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QA: N/A
Project No.WM-00011

MAY 30 2007

OVERNIGHT MAIL

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COMMENTS ON DRAFT INTERIM STAFF GUIDANCE DOCUMENT HLWRS-ISG-04, *PRECLOSURE SAFETY ANALYSIS – HUMAN RELIABILITY ANALYSIS*

In response to the U.S. Nuclear Regulatory Commission's request for comment published in Federal Register Notice (72 FR 19729) dated April 19, 2007, the U.S. Department of Energy/Office of Civilian Radioactive Waste Management (DOE/OCRWM) is providing the enclosed comments on Draft Interim Staff Guidance Document HLWRS-ISG-04, *Preclosure Safety Analysis – Human Reliability Analysis* (Draft HLWRS-ISG-04).

The DOE/OCRWM appreciates the opportunity to provide comments on this Draft HLWRS-ISG-04, which will be helpful in developing the Human Reliability Analysis (HRA) in the Preclosure Safety Analysis. The Draft HLWRS-ISG-04 appears to encourage a thorough qualitative identification of human failure events and to encourage a thorough identification of contextual factors as a background to development of human error probabilities. It specifically cites the use of operational events for insights into operating experience. The DOE/OCRWM supports such a thorough qualitative analysis but must also perform quantification of some human failure events in order to quantify the overall probabilities of event sequences for appropriate categorization and screening. As noted in Draft HLWRS-ISG-04, part of the qualitative HRA is "selection of an appropriate quantification method(s)." There are two broad categories of methods to be considered:

1. methods based on actual surrogate human performance data from other facilities (e.g., chemical processes, interim storage, industrial operations, and nuclear power plants), and
2. generic second generation methods in which probability distributions for human reliability are based on a qualitative assessment of context and performance factors.

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The Draft HLWRS-ISG-04 provides a considerable amount of guidance and cautions about the use of nuclear power plant data but provides no explicit guidance on the use of non-nuclear data and no guidance on the use of generic second generation quantification methods (such as Cognitive Reliability and Error Analysis Method "CREAM" and Human Error Assessment and Reduction Technique "HEART"). Therefore, the DOE/OCRWM recommends adding text to:

1. recognize human reliability data in addition to those associated with nuclear power plants, and
2. to provide guidance on the use of generic second generation methods.

The enclosure contains specific comments on the Draft HLWRS-ISG-04.

There are no new regulatory commitments in this letter or its enclosure. Please contact Mark H. Williams at (702) 794-5567 or e-mail mark_h_williams@ymp.gov, or Joe C. Price at (702) 794-1441 or e-mail joe_price@ymp.gov, for any additional information required.

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RAO:JCP-1076

Enclosure:
U.S. Department of Energy's Office of Civilian Radioactive Waste Management Comments on Draft Interim Staff Guidance, Document HLWRS-ISG-04

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Enclosure

U.S. DEPARTMENT OF ENERGY'S OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT COMMENTS ON DRAFT INTERIM STAFF GUIDANCE, DOCUMENT HLWRS-ISG-04

Comment 1: General

The interim staff guidance (ISG) appears to encourage a thorough qualitative identification of human failure events and to encourage a thorough identification of contextual factors as a background to development of human error probabilities. It specifically cites the use of operational events for insights into operating experience (lines 18 through 25). The U.S. Department of Energy (DOE) supports such a thorough qualitative analysis but must also perform quantification of some human failure events in order to quantify the overall probabilities of event sequences for appropriate categorization and screening. As noted in HLWRS-ISG-04, part of the qualitative human reliability analysis (HRA) is "selection of an appropriate quantification method(s)." There are two broad categories of methods to be considered: 1) methods based on actual surrogate human performance data from other facilities (e.g., chemical processes, interim storage, industrial operations, and nuclear power plants), and 2) generic second generation methods in which probability distributions for human reliability are based on a qualitative assessment of context and performance factors. The ISG-04 provides a considerable amount of guidance and cautions about the use of nuclear power plant data but provides no explicit guidance on the use of non-nuclear data and no guidance on the use of generic second generation quantification methods (such as Cognitive Reliability and Error Analysis Method "CREAM" and Human Error Assessment and Reduction Technique "HEART"). Therefore, the DOE recommends adding text to 1) recognize human reliability data sources in addition to those associated with nuclear power plants, and 2) provide guidance on the use of generic second generation methods.

DOE recommends adding a sentence at the beginning of Line 138 as follows:

Use of any quantification method, either data-driven or contextual, requires justification that it applies to Geologic Repository Operations Area (GROA) operations.

Comment 2: Footnote 3 (Below Line 70)

Although the discussion in Lines 50 to 64 is useful, the reference in footnote 3 to Regulatory Guide 1.174 is general in nature and not directly applicable to the preclosure safety analysis (PCSA). According to 10 CFR Part 63, compliance is based on evaluation, quantification, and radiological dose assessment of single event sequences. Regulatory Guide 1.174 specifically associates regulatory decision-making with total core damage frequency and total large early release frequency and uses changes in such risk measures as the basis for determination of risk significance. However, there is no counterpart for this approach that has been defined for application to 10 CFR Part 63.

DOE recommends revising footnote 3 as follows:

Delete footnote 3 from the ISG.

Comment 3: Line 56

The term "full-blown HRA" is used. The term "full-blown" is not a clear term.

DOE recommends revising line 56 as follows:

Replace the term "full-blown HRA" with "full HRA".

Comment 4: Lines 58, 77, 79, 88, 105-106, 121, 163-164, 168, 411-412

The term "risk-significant" is used in many ways in this ISG as follows:

Risk-significant aspects of review (Line 58)
Risk-significant human actions (Lines 77 and 79)
Risk-significant processes (Line 88)
Risk-significant activities (Lines 105-106);
Risk-significant human induced initiators (Line 121)
Risk-significant human actions (Line 163-164)
Risk-significant assumptions (Line 168).
Risk-significant event sequence (Lines 411-412).

The term risk-significant is often associated with nuclear power plants to indicate a structure, system, or component (SSC) or event sequence that has a relatively high core damage frequency, or release frequency. Because Category 2 event sequences are analyzed individually according to the regulation, it is not clear what the term risk-significant means in each of the above cases.

DOE recommends providing a definition of risk-significant in the Glossary that states:

"Risk-significant: important contributor to the probabilities or the consequences of a single event sequence."

Comment 5: Lines 79-81

10 CFR 63.2 defines Important to Safety (ITS) as applying to SSCs that are engineered features of the GROA. Therefore, actions and controls would not be ITS.

DOE recommends revising lines 79-81 as follows:

Examples of human actions that are risk significant include: (1) direct manual operator actions that are related to important-to-safety (ITS); (2) administrative or procedure safety controls that are related to ITS and involve human actions; or (3) human actions that contribute significantly to the reliability of a structure, system, or component (SSC) that is ITS.

Comment 6: Lines 117-119

The reason for reducing the frequency of occurrence of an event sequence or minimizing the probability of a hazard is not necessarily because of recovery difficulty.

DOE recommends revising lines 117-119 as follows:

Delete "Because recoveries are not possible for some waste-facility initiators" and revise the remaining sentence to "Because repository safety may rely on prevention of a credible event sequence/or low event probability, the human-induced...".

Comment 7: Lines 173 to 177

The cited nine regulatory bases do not specifically address human reliability analysis within the context of the PCSA.

DOE recommends adding the following to the listing of regulations that provides the bases for this ISG at line 173:

Event sequence means a series of actions and/or occurrences within the natural and engineered components of a GROA that could potentially lead to exposure of individuals to radiation. An event sequence includes one or more initiating events and associated combinations of repository system component failures, *including those produced by the action or inaction of operating personnel. [10 CFR 63.2, "Event Sequences"].*

Comment 8: Lines 220, 223, 446, 461, 476

The term "key" is used in a variety of phrases as follows:

Key human actions (Lines 220 and 223)
Potential key difference (Line 446)
Key administrative controls (Lines 461 and 476)

Key is not a defined term and its specific use in the above list implies multiple definitions.

DOE recommends providing a definition of key in the Glossary that states:

"Key: relates to an important contributor to the probability or the consequence of a single event sequence."

Comment 9: Glossary (Line 352)

The following terms are used through-out the ISG: human reliability analysis, pre-initiator human failure event, human-induced initiator, and post-initiator human failure event. These terms are not defined in the Glossary.

DOE recommends providing definitions of human reliability analysis, pre-initiator human failure event, human-induced initiator, and post-initiator human failure event in the Glossary that state:

Human reliability analysis (HRA)—HRA seeks to evaluate the potential for, and mechanisms of, human actions that may affect the safety of the GROA during operations prior to permanent closure. The HRA is conducted as an integrated activity to support both the PCSA and the human factor engineering design activities. The main objectives of the HRA are:

1. To ensure that human actions that could affect event sequences are systematically identified, screened, analyzed, and incorporated into the safety analysis in a traceable manner;
2. To quantify the probabilities of success and failure of human actions for event sequence quantification and screening; and
3. To provide insights that may improve human performance such as improvements of the man–machine interface, procedures and training, better matches between task demands and human capabilities, increasing prospects for successful recovery, and reducing the effects of dependencies between unsafe acts.

Pre-Initiator Human Failure Event—A HFE that represents actions taken before the initiating event that results in the unavailability of equipment or a system that is not discovered until it is required during response to the initiator. Examples of such HFEs are miscalibration of equipment or failure to restore equipment to an operable state after testing or maintenance activities. Pre-initiator HFEs may lay the foundation for an initiating event to occur.

Human-Induced Initiator—A HFE that represents actions that cause or lead to an initiating event. The GROA is expected to employ various manually controlled waste handling and transport equipment that may be subject to HFEs that could initiate an event sequence.

Post-Initiator Human Failure Event—Post-initiator HFEs represent those operator failures to manually actuate or manipulate systems or equipment, as required for response to an initiating event to prevent propagation of an event sequence or to mitigate its consequences. Post-initiator HFEs can be further divided into recovery and non-recovery events as appropriate for a given event sequence.

Comment 10: Lines 354-355 and Line 358

The definitions for error of commission (EOC) and error of omission (EOO) use the term "degraded plant state". This term has been applied to nuclear power plants but it does not apply to the GROA.

DOE recommends revising Lines 354-355 and Line 358 as follows:

Replace "degraded plant state" with "event sequence".