February 28, 2002

MEMORANDUM TO: Eric J. Leeds, Chief
Special Projects Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Thru: Joseph G. Giitter, Chief **/RA/**
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FROM: Andrew Persinko, Sr. Nuclear Engineer **/RA/**
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SUBJECT: JANUARY 22-25, 2002, IN-OFFICE REVIEW SUMMARY: DUKE COGEMA STONE & WEBSTER CONSTRUCTION AUTHORIZATION REQUEST SUPPORTING DOCUMENTS FOR THE MIXED OXIDE (MOX) FUEL FABRICATION FACILITY

On January 22-25, 2002, the U.S. Nuclear Regulatory Commission (NRC) conducted an in-office review of supporting documents and information associated with the construction authorization request (CAR) for the mixed oxide fuel fabrication facility (MFFF) submitted by Duke Cogema Stone & Webster (DCS) on February 28, 2001. NRC staff reviewed information in the areas of fire protection and structural design. During the course of the review, NRC staff posed questions to DCS, most of which were answered during the review. The questions posed by NRC and DCS responses are described below. DCS will document the answers in a letter to NRC.

1. Fire Protection

Supporting information reviewed consisted of the Fire Hazards Analysis (FHA) for the Mixed Oxide Fuel Fabrication Facility (DCS01-ASI-DS-ANS-R-10408 Draft of revision A) that incorporated Department of Energy comments.

A. Discuss how the FHA interfaces with the Safety Analysis

DCS stated that the FHA and the Hazard Analysis (HA) are performed simultaneously. The HA makes assumptions and the FHA proves or disproves the assumptions. The HA reviews assumptions in the FHA. The FHA identifies items relied on for safety (IROFS) based on the consequences of a fire (Note: The following discussion refers to IROFS, not principal structures, systems, and components (PSSCs), because the FHA refers to IROFS. However, at the construction phase, only PSSCs are evaluated for construction approval. NRC staff has treated IROFS as PSSCs for the purpose of this review). The HA

identifies the failure modes of the IROFS in each fire area. Subsequently, a fire safety strategy for each fire area is developed in the FHA. The fire strategy is reflected in the Safety Analysis (SA). The effect of failures of IROFS with respect to radioactive releases is determined as part of the safety analysis and is included in the SA. Material release analyses for each fire area are performed as part of the safety analysis and included in the SA. In the Integrated Safety Analysis (ISA), it is demonstrated that the IROFS will not be affected by fires in separate fire areas.

B. The FHA states that "Fires involving material within the gloveboxes are required to be effectively mitigated to meet the performance requirements of 10 CFR 70.61." Wording in the FHA implies that the nitrogen system is being relied on to perform this mitigation. Further, DCS response to RAI 207 states that the rear bearing of the calcination furnace is scavenged with nitrogen for containment purposes. Since it appears that the nitrogen system is relied on to mitigate fires and for containment, is the nitrogen system a PSSC?

DCS stated that the nitrogen system is not a PSSC and will provide supporting information that addresses both fire and confinement and will revise the FHA and CAR as necessary.

C. Is there a soot loading analysis for the C4 final filter?

DCS stated that the soot loading analysis is currently being performed for the C4 final filter and will be available as part of the HA.

D. Exhaust dampers in rooms with gloveboxes are manually operated. How is the operation of dampers guaranteed to ensure C4 confinement?

DCS stated that the isolation valves on the gloveboxes are located in separate fire areas away from the gloveboxes. Manual operation of the valves will be demonstrated through administrative controls such as training and written procedures. More information will be provided in the operating license stage.

E. Explain DCS criteria for the fire protection of redundant IROFS.

DCS stated that its criteria is to use fire barriers to separate redundant IROFS systems. Currently, this criteria is being evaluated by DCS as it is considered more restrictive than requirements for nuclear power plants. DCS will describe its criteria for fire protection of redundant IROFS, including a discussion of separation of redundant IROFS in the same fire area (e.g., electrical power supply).

F. The FHA states nuclear materials within the gloveboxes pose "an insignificant combustible hazard and are not considered in the fire loading calculation." What amount of nuclear material is considered “insignificant”?

DCS stated that if the nuclear material accounted for less that one percent of the total combustible mass, then it was considered “insignificant.” DCS will provide

the least conservative percent by mass of nuclear materials in fire areas and will identify the particular fire area.

G. Some gloveboxes do not use a nitrogen blanket (i.e., they have an air atmosphere). For these gloveboxes, are process temperature conditions used only for process reasons or do they perform a safety function and therefore, should they be IROFSs/PSSCs?

DCS stated that the temperature conditions are to ensure a superior product and are not IROFSs/PSSCs. However, DCS will provide additional information to support this statement.

H. Explain how the glovebox boundary high efficiency particulate air (HEPA) filter can be relied on to prevent the soot from reaching the C4 final filter. Is this function an IROFS? Can the C3 confinement be relied upon if the intermediate C3 filter is plugged? Is the manual bypass on the C3 an IROFS/PSSC?

DCS stated that in the event of a small fire, the glovebox boundary HEPA filter will probably clog, thus preventing all soot from reaching the C4 final filter. (This is under evaluation.) If the fire is large enough to involve the glovebox gloves or windows, the C3 ventilation system will be relied on to exhaust the products of combustion. If the C3 room boundary (intermediate) filters become clogged, the manual bypass will allow smoke to be exhausted through the system. The C3 exhaust system, including the C3 final filter is an IROFS/PSSC. However, the manual bypass and the intermediate filter are not IROFS/PSSC.

I. Discuss reliability and redundancy of the clean agent supply for suppression to a level that is comparable to what was done for water-based suppression.

DCS stated that they will provide this information.

J. What is the basis for classifying the Reagents building as Ordinary Hazard Group 1 per National Fire Protection Agency (NFPA) codes.

DCS stated that in spite of the flammable nature of the combustibles, and after accounting for all the combustibles, the hazard did not meet the requirements of the more restrictive protection class. DCS will provide more details on the quantities of the fuels.

K. Who comprises the "facility fire brigade"? How is that different from "facility-trained personnel"?

DCS stated that the facility fire brigade is a group of individuals dedicated to MFFF fire fighting. This group is not comprised of "facility trained personnel" who are part of the operations staff.

L. Describe the effects of potential accidents on personnel in safe havens.

DCS stated that it will provide the information.

M. The Preliminary Hazard Analysis concluded that an earthquake does not induce any risk of fire. What is the basis for this statement?

DCS stated that it will provide the information.

N. Provide specific reasons for the lack of suppression in specific areas such as some airlocks, PuO_2 buffer storage, and rod handling areas.

DCS stated that they would provide more specific reasons beyond the generic ones provided in the FHA.

2. Structural

Documents reviewed included:

- Tornado Missile Barrier Analysis and Design (DCS01-XGA-DS-CAL-B-01064-CA
- Climatological Description of the Savannah River Site by C.H. Hunter, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC, 1990. WSRC-RP-89-313.
- Determination of Safety Factor Against Bearing Capacity Failure at Foundation Edge, DCS01-WRS-DS-CAL-G-00022-A.
- Preliminary Hazards External Man-Made Event Screening, DCS01-RRJ-DS-ANS-H-38307-A.
- Preliminary Aircraft Hazard Analysis. Draft aircraft hazards analysis that included helicopter hazards.
- Snow load calculations .
- Soil property calculations.
- Tornado missile calculations.

A. Correct the temperature extreme values reported in Section 1.3.3 of the Construction Authorization Request.

DCS will provide corrected values.

B. Submit the Aircraft Hazard safety assessment, including the hazard analysis for a helicopter.

DCS will provide either the analysis or a summary of the analysis in sufficient detail for the staff to reach a safety conclusion. DCS will also check for more recent test data on aircraft penetration into reinforced concrete walls (reference currently cited is dated 1972) and will discuss or include this more recent data into its response.

C. Submit the soil bearing capacity value for Structural Category I structures, explain how it was obtained, and discuss why the foundation design will be adequate when considering this value.

DCS will provide this information.

D. In response to RAI 56, DCS stated that it selected a 100 year recurrence interval for snow loading. Chapter 1 in the CAR states that a 100 year recurrence interval snow load corresponds to 5 pounds per square foot (psf). NRC staff requested

that DCS consider a snow load recurrence interval for more than 100 years (i.e., on the order of 10,000 years). Since the larger snow load is an extrapolation of snow loads having a lower recurrence interval, NRC staff also questioned whether the appropriate 100 year snow load should be 5 psf or 10 psf, since the MOX site lies on a boundary in the map included in the American Society of Civil Engineers (ASCE) Standard 7-98 Figure 7-1,"Ground Snow Load for the United States."

DCS stated that it had considered a larger recurrence interval and that the snow load associated with this larger interval is bounded by the roof load chosen for design. DCS will provide information to support this statement. DCS provided a more accurate map showing that the MOX site lies in the 5 psf snow load zone in ASCE 7-98. NRC staff acknowledges that for the MOX site, the ASCE 7-98 Figure 7-1,"Ground Snow Load for the United States," shows that the snow load to be considered is 5 psf.

E. NRC staff questioned why site proximity missiles did not include those that may be potentially generated by external explosions.

DCS will review site proximity missiles with regard to information the presented in Regulatory Guide 1.91, "Evaluations of Explosives Postulated to Occur On Transportation Routes Near Nuclear Power Plants."

Related to this issue, NRC understands that the analysis for effects of potential explosions at the Reagents Process Building and the Gas Storage Area is ongoing and will be submitted to NRC in the future.

F. The draft Tornado Missile Barrier Analysis and Design Report was reviewed and was acceptable.

G. Load combinations considered by DCS for design were clarified. DCS showed that one load combination in SRP section 3.8.4 contained a typographical error for earthquake load.

3. Polycarbonate Report

The report “Choice of MFFF Process Glovebox Window Material,” was submitted to NRC by DCS letter dated December 15, 2000. Questions were posed to DCS via phone. DCS responded and will confirm responses via letter to NRC.

A. Provide a discussion regarding glovebox qualification, including design criteria for glovebox polycarbonate windows.

DCS will qualify polycarbonate panels in accordance with American Institute of Steel Construction (AISC) N690 to meet glovebox specific use. DCS will examine bounding conditions and will provide design criteria to assure the mechanical properties, fire properties, etc are valid. DCS may evaluate the utility of American Society for Testing and Materials (ASTM) C852, "Standard Guide for Design Criteria for Plutonium Gloveboxes," for functional requirements.

B. Does the failure criteria include creep at elevated temperatures?

DCS stated that it will consider creep and high temperatures as failure criteria. The applicant will provide more details on failure criteria.

C. Discuss what the expected variation in material properties such as ultimate/yield strength, ductility, density, clarity, color, radiation resistance, and flammability within a manufactured lot.

DCS expects that there will be some variation but will specify nominal material property values to the selected supplier.

D. ASTM 790 was cited as the test standard for flexural properties. Are there any other standards for testing the material properties of polycarbonate?

DCS will specify any other test standards.

E. The values presented on page 12 of the report show a range of values for the tempered safety glass but not for the polycarbonate material. Provide a range of values for the polycarbonate material, or indicate whether polycarbonate will be manufactured above the nominal values provided. Also, what is the basis for the values?

DCS will provide nominal values which were not selected at the time the polycarbonate report was written.

F. Will isolation valves for the hydraulic system be located in a separate fire area?

DCS will verify the location of isolation valves with respect to the fire barriers.

G. What are the normal and off-normal operating pressures and temperatures of the hydraulic system?

DCS will provide this information.

H. Were the effects of high temperature hydraulic oil leak or sprays on the windows considered?

DCS stated that the hydraulic system piping is completely sealed, thereby avoiding sprays onto electrical equipment and gloveboxes. However, they will verify this detail as it appears to contradict statements in the polycarbonate report.

I. Indicate the location of motors or electrical panels (in corners or near walls) to ensure that the effect of fires are not worse than accounted for in the analysis.

DCS stated that motors and electrical panels will be located away from walls.

J. Provide basis for estimating heat release rate of motor fires.

cc: P. Hastings, DCS
J. Johnson, DOE
H. Porter, SCDHEC
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