as applicable, verify that the required task (i.e., safety function) has been performed correctly (e.g., verify a condition), or re-perform the task (i.e., safety function), and confirm acceptable results before additional action(s) can be taken which potentially negatively impact the safety function of the IROFS. The required task and independent verification shall be implemented by procedure and documented by initials or signatures of the individuals responsible for each task. In addition, the individuals performing the tasks shall be qualified to perform, for the particular system or process (as applicable) involved, the tasks required and shall possess operating knowledge of the particular system

- IEEE C2 – 2007. National Electric Safety Code (IEEE, 2007a)

- The criticality safety for tanks that are not Items Relied on For Safety (IROFS) will utilize two independent IROFS for mass control. The two are referred to as "sampled and analyzed," e.g., tank contents are sampled and analyzed before being transferred to another tank or out of the system. The "bookkeeping measures" is a process to calculate the potential mass of uranium in the tank for any batch operation to ensure that no tank holds more than a safe mass of uranium. This calculated mass of uranium is then compared to a mass limit, which is based on the double-batching limit on mass of uranium in a vessel from the criticality safety analyses. The "bookkeeping measures" process is described in further detail below.
  - For the EREF, the "bookkeeping measures" are only applied to tanks where the mass of uranium involved, even when double batching error is considered, is far below the safe value. Bookkeeping measures are a documented running inventory estimate of the total uranium mass in a particular tank. The mass inventory for each batch operation is calculated based on the mass of material to be transferred during each batch operation and the mass inventory in the tank prior to the addition of the material from the batch operation.
  - There are two types of batch operations that are considered. The first type is liquid transfer between tanks based on moving a volume of liquid with uranic material present in the volume. The second is transferring a number of components into the tank with the uranic material contained within or on the components transferred in each batch operation. For both types of operations, the initial mass inventory is set after emptying, cleaning, and readying the tank for receipt of uranic material. For each batch operation, the amount of uranic material to be transferred during a particular batch operation is estimated. This quantity of material is then credited/debited to/from each tank as appropriate. A new mass inventory in each tank is calculated. The calculated receiving tank mass inventory is compared to the mass limit for the tank prior to the transfer.
  - For the second type, a transfer of a number of facility components into an open tank during a batch operation, the mass inventory on/within the components is estimated, and that mass credited to the receiving tank. The final mass inventory in the tank is calculated and the total is compared to the mass limit for the tank prior to the transfer. Open tanks associated with this system are located in the Decontamination Workshop.
- The Liquid Effluent Collection and Treatment System process piping is designed in accordance with the applicable provisions of American Society of Mechanical Engineers, ASME B31, Standards of Pressure Piping, revision in effect at time of detailed design. To provide system integrity and prevent leaks, welded construction is used everywhere practical.
- All collection tanks are designed in accordance with American Water Works Association (AWWA), American Petroleum Institute (API), or ASME Standards.
- UF_6 cylinders with faulty valves are serviced in the Ventilated Room. In the Ventilated Room, the faulty valve is removed and the threaded connection in the cylinder is inspected. A new valve is installed in accordance with the requirements of ANSI N-14.1 (ANSI, 2001).

Insert 1

Insert 1

3.3.8 Human System Interface Design

The human system interface (HSI) design process translates function and task requirements into HSI characteristics and functions. The HSI uses a structured methodology that guides designers in identifying and selecting candidate HSI approaches, defining the detailed design, and performing HSI tests and evaluations. The process and the rationale for the HSI design is documented and controlled under the design control process described in the AES Quality Assurance Program Description (QAPD).

3.3.8.1 Human System Interface Design Inputs

The HSI design is developed based on various design inputs. The following HFE program element design inputs will be considered in making design decisions:

- operating experience review (OER),
- functional requirements analysis (FRA) and function allocation (FA),
- task analysis (TA), and
- staffing analysis.

Additionally, the HSI design team considers applicable regulatory documents and codes as well as generic HFE standards and industry guidelines as discussed in the following subsections.

3.3.8.1.1 Analysis of Personnel Task Requirements

Several analyses, as indicated below, may be performed in the early stages of the design process to identify HSI design requirements.

3.3.8.1.1.1 Operating Experience Review

An OER determines how the strengths and weaknesses of the HSI technology concept impact the effectiveness of the operator when using the technology. The goal of the OER is to compare the analysis of current work practices, operational problems and issues in current designs, and industry experience with candidate technological approaches to system and HSI technology and specific supplier solutions.

3.3.8.1.1.2 Functional Requirement Analysis and Function Allocation

FRA and FA determine which operational functions are to be performed by automatic systems, by plant personnel, or by some combination of the two. The allocation is made based on the FRA after determining what is required to perform the function. FA evolves from FRA and results in allocating functions for the best overall accomplishment for that function.

The results of the FRA and FA are used to identify the personnel role in performance of functions to reveal the task requirements and identify the HSI design implications. These HSI design implications include insight into the information that is to be displayed and how that information is presented. This information is used in the HSI procedure and training design to make sure that adequate task support is available to the operators.

3.3.8.1.1.3 Task Analysis

TA is performed for procedure development and is iterated as the HSI design detail evolves and involves determining the requirements for plant personnel to successfully perform complex real-time control actions that stem from functions assigned to them as a result of the FA design effort. Actions performed by plant personnel to accomplish a common-purpose group of activities or functions are called tasks. TA requirements are a primary consideration in design of the HSI.

3.3.8.1.1.4 Staffing and Qualifications and Job Analysis

Staffing and qualification analysis considers the allocation of assigned operational activities, the impact of those activities on crew member roles and responsibilities, and the impact of changes to operational requirements for the operating crew as a whole.

The results of the evaluation of staffing, qualifications, and integrated work design may impact the HSI design in terms of how operational activities are allocated to crew members, including assignments that make operational activities more efficient or reduce workload, how teamwork is supported, personnel qualifications, and required staffing levels.

3.3.8.1.2 System Requirements

The HSI system requirements will be documented for use throughout the HSI design process. The design control process facilitates the translation of high level requirements to lower level requirements, design inputs to design outputs, and high level design features to lower level subsystem and component design features.

The HSI consists of the controls, alarms, and indications used by the operator for performance of the IROFS safety function.

3.3.8.1.3 Regulatory Requirements and Guidance

The HSIs are designed to address the following regulatory requirements, as applicable:

- 10 CFR 70.62(d) requires, in part, that "...engineered and administrative controls and control systems that are identified as items relied on for safety pursuant to §70.61(e) of this subpart are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed, to comply with the performance requirements of §70.61 of this subpart."
- 10 CFR 70.64(a)(10) requires that, "The design must provide for inclusion of instrumentation and control systems to monitor and control the behavior

of items relied on for safety." Given that the EREF design contains many IROFS that rely on human action, the instrumentation and control systems associated with these IROFS must be designed to adequately support operator task performance.

- NUREG-1513, "Integrated Safety Analysis Guidance Document," dated May 2001 (NRC, 2001a), identifies that for administrative controls (e.g., certain human actions), "...the man-machine interface for that individual should be carefully designed."
- NUREG-0700, "Human-System Interface Design Review Guidelines," Revision 2, dated May 2002 (NRC, 2002b)
- NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, dated February 2004 (NRC, 2004a).

3.3.8.2 Concept of Operations

The design of the plant I&C systems utilized to perform an IROFS function and the HSI consider the concept of operations including (1) the physical characteristics and technical abilities of the operating staff, (2) shift staffing and organization, and (3) responsibilities of the operational staff.

A description of the concept of operations and assumptions relative to the staffing, personal characteristics, division of team responsibilities, and other related issues that form the basis for the HSI design will be developed during detailed design.

The concept of operations is primarily concerned with the operating team. The secondary concern includes system users to be considered in the design of other user interfaces.

3.3.8.3 Functional Requirements Specification

Functional requirements for the HSIs will be included in design documents for the HSIs to address the concept of operation, personnel functions and tasks that support their role in the plant as derived from function, task, and staffing/qualifications analyses, and personnel requirements for a safe, comfortable working environment. Requirements will be established for various types of HSIs, e.g., alarms, displays, and controls.

3.3.8.4 HSI Concept Design

The EREF will implement a modern I&C design utilizing experience gained at the Georges Besse II plant. The HSI concepts utilize similar I&C concepts.

3.3.8.5 HSI Detailed Design and Integration

A style guide will be developed for use in the design of HSI features, layout, and environment. The content of the style guide will be derived from (1) the application of generic Human Factors Engineering (HFE) guidance and (2) guidance developed from design-related analyses and experience. The style guide supports the interpretation and comprehension of design guidance and helps to maintain consistency in the design across the HSIs. The primary topics addressed by the style guide include data presentation, screen-based data presentation, hierarchy, and navigation, presentation and operation of controls, and presentation and interpretation of alarms.

3.3.8.6 HSI Tests and Evaluations (Verification and Validation)

Verification and validation (V&V) of the HSI design should be performed so that the as-built HSIs (1) are complete and operable, (2) conform to standard HFE principles and requirements, (3) are free of safety issues and human performance issues, and (4) implement the design accurately in the final design output documentation.

Testing and evaluation should be conducted throughout the HSI development process. Activities such as concept testing, mock-up activities, trade-off evaluations, and performance-based tests may be utilized at various stages of the design.

3.3.8.7 HSI Design Documentation

The HSI designs are documented using specific design control process requirements. The various configuration management, design change controls, design verification, and design quality control tools are described in the EREF QAPD.

NRC, 2001a. Integrated Safety Analysis Guidance Document, NUREG-1513, U.S. Nuclear Regulatory Commission, May 2001.

NRC, 2001b. Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units for Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Regulatory Guide 1.140, Revision 2, U.S. Nuclear Regulatory Commission, June 2001.

NRC, 2002a. Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, NUREG-1520, U.S. Nuclear Regulatory Commission, March 2002. Insert 2

NRC, 2003a. Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites, Regulatory Guide 1.198, U.S. Nuclear Regulatory Commission, November, 2003.

NRC, 2003b. Potentially Defective 1-Inch Valves for Uranium Hexafluoride Cylinders, NRC Bulletin 2003-03, U.S. Nuclear Regulatory Commission, August 2003.

NRC, 2003c. Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems, Regulatory Guide 1.180, U.S. Nuclear Regulatory Commission, Revision 1, October 2003.

NRC, 2004a. Human Factors Engineering Program Review Model, NUREG-0711, U.S. Nuclear Regulatory Commission, Revision 2, February 2004.

NRC, 2004b. Regulatory Guide 1.168, "Verification, Validation, Reviews, and Audits for Digital Software Used in Safety Systems of Nuclear Power Plants," Revision 1, February 2004.

NRC, 2005. Safety Evaluation Report for the National Enrichment Facility in Lea County, New Mexico, NUREG-1827, U.S. Nuclear Regulatory Commission, June 2005.

NRC, 2006. Regulatory Guide 1.152, "Criteria for Digital Computers in Safety Systems in Nuclear Power Plants," Revision 2, January 2006.

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Peck, 1974. Foundation Engineering, Second Edition, Ralph B. Peck, Walter E. Hanson, and Thomas H. Thornburn, Publisher John Wiley & Sons, 1974.

SRP, 1998. Savannah River Site Hazard Analysis Generic Initiator Database, WSRC-RP-95-915, June 11, 1998.

Winterkorn, 1975. Foundation Engineering Handbook, H.F. Winterkorn and H.Y. Fang, 1975.

Insert 2

NRC, 2002b. NUREG-0700, Human-System Interface Design Review Guidelines, NUREG-0700, Revision 2, U. S. Nuclear Regulatory Commission, dated May 2002.