DUKE COGEMA
STONE & WEBSTER

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Subject: Docket Number 070-03098
Duke Cogema Stone & Webster
Mixed Oxide Fuel Fabrication Facility
Construction Authorization Request
Clarification of Responses to NRC Request for Additional Information

As part of the review of Duke Cogema Stone & Webster's (DCS') Mixed Oxide Fuel Fabrication Facility (MFFF) Construction Authorization Request (CAR), NRC Staff requested clarifications of DCS' responses to NRC's Request for Additional Information (RAI). These clarifications were discussed during a series of teleconferences and meetings between NRC Staff and DCS. The majority of the clarifications are noted in the NRC meeting summaries from A. Persinko to E. Leeds dated 03 November 2001 and 06 November 2001.

Enclosure A to this letter provides a partial listing of NRC clarification requests and associated responses by DCS. The responses address clarifications regarding material handling, criticality safety, quality assurance, electrical, and fire protection. DCS anticipates additional letters addressing the remaining clarification requests by NRC Staff. If you have any questions, please contact me at (704) 373-7820.

Sincerely,

Peter S. Hastings, P.E.
Licensing Manager

Enclosure: Responses to NRC Clarification Requests

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Enclosure A
Responses to NRC Clarification Requests

HEAVY LOADS/MATERIAL HANDLING

Clarification Requested:

RAI 219: The response to the NRC's RAI indicates that operating experience at MELOX and La Hague has been incorporated into the design and operation of cranes at those facilities, but does not state whether this operating experience will be incorporated at the MFFF. Clarify whether this operational experience will be incorporated at the proposed MFFF {November 3, 2001 letter, item 2B; November 6, 2001 letter, item 1B}.

Response:

The following information is added to the response to RAI 219:

A summary of MFFF implementation of MELOX and La Hague T4 crane related experience is as follows:

La Hague T4 experience:

- The need for an active brake release control and its applicability to MFFF will be analyzed in the Final Design phase. If needed as an IROFS, it will be identified in the ISA.
- For infrequently used cranes (*i.e.*, on the order of once/year or less), a "checkout" procedure for lifting mechanisms is expected to be developed and implemented for the operating facility.

MELOX experience:

- MFFF shipping package and unloading systems located in the receiving area are different than at MELOX. SAFEKEG and 9975 packages and related handling operations are MFFF-specific. Thus, MELOX experience is not directly applicable to the MFFF design.
- The MFFF shipping package handling area does not require simultaneous horizontal and vertical movement. Compared to MELOX, these motions are obtained by different means: the strongback loading fixture containing three fuel assemblies transfers the strongback from a vertical to a horizontal position, then the strongback is loaded horizontally into the MOX Fresh Fuel Package.

Clarification Requested:

RAI 193. With respect to equipment that may contain greater than or equal to 50 micrograms of respirable plutonium that is not in a glovebox, clarify the relationship between plutonium and respirable plutonium {November 3, 2001 letter, item 2D}

Response:

The response to RAI 193 is revised to include an update to Table 2 as shown below. The table provides a list of major equipment in process cells with greater than gram quantities of Pu or 50 micrograms or more of respirable plutonium (the title has been revised and the last two entries in the table have been added).

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HEAVY LOADS/MATERIAL HANDLING

List of Major Equipment in AP Process Cells Containing at Least Gram Quantities of Pu or 50 Micrograms or More of Respirable Pu

Equipment Number			Description	Type of Equipment	Location
Unit	Type	Number			
KDB	TK	3000	Plutonium nitrate, Receiving Tank	Slab Tank	Process Cell
KDB	TK	4000	Plutonium nitrate, Receiving Tank	Slab Tank	Process Cell
KDB	TK	5000	Plutonium nitrate, Dilution and Sampling Tank	Slab Tank	Process Cell
KDB	TK	6000	Plutonium nitrate, Dilution and Sampling Tank	Slab Tank	Process Cell
KDB	TK	7000	Buffer Tank	Annular Tank	Process Cell
KPA	TK	1000	Plutonium nitrate, Feeding Tank	Annular Tank	Process Cell
KPA	PULS	2000	Extraction Column	Pulsed Column	Process Cell
KPA	PULS	2200	Scrubbing Column	Pulsed Column	Process Cell
KPA	PULS	3000	Pu stripping Column	Pulsed Column	Process Cell
KPA	PULS	3100	Diluent Washing Column	Pulsed Column	Process Cell
KPA	CLMN	6000	Oxidation Column	Column	Process Cell
KPA	CLMN	6500	Air stripping Column	Column	Process Cell
KPA	TK	7000	Pu reception Tank	Annular Tank	Process Cell
KPA	TK	8000	Pu Rework Tank	Slab Tank	Process Cell
KPA	TK	9000	Raffinates reception Tank	Annular Tank	Process Cell
KPA	TK	9100	Control Tank	Annular Tank	Process Cell
KPA	TK	9500	Recycling Tank	Annular Tank	Process Cell
KPB	TK	3000	Solvent regeneration waste Tank	Conventional Tank	Process Cell
KCA	TK	1000	Constitution Lot Tank	Annular tank	Process Cell
KCA	TK	2000	Constitution Lot Tank	Annular tank	Process Cell
KCD	TK	1000	Reception Tank	Annular Tank	Process Cell
KCD	TK	1500	Buffer Tank	Annular Tank	Process Cell
KCD	TK	2000	Feeding Tank	Annular Tank	Process Cell

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Equipment Number			Description	Type of Equipment	Location
Unit	**Type**	**Number**			
KCD	EV	3000	Evaporator with Re-boiler	H/E, Evaporator	Process Cell
KCD	TK	4000	Concentrates reception Tank	Slab Tank	Process Cell
KCD	TK	4100	Concentrates control Tank	Slab Tank	Process Cell
KCD	TK	4200	Concentrate recycle Tank	Slab Tank	Process Cell
KPC	TK	1000	Feeding Tank	Conventional Tank	Process Cell
KPC	EV	2000	Evaporator with Re-boiler	H/E, Evaporator	Process Cell
KPC	TK	3000	Concentrates Tank	Conventional Tank	Process Cell
KPF	TK	1000	Re-circulation Tank	Conventional Tank	Process Cell
Main Process Piping for all above units			Double wall piping carrying process fluid with dissolved plutonium compounds	Double pipe carrying plutonium compound in liquid	Process Cell

Clarification Requested:

RAI 217: {November 3, 2001 letter, item 2A}

- Clarify whether heavy lift crane(s) travel over principal SSCs.
- Clarify if other cranes will be classified as heavy lift cranes, e.g., the waste handling crane.
- Clarify the maximum lift height for the fresh fuel casks.
- Clarify the definition of "material handling controls."
- Clarify MOX building drawing (Figure 11.1-16, MOXFFF Processing Area, Level 1) that show hatches in the fresh fuel handling hall.

RAI 217: {November 6, 2001 letter, item 1A)

- Provide clarifications related to the material transport systems on the following topics:
  - the maximum lift height of a MOX fresh fuel package and
  - "material handling controls."

In addition to the above requested clarifications, the Staff asked for a statement to reiterate DCS' preference for engineered controls over administrative controls (i.e., describe the hierarchy of controls for Heavy Lift Cranes). {verbal request}

HEAVY LOADS/MATERIAL HANDLING

Response:

- As stated in the original response to RAI 217, the general design philosophy is to prevent lifts above principal SSCs. Where this is not possible, IROFS will be designated as necessary to meet the performance requirements of 10CFR70.61.

- As the design has progressed, additional MFFF cranes have been identified as potential heavy lift cranes. These include the following; a bridge crane stacker for waste drum handling in room B-254, a bridge crane for handling empty PuO_2 shipping package pallets in room B-163, and a crane used for maintenance purposes in the Emergency Diesel Generator Building. Additionally as the design progresses, one or more cranes in the secured warehouse may be designated as heavy lift cranes as they are used for maintenance activities and normal operations including handling of UO_2 drums.

- The maximum lifting height of a MOX Fresh Fuel Package in the current design is about 16 ft above the floor elevation. This is below the 30-ft qualification height of the MOX Fresh Fuel Package.

- The principal SSC, Material Handling Controls, includes the potential controls on material handling equipment as described in response to RAI 185 and potential administrative controls. These administrative controls may include safe travel paths, procedures and training to limit crane operations during normal operations, procedures and training to remove material from a glovebox prior to crane operations during maintenance activities, radiation protection program to ensure workers are appropriately trained and protected during maintenance activities. Specific material handling controls will be identified in the ISA.

  Material Handling Controls is specified as the principal SSC for many events including potential load handling events involving the C4 final HEPA filters. Even though these HEPA filters are expected to contain very little material, principal SSCs are specified. In the current design and operations, there are no cranes or other equipment in the vicinity of the final HEPA filters that could cause a load handling event. Thus there are no credible load handling events during normal operations. During maintenance operations, maintenance will be performed on the out-of-service train and will be performed in accordance with maintenance procedures. As necessary, precautions will be taken to ensure that no release of material occurs during maintenance operations.

- The area identified at coordinates H/J 10/11 on CAR Figures 11.1-16 and 11.1-17 represent a reserved area (at the same level of the normal floor level) to dismantle a MOX fuel assembly should it be returned from a utility. This special operation is not expected to occur, however, provisions have been incorporated into the design to account for this potential operation.

The DCS preference for engineered controls over administrative controls (i.e., hierarchy of controls) is provided in section 5.5.5.1 of the CAR.

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NUCLEAR CRITICALITY SAFETY

Clarification Requested:

RAI 75: DCS agreed that there would be two criticality alarms over each area required to be covered, per 10 CFR 70.24 {November 3, 2001 letter, item 3A}.

Response:

The response to RAI 75 is revised (as noted in bold text) as follows:

> As required by 10 CFR 70 and Regulatory Guide 3.71, the MFFF CAAS will provide two criticality monitors/alarms for coverage of **all non-exempt areas**. Standard gamma/neutron criticality detectors are planned to be used. Actual detector selection will be made for final design.

Clarification Requested:

RAI 90: DCS understands NRC's position on ANSI standards ANSI/ANS-8.1, 8.3, 8.7, 8.15, 8.17, and 8.22, and will clarify its commitment to these ANSI standards {November 3, 2001 letter, item 3C}.

Response:

Modifications/clarifications to applicable portions of the original response (full text not provided) to RAI 90 is highlighted in bold text as follows:

ANSI/ANS-8.1-1983 (R1998), Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors

- Section 4.3.2: In cases where **an extension** in the area(s) of applicability of a NCS analysis methodology is required, the method will be supplemented by other calculation methods **or other justifications** to provide a better estimate of bias in the extended area(s). As an alternative, the extension in the area(s) of applicability may be addressed through an increased margin of subcriticality.

ANSI/ANS-8.3-1997, Criticality Accident Alarm System

- MFFF operations will comply with the requirements and implement the recommendations of ANSI/ANS-8.3-**1997 (and the corresponding guidance in Regulatory Guide 3.71).**

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ANSI/ANS-8.7-1975, Guide for Nuclear Criticality Safety in the Storage of Fissile Materials

- Note that Regulatory Guide 3.71 endorses the 1975 version of this standard. The MFFF may also reference guidance provided in the most recent Subcommittee ANS-8 working group approved version (i.e., ANSI/ANS-8.7-1998). **However, if this is done, a demonstration will be provided that this more recent standard constitutes an acceptable methodology.**

ANSI/ANS-8.15-1981, Nuclear Criticality Control of Special Actinide Elements

- ~~Although MFFF processes will contain special actinide nuclides, they will always be present in relatively low concentrations in mixtures with ^{235}U, and ^{239}Pu. Therefore, t~~This standard will not be referenced as a basis for design for the MFFF. Nuclear criticality control of special actinide nuclides will be explicitly evaluated using validated NCS analysis methodology in accordance with ANSI/ANS-8.1-1983, or criticality safety may be demonstrated by reference to the single-parameter limits or multiparameter control specified in Sections 5 and 6 of ANSI/ANS-8.1-1983.

ANSI/ANS-8.17-1984, Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors

- Section 5.1: The criticality experiments used as benchmarks in computing k_c will have physical compositions, configurations, and nuclear characteristics (including reflectors) similar to those of the system being evaluated. In cases where similar experiments are not available or are not similar in criticality safety significant respects to the design application, alternative analyses will be presented. Alternative analyses will further demonstrate similarity or, in cases **where an extension** in the area(s) of applicability of a NCS analysis methodology is required, the method will be supplemented by other calculation methods **or other justifications** to provide a better estimate of bias in the extended area(s). As an alternative, the extension in the area(s) of applicability may be addressed through an increased margin of subcriticality.

ANSI/ANS-8.22-1997, Nuclear Criticality Safety Based on Limiting and Controlling Moderators (the following bullet is deleted from the clarification provided in the original response)

- ~~Section 5.4.1: Where fire suppression is determined to be justified in moderator control areas, the use of non moderating fire suppressant media will be considered.~~

NUCLEAR CRITICALITY SAFETY

Clarification Requested:

RAIs 103 and 104: DCS agreed to revise the wording in Tables 6.3 and 6.4 (permissible values of parameters), to further clarify that they are order-of-magnitude estimates that will not be used for criticality safety limits without further justification {November 3, 2001 letter, item 3D}.

Response:

The response to RAI 103 is revised (as noted in bold text) as follows:

During a meeting with the NRC in November 1999, it was suggested that typical or order-of-magnitude values of plutonium media found in the MFFF be provided. Therefore, CAR Table 6-3 contains typical, order-of-magnitude values of Pu materials found mainly in the AP process at optimum moderation. CAR Table 6-4 contains typical, order-of-magnitude values of MOX materials found mainly in the MP process at typical low moderation conditions. The values listed in Tables 6-3 and 6-4 are not single parameter limits. The values listed are presented as "information only" in order to provide "preliminary best estimate" nominal Pu values typical of those expected to be found in the AP and MP processes.

The actual values referenced in the NCSEs will be based upon calculations and not necessarily the values shown in Tables 6-3 and 6-4. **Tables 6-3 and 6-4 will not be referenced in criticality calculations or safety evaluations.**

Action:

In the next update to the CAR, footnotes will be added to Tables 6-3 and 6-4 to indicate that these are typical order of magnitude values that will not necessarily be used in the calculations/NCSEs. **Additionally, CAR Section 6.3.4.5 will be amended to state that Tables 6-3 and 6-4 will not be referenced in criticality calculations or safety evaluations.**

The response to RAI 104 is revised (as noted in bold text) as follows:

CAR Table 6-3 contains typical, order-of-magnitude values of Pu materials found mainly in the AP process at optimum moderation. The physical forms are, as noted in the tables, sphere, infinite cylinder, and infinite slab. In all cases, the fissile material was fully reflected with water.

CAR Table 6-4 contains typical, order-of-magnitude values of MOX materials found mainly in the MP process at typical low moderation conditions. The physical form used in the typical calculations is a sphere. In all cases, the fissile material was fully reflected with water.

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The values listed in Tables 6-3 and 6-4 are not mass limits. The values listed are presented as "information only" in order to provide "preliminary best estimate" nominal Pu values typical of those expected to be found in the AP and MP processes.

The actual values referenced in the NCSEs will be based upon calculations and not necessarily the values shown in Tables 6-3 and 6-4. **Tables 6-3 and 6-4 will not be referenced in criticality calculations or safety evaluations.**

Action:

In the next update to the CAR, footnotes will be added to Tables 6-3 and 6-4 to indicate that these are typical order of magnitude values that will be validated in the criticality calculations. **Additionally, CAR Section 6.3.4.5 will be amended to state that Tables 6-3 and 6-4 will not be referenced in criticality calculations or safety evaluations.**

QUALITY ASSURANCE

Clarification Requested:

DCS agreed to provide further clarification of the terminology for and categorization of criticality control SSCs as QL-1a and 1b {November 6, 2001 letter, item 5}.

Response:

This clarification request originated as a question regarding the basis for geometry control (for criticality control) being designated as QL-1a when other criticality controls are designated as QL-1b (pursuant to DCS' QA program). MFFF SSCs are assigned a quality level (QL) commensurate with each SSC's function and safety significance. Quality levels are defined in the DCS MPQAP.

- QL-1a is used to designate MFFF SSCs whose single failure could cause an accident with consequences exceeding the 10 CFR 70.61 performance criteria.

- QL-1b is used to designate MFFF SSCs whose failure could indirectly lead to exceeding 10 CFR 70.61 performance criteria (i.e., failure in conjunction with an independent, unlikely failure of another item or administrative control).

QL-1a and -1b SSCs are both IROFS; QL-1b SSCs are graded in recognition of their reduced safety significance (as compared with QL-1a SSCs).

The MFFF is designed to ensure that the facility remains subcritical under all normal and credible abnormal conditions. This design philosophy for criticality safety is implemented by incorporation of the double contingency principle as well as ensuring that a criticality is highly unlikely. This requires that the system incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions to occur before a criticality is possible. As a consequence, the failure of the operation of a single SSC would not directly cause an accident with consequences exceeding the 10 CFR 70.61 performance criteria. Consistent with the definition for QL-1b, therefore, the failure of the operation of a single criticality control cannot directly cause an accident to exceed the 10 CFR 70.61 performance requirements. Thus the operation of all criticality controls meet the definition of QL-1b.

Geometry control involves the use of passive engineered SSCs to control worst-case geometry. Geometry control parameters are established in a manner that ensures an adequate margin of subcriticality. Geometry control is the preferred criticality control method within the MFFF; it is used whenever possible, and it is the predominant method used for the AP process. Geometry control SSCs meet the definition of a QL-1b SSC. However, DCS has made a conservative management determination that, to provide additional defense in depth and emphasis to the controls associated with, for example, procurement and/or inspection of these SSCs, they will not be graded (i.e., they will be controlled as QL-1a).

QUALITY ASSURANCE

Clarification Requested:

RAI 237 – If the CAAS is designated as QL2, what management measures will be associated with it (i.e., how to know it can be relied on when needed)? {verbal information request}

Response:

The basis for CAAS designation as QL-2 is provided in the response to Question 6 in the Request for Additional Information for Revision 2 of the MPQAP (see DCS-NRC-000054, Hastings to Document Control Desk, *Response to NRC RAI on the MPQAP Revision 2*, 18 July 2001). The CAAS is intended to perform the following functions:

- Detect an accidental dose rate
- Warn personnel as quickly as possible
- Facilitate evacuation to limit personnel dose in the highly unlikely event of a criticality.

The CAAS is designed in accordance with generally accepted practices and those required by 10 CFR §70.24. ANSI/ANS-8.3-1997, *Criticality Accident Alarm System*, is the main guidance document that defines the features of a criticality alarm system. This standard provides guidance for alerting personnel that an inadvertent criticality has occurred. The main requirement linked to the design of the system is the reliability of actuation of the alarm.

QL-2 SSCs, such as the MFFF CAAS, and their associated activities will also be evaluated against the requirements in sections 1-18 of the MFFF MPQAP. This evaluation will identify which QA controls are needed to ensure these SSCs meet their intended functions.

Specific management measures for the MFFF CAAS include the following (as required by ANSI/ANS-8.3-1997):

Testing

1. Initial Tests. Initial tests, inspections, and checks of the system will verify that the fabrication and installation were made in accordance with design plans and specifications
2. Special Tests. Following modifications or repairs, or events which call the system performance into question, tests and inspections will be performed to demonstrate system operability.
3. Response to Radiation. System response to radiation will be measured periodically to confirm continuing instrument performance.
4. Periodic Tests. The entire CAAS will be tested periodically.
5. Corrective Action. When tests reveal inadequate performance, corrective action will be taken without unnecessary delay.
6. Test Procedures. Procedures for system testing will minimize both false alarms and inadvertent initiation of emergency response. The procedures will also require that the systems be returned to normal operation immediately following tests.
7. Records. Records of tests and corrective actions for the CAAS will be maintained.

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Employee Familiarization

1. Posted Instructions. Instructions regarding response to criticality alarm signals will be posted at strategic locations within areas requiring alarm coverage.
2. Training and Criticality Alarm Drills. Training of employees, visitors, and for the conduct of criticality alarm drills will be as provided in ANSI/ANS-8.19-1996, *Administrative Practices for Nuclear Criticality Safety*.

Clarification Requested:

Clarify the relationship of the discussion of management measures in Chapter 6 (6.2.1 to 6.2.4) of the CAR with the discussion in Chapter 15 of the CAR. The items in Chapter 6 should also show the tie to the QA program {verbal information request}.

Response:

DCS will establish criticality management measures prior to operating the MFFF. All criticality management measures will be implemented through the DCS quality assurance (QA) program in accordance with 10 CFR Part 50 Appendix B. The management measures listed in Chapter 6 of the CAR refer specifically to the criticality management measures while the management measures listed in Chapter 15 refer to overall management measure for the entire facility. The management measures listed in Chapter 6 are a subset of those listed in Chapter 15.

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Clarification Requested:

RAI 152: DCS response indicates they will follow the guidance of IEEE Standard 338-1987. Regulatory Guide 1.118, Revision 3, endorses that IEEE standard with four clarifications. DCS will consider following the additional guidance of the Regulatory Guide {November 3, 2001 letter, item 8A}.

Response:

The response to RAI question 152 is amended to include the following new information (note that the Regulatory Guide makes three clarifications, rather than four):

Regulatory Guide 1.118, Rev. 3, states that conformance with the requirements of IEEE Std. 338-1987 provides a method acceptable to the NRC staff for satisfying the Commission's regulations with respect to periodic testing of electric power and protection systems if the following exceptions are complied with:

1. *The definitions of "safety systems," "safety function," and "safety group" in IEEE Std. 603-1991, " Criteria for Safety Systems for Nuclear Power Generating Stations," are used instead of the definitions in IEEE Std. 338-1987.*

2. *Both Sections 5(15) and 6.4(5) of IEEE Std. 338-1987 are replaced by the following:*

   Procedures for periodic tests shall not require makeshift test connections except as follows:

   (1) Temporary jumper wires may be used with safety systems that are provided with facilities specifically designed for the connection of portable test equipment. These facilities shall be considered part of the safety system and shall meet the requirements of IEEE Std. 338-1987.

   (2) Removal of fuses or opening a breaker is permitted only if such action causes trip of the associated channel or actuation of the logic of the associated load group.

   (3) Test procedures or administrative controls shall provide for verifying the open circuit or verifying that temporary connections are restored after testing.

3. *The description for a logic system functional test, as noted in Section 6.3.5 of IEEE Std. 338-1987, implies that the sensor is included. A logic system functional test is to be a test of all logic components (i.e., all relays and contacts, trip units solid state logic elements, etc.) of a logic circuit, from as close to the sensor as practicable up to but not including the actuated device, to verify operability.*

DCS will comply with the clarifications to IEEE Standard 338 identified above and in Regulatory Guide 1.118, Rev. 3. It should be noted that DCS has committed to adhere to the 1998 revision of IEEE Std. 603 (refer to the response to RAI 173 for a discussion of differences

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between these versions). The definitions of "safety group," "safety system," and "safety function" are the same in the 1991 and 1998 versions of the standard.

Clarification Requested:

RAI 161: Regarding whether DCS will meet all the test/analysis conditions and assumptions related to the IEEE Standard 384-1992, DCS stated that power cables associated with IROFs would be in conduits and not cable trays {November 3, 2001 letter, item 8Bi}.

Response:

The paragraph on page 161-2 of the response to RAI 161 is revised as follows:

> Section 5.1.1.2 of the 1974 version of the standard allows for minimum separation distances that are established by testing and analysis. The basis for the 1992 version of the standard was actual testing as documented in paper 90 WM 254-3 EC, *Cable Separation – What Do Industry Testing Programs Show?* The changes implemented in the 1992 version of the standard are in keeping with the spirit and direction of the 1974 version. **DCS will route IROFS power cables in conduit to minimize the likelihood of any interaction between divisional cables and between divisional and non-divisional cables.**

Clarification Requested:

RAI 161: Table on page 161-1 has an incorrect entry for open trays in non-hazard area under IEEE Standard 384-1992. DCS will correct. Also, DCS stated that it committed to 1ft/3ft spacing and will confirm {November 3, 2001 letter, item 8Bii}.

Response:

The table in the response to RAI 161 is revised as noted below to correct the typographical error and to denote 1ft/3ft spacing. A new column was added to identify the MOX criteria.

CONFIGURATION	IEEE 384-1974	IEEE 384-1992	MOX Criteria
Non-Hazard Area			
Open Trays	N/A	1" hor ; 3" vert	1' hor ; 3' vert
Enclosed to Open	N/A	1" hor ; 3" vert	1" hor ; 3" vert
Enclosed Raceway	N/A	1" hor ; 1" vert	1" hor ; 1" vert
Limited Hazard Area			
Open Trays (2/0 & up and ALL Medium Voltage)	N/A	3' hor ; 5' vert	3' hor ; 5' vert
Open Trays (less than 2/0)	N/A	6" hor ; 12" vert	6" hor ; 12" vert
Open Trays (I&C)	N/A	1" hor ; 3" vert	1" hor ; 3" vert
Enclosed to Open (2/0 & up and ALL Medium Voltage)	N/A	3' hor ; 5' vert	3' hor ; 5' vert

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Enclosed to Open (less than 2/0)	N/A	6" hor ; 12" vert	6" hor ; 12" vert
Enclosed to Open (I&C)	N/A	1" hor ; 3" vert	1" hor ; 3" vert
Enclosed Raceway	N/A	1" hor ; 1" vert	1" hor ; 1" vert
Hazard Area	Only one division allowed in area	Only one division allowed in area	Only one division allowed in area
Internal Panel	6"	1" hor ; 6" vert	1" hor ; 6" vert
Cable Spreading Area			
Open to Open	1' hor ; 3' vert	N/A	N/A
Enclosed Raceway	1" hor ; 1" vert	N/A	N/A
General Plant Areas			
Open to Open	3' hor ; 5' vert	N/A	N/A
Enclosed Raceway	1" hor ; 1" vert	N/A	N/A

Clarification Requested:

RAI 161: With respect to breaker testing, DCS stated that it will test per IEEE Standard 741 but test frequency has not been determined yet {November 3, 2001 letter, item 8Biii}.

Response:

The last paragraph of the discussion for Regulatory Position 1 in the response to RAI question 161 is revised as follows to address breaker testing:

> DCS will follow the requirements of Section 7 of the 1992 version of the standard with respect to proper coordination of protective devices and periodic testing to ensure coordination is maintained. **Protection for IROFS circuits is applied and tested in accordance with the guidance of IEEE 741-1997. Circuit breakers will be tested periodically to ensure that they trip within a specified tolerance of the manufacturer's published time-current trip curves for the models involved. Details of the maintenance and test program will be developed at a later date prior to operation. NEMA AB1 and AB4 provide guidance on the selection, maintenance, and testing of molded case circuit breakers. Where circuit breakers or fuses are used as isolation devices, DCS will also use two trip devices in series to isolate IROFS circuits and equipment from non-IROFS equipment and circuits.**

Clarification Requested:

RAI 161: On page 11.5-14 of the CAR, the statement "except that a single circuit breaker or fuse tripped by overcurrent are not used as an isolation device" in the second paragraph will be clarified to state that DCS will use two devices in series {November 3, 2001 letter, item 8Biv}.

Response:

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The wording of page 11.5-14 of the CAR (section 11.5.7.1, second paragraph, 2nd sentence) will be revised (deletions in strikeout and additions in bold) as follows:

"...,except that ~~a single~~ **where** circuit breakers **and** ~~or~~ fuses ~~tripped by overcurrent~~ are ~~not~~ used as ~~an~~ isolation devices**, two will be placed in series**.

Clarification Requested:

RAI 156: IEEE Standard 387-1995 does not require a loss of offsite power (LOOP) test on a periodic basis. DCS stated that it would perform LOOP tests but did not specify the frequency at this time {November 3, 2001 letter, item 8C}.

Response:

The last paragraph of the response to RAI Question 156 is revised as follows:

> Table 1 of ~~the~~ Regulatory Guide **1.9** is essentially the same as Table 3 of IEEE Std 387-1995. These tables show types of tests that must be done and at what stage the test is performed. The **IEEE** standard lists "site" tests and "pre-operational" tests that in total are equivalent to the pre-operational tests listed in ~~the~~ Regulatory Guide **1.9**. It should be noted that **the** SIAS and combined SIAS and LOOP tests are not applicable to the MFFF, as there is no equivalent safety injection signal at this facility. **However, a LOOP test will be performed at the MOX facility on a frequency that will be determined when the complete facility test and maintenance program is developed.** The descriptions of the tests in the two documents are also essentially equivalent. DCS will fully test the emergency diesel generators in accordance with the requirements of the **IEEE** standard.

Clarification Requested:

RAI 162: DCS has committed to follow the guidance of IEEE Standard 484. DCS will clarify its commitment to the guidance contained in Regulatory Guide 1.128 {November 3, 2001 letter, item 8F}.

Response:

The response to CAR RAI question 162 is amended to include the following additional information addressing RG 1.128 (note that the applicability of specific requirements indicated below may be impacted by the ISAs determination of the extent of equipment designated as IROFS):

> Regulatory Guide 1.128 Revision 2, September 1985 endorses the requirements of IEEE Std 484-1975 as an adequate basis for complying with the design, fabrication, erection, and testing requirements of Criteria 1 and 17 of Appendix A and Criterion III of Appendix B to 10 CFR Part 50 with respect to quality standards applied to installation design and installation of large lead storage batteries, subject to the following:

Enclosure A
Responses to NRC Clarification Requests

ELECTRICAL

1. *In subsection 4.1.4, "Ventilation," instead of the second sentence, the following should be used:*

   "The ventilation system shall limit hydrogen concentration to less than two percent by volume at"

The 1996 revision of the standard has the following wording in section 5.4, Ventilation : "The ventilation system shall limit hydrogen accumulation to less than 2% of the total volume of the battery area."

a. *Subsection 4.1.1, "Location," item 2—The recommendations that address the need for a well-ventilated location with adequate aisle space and space above cells.*

Item 5.1 c) of the 1996 standard contains the same requirements for space around and above the battery.

b. *Subsection 4.1.1, "Location," item 4 –The recommendations that address temperature differential between cells at a given time and the avoidance of localized heat sources.*

Item 5.1 f) of the 1996 standard contains the same requirements avoiding conditions that could cause spot heating or cooling.

c. *Subsection 4.1.1, "Location," item 5 –The recommendations set forth in item 5 that addresses the provisions for containing or safely dispersing spillage from water facilities, supplemented with the following:*

   "Where stationary water facilities are provided within the battery room, their design should be such as to preclude any inadvertent spilling of water from these facilities on the battery installation itself."

Item 5.1 d) of the 1996 standard addresses the intent of this concern with the following, "The battery should be protected against natural phenomena such as earthquakes, winds, and flooding, as well as induced phenomena such as fire, explosion, missiles, pipe whips, discharging fluids, and CO_2 discharge."

d. *Subsection 4.1.2, "Mounting," item 2—The recommendation that addresses the number of tiers or steps for mounting batteries.*

Item 5.2 b) of the 1996 standard contains the same wording in part and adds the following, "A three-tier rack is acceptable provided the requirements of 5.1 item f) are met (see above), and maintenance is not adversely affected."

ELECTRICAL

e. *Subsection 4.1.5, "Instrumentation and Alarms" –The three items listed. Instead of the "NOTE" following the last paragraph of Subsection 4.1.5, the following should be used:*

"NOTE: The preceding recommendations for instrumentation and alarms could be satisfied by equipment in the d.c. system, with the exception of items 4 and 5."

In addition, the three listed item should be supplemented with the following items:

"4. Ventilation air flow sensor(s) and alarm(s) in the control room."
"5. Fire detection sensor(s), instrumentation, and alarm(s)."

Section 5.5 of the 1996 standard contains the same wording of the note above in the body of the section text. The previous three items remain in the section and a fourth item has been added, "Instrumentation to measure current through the battery (refer to 4.5 of IEEE Std. 450-1995)."

The 1996 revision of the standard does not address fire detection or air flow sensors for the battery rooms. DCS will provide a fire detection system for the MOX facility that will include monitoring of all areas and rooms containing electrical equipment, including the battery rooms. DCS will also provide the battery rooms with air flow sensor (s) to alarm a low flow condition and start a backup fan.

f. *Subsection 5.1.2, "Unpacking," item 3—The recommendation that any cell that exhibits an electrolyte level ½ inch or more below the top of the plates be replaced.*

Section 6.1.2 c) of the 1996 standard contains the recommendation listed above and adds, "If the level is less than approximately 13mm (0.5 in.) below the top of the plates, add electrolyte of approximate strength, or water, and fill to cover the plates.

g. *Subsection 5.1.3, "Storage," item 1 – The recommendation that cells not be exposed to extremely low ambient temperatures or localized sources of heat during storage.*

Section 6.1.3 a) of the 1996 standard contains the recommendation listed above.

h. *Subsection 5.2.3, "Preoperational Care," with "IEEE Std. 450-1975" used in lieu of IEEE Std. 450-1972."*

IEEE Std. 450-1995 is referred to in the 1996 version of the standard.

i. *The eight items listed in Subsection 5.3.1, "Freshening Charge, " supplemented with the following item:*

"9. At the completion of Item 7 above, hydrogen survey should be performed to verify that the design criteria required by Position 1 are met (see Section 6, "Records")."

ELECTRICAL

The 1996 version of the standard does not address performing a hydrogen survey of the battery rooms after a freshening charge. DCS intends to install a hydrogen detection system in each battery room to alarm should the room hydrogen concentration approach the 2% concentration level.

j. *The five items listed in Section 6, "Records," supplemented with the following item:*

"6. Initial hydrogen survey data for future reference."

Hydrogen Survey data is not addressed in the records section of the 1996 version of the standard. As stated earlier DCS intends to install hydrogen monitors in each battery room. With continuous monitoring of the battery rooms, increases in the hydrogen concentration would be identified so that corrective action could be taken.

FIRE PROTECTION

Clarification Requested:

Provide a statement that the fire doors to the material transfer system are normally shut and only manually opened when material is transferred {November 6, 2001 letter, item 3A}.

Response:

The fire doors of the material transfer system are normally closed and are automatically opened by the normal PLC when material is transferred.

Clarification Requested:

Confirm that process room cable trays are solid on top and on the bottom {November 6, 2001 letter, item 3B}.

Response:

Cable trays (as well as wireways or conduits) that enter glovebox or decanning rooms (i.e., process rooms, designated as confinement level 3B) are solid stainless steel construction.

Clarification Requested:

Provide basis for not allowing portable extinguishers in Rod Assembly Storage/handling areas due to ALARA concerns {November 6, 2001 letter, item 3C}.

Response:

To meet the principles of maintaining personnel radiation exposure As Low As Reasonably Achievable (ALARA), portable fire extinguishers are not provided in MFFF rooms that are expected to have high radiation levels. The Rod Assembly Storage/handling areas as shown on CAR Figure 9-1 are high radiation areas. Response to fires in these areas will be by trained individuals.

Clarification Requested:

Provide clarification that areas with vertical openings or grated floors will be treated as one fire area {November 6, 2001 letter, item 3D}.

Response:

Fire areas that include grated assemblies are treated as a single area; the areas above and below the grated area are part of the same fire area.

FIRE PROTECTION

Clarification Requested:

Provide clarification that cementitious grouting used for vertical penetrations will be appropriately rated {November 6, 2001 letter, item 3E}.

Response:

Where cementitious grouting is used as a penetration seal in a fire barrier, it will have a fire-resistance rating equal to or greater than that required of the fire barrier. This applies to both horizontal and vertical penetrations.

Clarification Requested:

Provide the basis for using one sheet of polymethyl methacrylate (PMMA) as representative transient loading {November 6, 2001 letter, item 3F}.

Response:

The selection of a conservative transient combustible load is based on operating experience at an analogous facility (*i.e.*, the Melox facility). A discussion with Melox facility staff regarding the typical and maximum expected transient combustibles at Melox concluded that:

- the typical transient combustibles are a one-liter bottle of lube oil and ten paper towel sheets; and.
- the maximum transient combustible is one sheet of Kyowaglass that is 1.5 m by 1.0 m by 46 mm, with a density of 1.6 g/cc.

The fire loading of each MFFF fire area therefore is assumed to include a conservative transient fire loading contribution. This contribution, which is due to one sheet of Kyowaglass, results in a transient fire loading contribution of 2,600,000 Btu (2,743 MJ). Based on Melox experience, this conservative transient combustible load is expected to represent a maximum transient load quantity of transient combustible material in the BMF.

Clarification Requested:

RAI 107 – Provide revised paragraph clarifying the use of sprinklers in plutonium handling areas {November 6, 2001 letter, item 3G}.

Response:

No water-based fire suppression systems are planned in areas where fissile material is handled, as a result of criticality considerations. Where water-based suppression systems are used within the MOX Processing and Aqueous Polishing areas of the MOX Fuel Fabrication Building (*e.g.*,

FIRE PROTECTION

in egress areas such as corridors and stairwells), they are preaction sprinkler systems for additional protection against the ingress of water into areas where fissile material is handled. Within the Shipping and Receiving (S&R) area of the BMF, the water-based suppression systems are wet-pipe sprinkler systems.

Clarification Requested:

Provide an explanation of the relationship of the polycarbonate report to the FHA including the use of DOE-STD-1066 as input to the polycarbonate decision. Clarify use and interpretation of DOE-STD-1066-97 and how it is applicable to the CAR {November 6, 2001 letter, item 3}.

Response:

The discussion of DOE-STD-1066-97 in Section 1.4.4 of DCS report DCS01-ZJJ-DS-NTE-M-40006-A, "Choice of MFFF Process Glovebox Window Material" (*i.e.*, the *polycarbonate report*) is not intended to invoke the use of this DOE Standard in the design of the MFFF gloveboxes. Rather, it provides the reader/reviewer of the polycarbonate report with background information regarding the guidance that exists with respect to glovebox window materials. The discussion of this DOE Standard was provided to demonstrate that the guidance presented in the standard is based upon other references and lessons learned that do not stipulate that glovebox windows be constructed of noncombustible materials, but rather self-extinguishing materials.

The polycarbonate report was provided to the NRC for review (as the Authority Having Jurisdiction under NFPA-801) to concur that "the use of polycarbonate is acceptable for use in glovebox windows" [refer to letter DCS-NRC-000030 dated 15 December 2000]. The report demonstrates that, in consideration of the low fire risk posed by polycarbonate, and the positive contribution to safety in terms of confinement, ease of manufacturing and handling, and usability (*e.g.*, clarity for operators), polycarbonate is the appropriate material for use in glovebox windows. DCS requested NRC concurrence with this position by letter dated 15 December 2000.

Having weighed the relative risk contributions, concluded that the positive contributions significantly outweighed the negative, and selected polycarbonate as the material for use in glovebox windows, DCS has used, and intends to use, on a conservative basis, the full combustible load represented by polycarbonate in all applicable fire analyses in support of the CAR and subsequent analyses in support of the ISA.

Enclosure A
Responses to NRC Clarification Requests

FIRE PROTECTION

Clarification Requested:

Acknowledge that the polycarbonate is/will be used in FHA. {verbal information request}.

Response:

Polycarbonate glovebox windows will be used in the MFFF process gloveboxes, and the polycarbonate is considered to be part of the combustible loading of the room in which a glovebox is located, and therefore, part of the FHA (see discussion above).

Clarification Requested:

RAI 148 - Provide reference for basis/citation for:
1) 45% compartment efficiency, and
2) Soot yield values.
3) Verify that DCS is going to 60% combustion efficiency {verbal information request}

Response:

1) Fires efficiencies of less than 100% have been demonstrated many times both in actual fires and in fire testing. Compartment fires normally range between 30% and 60% efficiency. Therefore, it is reasonable (yet not unconservative) to assume that for a fire within an MFFF room, the combustion will be incomplete. Since 30% is the lower efficiency limit and 60% is the upper efficiency limit, the average of 45% was assumed for the HEPA filter soot loading analysis (see item 3 below). Combustion efficiency is discussed throughout the SFPE Handbook (2nd Edition); refer to discussions provided on pages 2-10, 3-77, and 3-84 of the SFPE Handbook.
2) The references for soot yield values in the approved version of the HEPA filter soot loading analysis are the SFPE Handbook (2nd Edition) and part of the proceedings of the 12th Joint Panel Meeting of the UJNR Panel on Fire Research and Safety conducted 27 October 1992 through 02 November 1992. The referenced part of the proceedings is entitled "A New Generation of Fire Resistant Polymers: Part II Silicone-Containing Polycarbonate" by Takashi Kashiwagi and Thomas G. Cleary.
3) To increase the conservatism of the HEPA filter soot loading analysis, the analysis is being revised utilizing a combustible efficiency of no less than 60%.