February 28,2002

MEMORANDUM TO: Eric J. Leeds, Chief
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Office of Nuclear Material Safety
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Thru: Joseph G. Giitter, Chief **/RA/**
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SUBJECT: FEBRUARY 4,5, 22, 2002 SUMMARY OF PHONE CALLS: REVIEW OF DUKE COGEMA STONE & WEBSTER CONSTRUCTION AUTHORIZATION REQUEST SUPPORTING DOCUMENTS FOR THE MIXED OXIDE (MOX) FUEL FABRICATION FACILITY

On February 4, 5, and 22, 2002, the U.S. Nuclear Regulatory Commission (NRC) reviewed outstanding questions with Duke Cogema Stone & Webster (DCS) via phone that are associated with the construction authorization request (CAR) for the mixed oxide fuel fabrication facility (MFFF) submitted by DCS on February 28, 2001. The purpose of this memorandum is to document questions asked by NRC and to reconcile differences between outstanding items being tracked by DCS (described in Enclosure B in DCS's letters dated January 7 and February 11, 2002) versus those being tracked by the staff. With respect to the questions in the attachment, most were asked previously whereas some were provided to DCS for the first time (e.g., those resulting from continuing staff review of the CAR and DCS responses to requests for additional information (RAIs) and those resulting from the recent reorganization announced by DCS). DCS will document their responses in a letter to NRC.

1. Site Description

   A. Regarding site hydrology, Section 1.3.4.6 indicates no radiological contamination in Upper Three Runs or Gordon aquifers. Is this no detectable contamination or no contamination above Environmental Protection Agency drinking water limits? Will there be further studies on Seepage Basin Plume on proposed MFFF site versus statement plumes are well defined as to extent and flow direction (included in Enclosure B of DCS February 11, 2002, letter)?

   B. Provide a discussion of hospitals located in the vicinity of the Savannah River Site (SRS). Such a discussion was omitted from Section 1.3 in the Construction Authorization Request (CAR).

2. Project Costs

   A. Will project design costs that were under review by U.S. Department of Energy (DOE) be submitted (RAI 30) (Included in Enclosure B of DCS February 11, 2002, letter)?

   B. Do design costs include licensing costs (RAI 30) (included in Enclosure B of DCS February 11, 2002, letter)?

   C. Are escalation and contingency costs included in the design costs (RAI 30) (included in Enclosure B of DCS February 11, 2002, letter)?

3. DCS Organization

   A. Provide updated organization charts and descriptions (Chapter 4 and the Quality Assurance Plan) (included in Enclosure B of DCS February 11, 2002, letter).

   B. Provide updated financial qualifications (Chapter 2) (included in Enclosure B of DCS February 11, 2002, letter).

   C. Provide updated institutional information (Chapter 1.2) as a result of the recent purchase of Duke Engineering and Services by Framatome. Does the recent purchase affect the foreign ownership, control, or influence (FOCI) determination made by the DOE? Provide a copy of the FOCI review performed by DOE (Included in Enclosure B of DCS February 11, 2002, letter).

4. Equipment Qualification

   Is the discharge stack a principal structures, systems, and components (PSSC)? If so, what is its design basis for seismic and other natural phenomena events and accidents (included in Enclosure B of DCS February 11, 2002, letter)?

5. Mechanical Equipment/Material Transport

A. DCS agreed to provide additional clarification with regard to quality levels and fluid transport system categories as they relate to welding and welding procedures (included in Enclosure B of DCS February 11, 2002, letter).

B. Regarding DCS' letter dated January 7, 2002, Enclosure B, RAI 144: In DCS' future evaluation of the enclosure of the furnaces, in addition to the current evaluation of enclosing the furnaces in gloveboxes, also evaluate and justify why the furnaces could not be enclosed in a process cell (answered in DCS February 11, 2002, letter).

C. Regarding the Material Maintenance and Surveillance Program (MM&SP) (CAR p5.5-87), describe how the MM&SP will detect corrosion/wall thinning in piping and equipment located in process cells. If the MM&SP will not be used in the process cells, what is the design basis for the corrosion allowances in the system design? DCS states that in the design process corrosion resistance of the materials with the process fluids will be addressed. However, DCS does not mention that the corrosive or galvanic affect between dissimilar metals will be considered in the design. (included in Enclosure B of DCS February 11, 2002, letter).

D. Regarding the manual isolation valves mentioned in CAR 11.4.7.1.5, clarify if they are the only type of isolation valves on gloveboxes. Describe the design basis if other types of isolation valves are used on gloveboxes (included in Enclosure B of DCS February 11, 2002, letter).

E. The discussion of the decontamination system does not mention its interface with the demineralized water and nitric acid system. Clarify the list of interfaces for the decontamination system (included in Enclosure B of DCS February 11, 2002, letter).

F. Clarify the point of delineation between “PSSC” and “non-PSSC” in the instrument air system. A drawing or diagram at the equipment level would be acceptable (included in Enclosure B of DCS February 11, 2002, letter).

G. Clarify the compatibility of references to two standards for instrument air. Both American National Standards Institute (ANSI) / Instrument Society of America (ISA) 7.0.01-1996, “Quality Standard for Instrument Air,” and ISA S7.3, “Quality Standard for Instrument Air,” are referenced in the CAR Section 11.9 text and non-PSSC design bases, respectively (included in Enclosure B of DCS February 11, 2002, letter).

H. Clarify why the design basis of the instrument air and station air systems include high efficiency particulate air (HEPA) filters on their penetrations of the MFFF confinement, while the bulk gas systems do not. Discuss the provision for HEPAs on penetrations (included in Enclosure B of DCS February 11, 2002, letter).

I. Clarify the basis for not including the seismic isolation system and isolation valves and seismic detectors in the hydrazine system design basis (included in Enclosure B of DCS February 11, 2002, letter).

J. In the chemical process discussion, DCS mentions in the CAR, pages 8-8, 27, 28, a "P10" gas further described as "methane+argon-7%." Research indicates that P10 is 10% methane 90% argon. Provide a description of the "P10" equipment and provide any design basis information. No other information can be found in Section 8 or 11. Clarify whether industrial P10 or "methane+argon-7%" is correct. If the latter, also describe what additional precautions will be taken for handing the potentially explosive mixture (RAI 113) (included in Enclosure B of DCS February 11, 2002, letter).

K. Identify the interface with the N_2O_4 system. The CAR pg 11.9-48 and Figure 11.9-29 identifies the service air system, while the Drawing GNO/RMN-14735 Sheet 1 identifies the instrument air system supplying both the N_2O_4 evacuation and pumping the N_2O_4 system boiler (included in Enclosure B of DCS February 11, 2002, letter).

L. Clarify the operating temperature for the N_2O_4 system. CAR page 11.9-48 mentions gas mixture is electrically heated and the system heat traced to 122° F or 50° C to avoid condensation of NOx from the boiler; however, CAR response 128 (August 2001) states that the system is designed for an operating temperature of 55° F. If the latter temperature is correct, identify how the system will be maintained at this temperature and the range of allowable gas temperatures for the entire system (ncluded in Enclosure B of DCS February 11, 2002, letter).

M. DCS will clarify design basis information related to seismic qualification of mechanical equipment that was in its January 7, 2002, response, including identifying the design basis seismic event that will activate the seismic isolation system (partially answered in DCS February 11, 2002, letter).

N. Provide most recent design basis for truck shipping bay. Specifically, clarify whether fresh fuel casks will be stored in racks or frames, one above another. If so, what is the design basis for the frames (included in Enclosure B of DCS February 11, 2002, letter)?

O. Clarify whether the maximum qualified lift height for a fresh fuel cask could be exceeded in the shipping truck bay (from maximum withdrawn position of the crane to the lowest point of the truck bay floor) (included in Enclosure B of DCS February 11, 2002, letter).

P. Clarify the design basis for the seismic isolation valves. RAI Response 191 only discusses the response time and selection criteria for check valves (included in Enclosure B of DCS February 11, 2002, letter).

Q. The CAR indicates that DCS will be using the 1977 version of American Society of Mechanical Engineers AG-1, Code on Nuclear Air and Gas Treatment, however, the latest version of the code is 1991. Please clarify which version of the code DCS using. If it is the 1977 version, please describe why the latest version is not being used.

R. Regarding DCS's letter dated January 7, 2002, Enclosure B, RAI 221: DCS asks if additional information on the release fraction for respirable plutonium is needed. DCS provided a response in its clarification to RAI 193 dated December 5, 2001. No additional information is needed. DCS stated that it would include the changes in a future revision of the CAR.

6. Nuclear Criticality Safety

A. Clarify how DCS will meet the requirements of 10 CFR 70.61(b) for criticality accident sequences, and in particular, how you will ensure that an accidental criticality is "highly unlikely." This may be done either qualitatively or quantitatively, as described in the NRC guidance letter dated December 5, 2001 (RAI 40/41) (included in Enclosure B of DCS February 11, 2002, letter).

B. Provide justification for the experience levels (*i.e.*, required years of nuclear industry experience) for Nuclear Criticality Safety (NCS) staff during the design phase. In addition, add the requirement that individuals in the NCS Function Manager, Senior NCS Engineer, and NCS Engineer positions must have a specified amount of technical experience in uranium/plutonium (or MOX) processing. Provide a criterion on how much experience directing an NCS Function is required for the NCS Function Manager. Guidance on accepted experience levels at other fuel facilities was provided to you by letter dated November 9, 2001 (RAI 68) (included in Enclosure B of DCS February 11, 2002, letter).

C. For each Criticality Control Unit (CCU) in Tables 6-1 and 6-2 for which numerical parameter limits are given but the associated parameter is not identified as a controlled parameter, provide justification for the limiting values stated. In particular, justify not controlling the physiochemical form of the process material where $Pu(NO_3)_3$ is assumed, and justify the use of densities when less than theoretical densities are used (RAI 83) (included in Enclosure B of DCS February 11, 2002, letter).

D. For each of the following ANSI standards, provide the requested clarification:

ANSI/American Nuclear Society (ANS) -8.1-1983 (R1988): In your December 5, 2001, clarification letter you add the words "...or other justifications..." to your discussion of how extensions for the area(s) of applicability for validated calculational methods will be treated. Clarify what specific methods will be used to provide this additional justification (also, ANSI/ANS-8.17-1984) (included in Enclosure B of DCS February 11, 2002, letter).

ANSI/ANS-8.1-1983 (R1988): In your August 31, 2001, RAI response, you defined "unlikely" for meeting the double contingency principle as "not expected to occur during the facility lifetime." Clarify what is meant by this phrase–*e.g.*, whether the facility lifetime is assumed to be on the order of 10 or 100 years and how you assured that "not expected to occur during the facility lifetime" was determined for the lifetime assumed (included in Enclosure B of DCS February 11, 2002, letter).

ANSI/ANS-8.15-1981: In your December 5, 2001, clarification letter, you state that criticality control involving special actinide elements may be demonstrated by reference to the limits specified in ANSI/ANS-8.1. In your August 31, 2001, RAI response, it is mentioned that special actinide elements will be present "in relatively low concentrations in mixtures with ^{235}U and ^{239}Pu." Quantify when the concentration of special actinide elements is sufficiently low that the limits of ANSI/ANS-8.1 may be used conservatively (RAI 90) (included in Enclosure B of DCS February 11, 2002, letter).

E. The February 11, 2002, clarification for RAI Question 80/81 states that systems that rely on passive geometry control automatically meet the double contingency principle, because there are no credible changes in process conditions that can occur causing a criticality. This is not necessarily correct, because in some cases the geometry can be altered by bulging, corrosion, or other mechanisms, and in other cases, geometry can fail and result in material accumulating in unfavorable geometry areas. Commit to evaluate on a case-by-case basis the potential for the system geometry to be altered. Clarify that passive geometry control is sufficient to ensure compliance with double contingency only if there are no credible means of changing the system geometry, and that if credible means of changing the system geometry exist, sufficient controls will be established to ensure that at least two independent, unlikely, and concurrent, changes in process geometry are needed before criticality is possible (RAI 80/81).

7. Electrical

A. On Page 23 of the DCS's January 7, 2002, response, DCS quotes Section 5.2 of the Institute of Electrical and Electronics Engineers (IEEE) Std-484, "IEEE Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications," as requiring "acid resistant insulation" between battery cells and steel racks. Regulatory Guide (RG) 1.128, "Installation Design and Installation of Large Lead Storage Batteries for Nuclear Power Plants," requires not just "acid resistant" but also "moisture resistant" insulation. Will the insulation also be moisture resistant (Included in Enclosure B of DCS February 11, 2002, letter)?

B. Regarding page 23 of DCS's January 7, 2002, response, Item 6: RG 1.128 states that the "shoulds" in the listed sections of IEEE Std 484 must be treated as "shalls." DCS needs to clarify its commitment to RG 1.128 and its application of "shoulds" and "shalls" (included in Enclosure B of DCS February 11, 2002, letter).

C. On Page 22 of DCS's January 7, 2002, response, Item 1 states that subsection 4.1.4 of RG 1.128 requires that the hydrogen concentration be limited to less than 2% at any location in the battery area. DCS also quotes that IEEE Std 484-1996 requires the hydrogen concentration to be less than 2% of the total volume of the battery area. Thus, RG 1.128 requirement covers every area while IEEE Std-484 requirement is an average across the whole room. DCS should address these different requirements. According to the National Fire Protection Association (NFPA) 801, "Standard for Facilities Handling Radioactive Materials," the concentration of hydrogen must be kept below 25% of lower flammability limit (LFL) or lower explosive limit (LEL) where the LFL for hydrogen is 4% by volume. Also NFPA 70E, "Standard for Electrical Safety Requirements for Employee Workplaces," requires that ventilation systems limit hydrogen accumulation to no more than 1%. DCS should address these NFPA requirements in contrast to those of RG 1.128 and IEEE Std-484 and describe to which requirements it is adhering (included in Enclosure B of DCS February 11, 2002, letter).

D. Section 5.4 of IEEE Std 484-1996 states that for batteries the ventilation system shall limit hydrogen accumulation to less than a specific value. Also a prior version of this standard stated that the ventilation system should maintain the battery room temperature within design temperatures. Review of the CAR indicates that although the emergency diesel generator building HVAC systems ventilate and cool the emergency switchgear rooms, there appears to be no discussion pertaining to those systems maintaining the emergency diesel generator starting batteries' temperatures within their design requirements nor limiting hydrogen accumulation. Also there appears to be no discussion of the HVAC systems and their capabilities for specifically maintaining temperatures and limiting hydrogen accumulation in rooms containing other batteries such as the emergency dc system batteries. Additionally, some of these ventilation systems may operate intermittently (such as when the diesel generator is running) and some battery rooms may not have hydrogen or loss of ventilation alarms. NFPA 801 requires detection of hydrogen accumulation "in enclosed spaces" where combustible gases could accumulate. The applicant does not consider electrical equipment rooms to be enclosed because they are ventilated. The applicant should address the capabilities of the HVAC systems related to maintaining appropriate temperatures for MFFF batteries and limiting hydrogen accumulations. The applicant should identify which of those HVAC systems, as well as any other systems or components related to hydrogen control, are PSSCs. Further, the applicant should justify not treating electrical equipment rooms as enclosed spaces especially when no or intermittent ventilation systems are used.

E. Section 5.1 of IEEE Std 484-1996 states that in battery areas, nearby equipment with arcing contacts shall be located in such a manner as to avoid those areas where hydrogen pockets could form. Section 6.1.7 of Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants," states that switchgear and inverters should not be located in battery rooms. Also NFPA 801 recommends separation of major concentrations of electrical equipment from adjacent areas. Review of the CAR indicates that switchgear, diesel generators, and other arcing equipment may be located in the same room or in close proximity to batteries. The applicant should address this issue.

8. Instrumentation and Control (I&C)

A. The CAR states that the safety control subsystem (in the MOX Processing (MP) and Aqueous Polishing (AP) process control systems) is a single channel that is separate and independent from the other two control subsystems (normal and protective). Are the normal and protective control subsystems single channel and separate/independent from the other two control subsystems? (Although not considered a safety system by DCS, this information is being asked for completeness in understanding the I&C systems.)

B. The CAR states that the safety control subsystem (in the utility control systems) is a single channel that is separate and independent from the other two control subsystems (normal and protective). Are the normal and protective control systems single channel and separate/independent from the other two control subsystems? (Although not considered a safety system by DCS, this information is being asked for completeness in understanding the I&C systems.)

C. The CAR states that the associated AP or MP control rooms are not required when the functional unit is not operating. The CAR also states that the AP systems control room provides control of the normal and safety utilities systems, the fire detection systems, and the health physics systems. Does the first sentence imply that crucial systems, such as the fire detection systems, are not controlled when certain control rooms are not required (included in Enclosure B of DCS February 11, 2002, letter)?

9. Radiological Consequences

A. Solvent wastes contain greater than 5000 times the Part 20, Appendix B, Table 2, limits of plutonium-239 (i.e., the 70.61(c)(3) performance requirement). Was a spill of solvent waste considered in the hazard analysis? If so, why were no PSSCs identified to prevent or mitigate this intermediate consequence event (CAR Ch. 10/RAI 143)?

B. The applicant's estimate for radionuclide release rates during normal operations (Table D-7 of the ER) fails to meet the applicant's own ALARA design goal for effluent control stated in Ch. 10 of the CAR. The ALARA design goal is 20% of the Part 20, Appendix B, Table 2, concentration limits. The applicant's estimate of effluent release rates exceeds this goal by a factor of approximately 15. In light of the footnote accompanying Table D-7 that states the applicant's estimates are probably 10 times too high, has DCS derived a more realistic source term for normal operations? Where onsite would air effluents be measured to see if the ALARA goals are met (CAR Ch 10) (included in Enclosure B of DCS February 11, 2002, letter)?

C. DCS did not properly identify PSSCs for environmental protection because safety assessment methodology was not acceptable to the staff. Staff has stated that the respirable fraction may not be used in the assessment and the boundary at which compliance must be demonstrated is the restricted area, not the controlled area. Also, a decontamination factor of no more than 100 is acceptable for HEPA filters exposed to severe conditions. As a result, the mitigated bounding fire event consequences exceed the intermediate consequence performance requirement in 70.61(c)(3). This would also hold true for any glovebox with a fire hazard that contains more than approximately 5 kilograms of dispersible plutonium. DCS will assess the environmental protection performance requirements at the restricted area boundary (CAR Ch.10) (Included in Enclosure B of DCS February 11, 2002, letter).

10. Physical Security

NRC provided the design basis threat to DCS by letter dated March 13, 2000 (letter attachment is classified). Does DCS intend to meet that design basis for the MFFF?

11. External Man-Made Hazards

With regard to the effect of potential explosions in F-Area and their effect on the MFFF, clarification was requested from DCS for the basis of the explosion potential. DCS stated on page 17 of its February 11, 2002, letter that the hazard screening performed by DCS was based on documents provided by DOE that included tank sizes, location, and contents, and that calculations in support of Integrated Safety Analysis are currently being developed based on updated values and references. DCS also stated that calculations and references will be available for onsite review.

DCS should identify and summarize the referenced information and bounding calculations that assure the safety of the site and building design for construction authorization. The response should also assure that the DOE documents reviewed are still valid (RAI 57).

12. Sintering Furnace

Provided below are questions regarding the sintering furnace. Most were provided previously by technical discipline but are provided again in order to consolidate the questions across technical disciplines and facilitate the response by DCS. Some questions result from the staff's review of DCS's recent calculations concerning a potential leak in the sintering furnace, and are new.

Questions posed by NRC staff focused on: 1) potential leaks of the sintering furnace atmosphere which includes hydrogen into the room (included in Enclosure B of DCS February 11, 2002, letter); 2) potential explosions due to hydrogen build up in the room or the furnace (included in Enclosure B of DCS February 11, 2002, letter); and 3) potential steam explosions (included in NRC in-office review summary dated December 18, 2001).

Potential consequences of leaks from the sintering furnace include radiological exposure to the worker and an explosion in the room. DCS recently completed calculations related to worker safety issues in the vicinity of the sintering furnace.

Overall questions regarding all three areas in the previous paragraphs are:

A. Based on the hazards analysis, including the recent worker safety calculations, provide a clearer explanation of PSSCs and design bases associated with the sintering furnace.

B. Describe how 10 CFR 70.64(b) defense-in-depth provision is applied to reduce the risk to the facility worker of a sintering furnace loss-of-confinement event

Regarding potential leaks and their effects on workers, NRC staff: 1) posed questions regarding enclosing the sintering furnace in a glovebox as a method of assuring that worker performance requirements are met and as a defense-in-depth feature (answered in DCS February 11, 2002 letter); and 2) requested that DCS perform an analysis to determine whether sufficient time is available for workers to take protective mitigative actions in the case of potential leaks. DCS has elected to assure that the performance requirements are met by relying on operator actions. DCS performed calculations of the mitigated dose to the facility worker from a loss of confinement event at the sintering furnace. DCS calculated the mitigated dose to be approximately 1 rem for a 30 second intake. NRC staff reviewed the calculations and concluded that the method employed by DCS is generally acceptable provided that DCS can demonstrate that the 30 second intake is reasonable. The consequence value assumes that the worker is aware that a release has started and takes action to escape within 30 seconds. In order to assure that the worker can and will take the protective actions, the staff poses the following questions:

C. What is/are the protective action(s) being relied on by DCS in order to ensure that worker performance requirements are met?

D. What information is available to the worker on the floor and in the control room to assure that the worker is aware of a leak and can take the appropriate protective action? How quickly will the information be available to the worker? If an alarm is being relied on, what parameter will activate the alarm (e.g., hydrogen, radioactivity)? Room conditions (e.g., room ventilation) should be factored in to the measurement of the parameter to assure that such measurements will produce the desired results . If an audible alarm is being relied on, what is the expected ambient noise level in the room and how much above ambient will that alarm be? If visual alarms are relied on, describe those alarms.

The following questions relate to both leaks into the room and to explosions, both internal and external to the furnace:

E. The sintering furnace uses a hydrogen-argon gas mixture. Half of the stated control range is flammable in air. Do the design bases for the sintering furnace include a standard for sensor placements and PSSC designations for detectors and door interlocks?

F. Are PSSCs needed for the airlock sweep gases?

G. Describe the sintering furnace sensors, controls, and PSSCs related to hydrogen controls and for controlling air entry into the furnace.

H. Describe the design basis for pressure sensors that will detect a leak in the sintering furnace and terminate hydrogen flow. (RAI 122, 124)

I. Describe the means for ensuring that entry of air into the furnace is precluded at the furnace entry and exit and associated design bases.

Docket: 70-3098

cc:
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