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05 June 2003  
DCS-NRC-000142

Subject: Docket Number 070-03098  
Duke Cogema Stone & Webster  
Mixed Oxide Fuel Fabrication Facility  
Meeting Minutes from the 02-04 June 2003 Public Meeting on Chemical Safety  
Open Items

Reference: Robert C. Pierson (NRC) letter to Robert H. Ihde (DCS) dated April 30, 2003,  
*Draft Safety Evaluation Report on Construction of Proposed Mixed Oxide Fuel  
Fabrication Facility, Revision 1*

Duke Cogema Stone & Webster (DCS) and Nuclear Regulatory Commission Staff participated in a public meeting the week of 02 June 2003 regarding the Chemical Safety Open Items identified in Reference 1 above. DCS appreciated the opportunity to meet with the staff to discuss these issues. DCS also believes that progress was made toward resolution of open items as a result of this meeting.

Enclosure 1 provides a synopsis of the meeting including identification of action necessary for closure of the open items discussed in the meeting.

If you have any questions, or need additional information please call me at (704) 373-7820.

Sincerely,

Peter S. Hastings, P.E.  
Manager, Licensing and Safety Analysis

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Open Items

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**Enclosure 1**  
**Meeting Minutes from the 02-04 June 2003**  
**Public Meeting on Chemical Safety Open Items**

**Open Item CS-01:**

**The staff concludes that the red oil phenomena analysis in Chapter 5.5 of the revised CAR is not complete and that PSSCs and their design bases for preventing red oil explosions are not adequate for all potentially affected components. At a minimum, this applies to the following areas: purification, solvent recovery, calciner, oxalic mother liquor, acid recovery, and offgas. (DSER Section 8.1.2.5.2.5)**

Prior to the meeting DCS provided a response to open item CS-01 as part of an update to the Construction Authorization Request. At the meeting DCS identified that Sections 8.1.2.5.5.3 and 8.1.2.5.5.4 of the DSER state that the steam temperature at DOE facilities is limited to 120°C and existing licensed facilities limit the temperature to 90°C. As a result of discussions, where DCS questioned these values NRC staff requested DCS to provide information about comparable systems at SRS and La Hague regarding steam and solution temperatures. NRC staff also asked DCS to review the DNFSB web site for relevant documentation and explain any inconsistencies with the information presented in the DSER.

Prior to conclusion of the meeting, DCS contacted SRS and COGEMA and reviewed the DNFSB web site information. As a result of these inquiries, the following information was discussed at the meeting.

- Preliminary information from SRS indicated that the *solution* temperature is controlled to approximately 120°C<sup>1</sup> and the steam temperature is controlled to 25 psig (which translates to approximately 130°C).
- DCS's review of information for La Hague indicates that the evaporators are typically operated with the fluid temperature above 120°C<sup>1</sup> and the steam temperature in excess of 135°C for the R4 and UP3 process lines. This information is documented in the facility's "prescription technique" (i.e., approved by the French regulator).
- DCS's review of the DNFSB web site substantiated the information on SRS evaporators discussed above (see 11 March 1998 DNFSB letter, Conway to Moniz).

DCS did not see an analogous system with a steam temperature at 120°C or below. The Staff concurred with DCS that the information provided was sufficient to correct the information in the DSER. DCS agreed to provide appropriate references for the SRS and La Hague information discussed above.

In the course of the meeting, DCS reiterated that the MFFF has committed to having automatic controls, control of residence time, provisions for adequate venting and provisions for adequate evaporative cooling.

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<sup>1</sup> The actual solution temperature will obviously correspond to the azeotroph of the operating fluid.

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DCS noted that the predominant means for providing heat transfer in these systems is given by evaporative cooling. Effective evaporative cooling ensures the temperature of the solution will not exceed its boiling point, *irrespective* of the temperature of the heat source. DCS has previously identified principle SSCs to provide this safety function, and during the ISA will identify the specific Items Relied On For Safety (IROFS) to implement this function. Options such as measurement of the solution temperature and/or continuous introduction of aqueous phase are already elements of the design, and designating them as IROFS as part of the ISA will not significantly impact the design of the constructed facility.

DCS also recognized a discrepancy between the steam temperature provided in Chapter 8 of the CAR and previous correspondence regarding this open item (i.e., 135°C vs. 133°C), and committed to reconciling this discrepancy.

**Actions:**

- DCS will verify the solution and steam temperatures for SRS and COGEMA discussed in the meeting.
- DCS will resolve the discrepancy between the CAR and the previous correspondence related to steam temperature.
- NRC Staff will make appropriate corrections in the SER.

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**Open Item CS-02**

**The staff concludes that the HAN/hydrazine analysis in Chapter 5.5 of the revised CAR is not complete and that PSSCs and their design bases for preventing HAN/hydrazine explosions are not adequate for all potentially affected units and components. At a minimum this applies to the following areas: purification event, solvent recovery, offgas. (DSER Section 8.1.5.2.3)**

DCS provided a response to Open Item CS-02 in a letter dated 30 May 2003 which NRC is still reviewing. In the meeting the NRC staff asked for an explanation of how the DCS methodology compares with the DOE Instability Index. The staff also asked about the extent to which the DCS methodology accounts for the uncertainties in the instability index previously identified by DCS.

DCS reiterated that the Instability Index considers the effects of Fe and no other impurities, whereas within the MFFF the predominant metal ion species is Pu (in systems containing HAN). Therefore, the design basis is established using Pu (the impact of lesser impurities will be evaluated during the ISA).

During the meeting DCS discussed a comparison of the DCS model (without consideration of the use of hydrazine) and the instability index. The staff concurred that the models are in good agreement. Furthermore, the DCS model provides for conservative results at high HAN concentrations and in particular a conservative margin at higher HAN concentrations. DCS also clarified that the comparison did not include the additional significant safety margin added by including hydrazine to the system (identified previously by DCS as a principle SSC). The Staff concurred that the use of hydrazine provided a substantial safety margin.

DCS also provided a high-level summary of the data expected from the test program being proposed – i.e., the test program will improve our understanding of the current conservative over-prediction of the DCS model, confirm rate constant data, confirm the loss rate for hydrazine due to radiolysis, and provide supporting information for establishing limits on residence time.

The NRC Staff agreed that DCS has provided sufficient information at this time, based on the 30 May 2003 letter and the discussion at the meeting. The Staff needs to review the new information and inform DCS if there are any additional questions.

**Action:**

- NRC Staff will continue their review of this item and inform DCS of any additional questions.

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**Open Item CS-03**

**The staff concludes that the HAN/hydrazine analysis in Chapter 5.5 of the revised CAR is not complete and that PSSCs and their design bases for preventing azide formation and potential explosions are not adequate for all potentially affected units and components. (DSER Section 8.1.5.2.3)**

DCS provided a response to Open Item CS-03 in a letter dated 23 May 2003. NRC has reviewed the response and agreed that this issue is now closed.

**Action:**

- NRC Staff will update the monthly Open Item Status Report to reflect closure of this item.

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**Open Item CS-05b**

**The applicant should provide chemical consequence levels that provide a clear toxicological basis, and provide adequate margin and conservatism (Section 8.1.2.3.1) (CS-05b).**

The discussion of open item CS-05b was divided into two sub-items. The first sub-item is related to the use of TEELs and the second sub-item is associated with indoor wind speeds.

Use of TEELs

The NRC Staff continues to review the information previously presented by DCS regarding the development and use of TEELs, and at present there is no further DCS action required. In an effort to assist the NRC in their evaluation, DCS also provided the staff with the SCAPA membership directory and reiterated the process for development of TEELs discussed in a previous public meeting. The NRC Staff informed DCS that the finalization of their review of TEELs for the use at MFFF is estimated to be complete by the end of June.

Indoor Wind Speeds

The second sub-issue was related to the indoor wind speed discussed by DCS in the 18 Feb 2003 letter. DCS reiterated the response provided in that letter and provided more information regarding the conservative assumptions in the letter (e.g., the size of the postulated spill, etc). As stated in the letter, DCS believes the release of nitric acid at elevated temperatures results in low consequences to the site workers at 100 meters. It was concluded by the NRC Staff: that DCS has provided information that indicated an adequate safety margin; that there are additional margins associated with other features (not credited for this scenario, but some of which are PSSCs for other reasons); that DCS has committed to detailed analyses of each applicable process cell as part of the ISA; and that if necessary, existing MFFF features could be credited in the ISA to ensure chemical consequences are low. The Staff therefore concurred that the sub-item related to indoor wind speed is now closed.

**Action:**

- NRC Staff will finalize their review of the use of TEELs at the MFFF.
- NRC Staff will update the monthly Open Item Status Report to reflect closure of the indoor wind speed portion of this item.

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**Open Item CS-10:**

**A suitable design basis for habitability in the Emergency Control Room has not been identified. (DSER Section 8.1.2.6.1)**

DCS committed in the meeting to the use of IDLH values where available for chemicals at the MFFF for the protection of Emergency Control Room (ECR) operators. Where IDLH values are not available, DCS committed to the use of TEEL-2 values. The specific chemicals and the values to which DCS commits will be provided in a new table (i.e., specific to ECR operators) in the next update of the CAR.

**Action:**

- DCS will update the CAR to include the table discussed above.



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**Open Item AP-02:**

**With respect to the electrolyzer, the applicant's hazard and accident analysis did not consider fires and/or explosions caused by ignition of flammable gases generated by chemical reactions and or electrolysis, such as from an overvoltage condition. This applies to the dissolution unit (DSER Section 11.2.1.3.3). This issue also includes the determination of flammability limits for the sintering furnace (formerly included in MP-4).**

DCS reiterated the response provided in the DCS 18 February 2003 letter, and the NRC 05 March 2003 letter providing the meeting minutes from the January 2003 public meeting.

In the meeting NRC Staff agreed to review the DCS 18 Feb 2003 letter, the revised DSER, and the NRC 05 March 2003 letter regarding LFL methodology. The Staff will determine if there is enough information to justify the use of 50% LFL as a design basis and 25% LFL as the setpoint at which an action is taken, and notify DCS if additional justification is needed.

DCS also requested clarification of certain language in the revised DSER regarding AP-2. NRC Staff confirmed that all of the discussion in the revised DSER related to AP-2 that had not already been resolved was related to the confirmation of the design basis LFL value, such that closure on the design basis value will also close this open item.

**Action:**

- NRC Staff will continue their review of this item and inform DCS of any additional questions.
- NRC Staff will make appropriate corrections (i.e., regarding non-LFL issues related to AP-2) in the SER.

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**Open Item AP-03**

**The applicant's hazard and accident analysis did not include events involving titanium, such as titanium fires. Accident events should be evaluated and PSSCs identified as necessary. This applies to the dissolution unit (DSER Sections 11.2.1.3.4)**

DCS provided a response to Open Item AP-03 in a letter dated 23 May 2003. NRC has reviewed the response and agreed that this issue is now closed.

**Action:**

- NRC will update the monthly Open Item Status Report to reflect closure of this item.

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**Open Items CS-09, AP-08, and AP-09:**

**The applicant has not provided a solvent temperature design basis with sufficient margin. (DSER Section 8.1.2.5.2.2)**

**A design basis and PSSCs are needed for flammable gases and vapors in the Offgas unit (DSER Section 11.2.1.10)**

**A design basis and PSSCs are needed for maintaining temperatures below the solvent flashpoint (DSER Section 11.2.1.3.10)**

It was proposed and agreed that these three open items are interrelated and will be addressed together. NRC Staff asked if DCS had proposed the use of the sum-of-fractions rule for calculating LFL for mixtures? DCS indicated that they are still looking at the calculational methods and had not proposed the use of such methodology at this time. It was also noted that these three open items may be tied to the NRC decision on Open Item AP-02.

DCS expects that exceeding flashpoint will be an off-normal event and noted that there are no appreciable ignition sources within the process. DCS also asked if NRC had identified any clear precedent on the applicability of various NFPA codes to process vessels. NRC indicated they would need to confer with their fire protection code experts and committed to contact DCS with additional information the following week.

**Action:**

- NRC Staff will confer with fire protection reviewers and contact DCS (expected to occur no later than Tuesday 10 June 2003) to discuss further.

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**Open Item AP-10:**

**Provide a design basis and PSSCs for removal of potentially toxic or reactive gases in the Offgas unit (DSER Section 11.2.1.3.10)**

DCS provided a response to AP-10 in a letter dated 30 May 2003. NRC reviewed the response and agreed that there are two parts to the open item. These items are:

1. DCS provided information regarding protection of HEPA filters from reactive gases in the offgas system in a prior response associated with Open Item VS-01.
2. DCS provided information regarding protection of the site worker from toxic gases in various prior responses related to CS-05b.

NRC Staff reviewed the response and agreed that the first sub-issue can be closed and the second can be closed with resolution of the remaining issue in CS-05b (i.e., use of TEELs).

**Action:**

- NRC Staff will update the monthly Open Item Status Report to reflect closure of the HEPA filter protection portion of this item.
- NRC Staff will finalize their review of the use of TEELs at the MFFF pursuant to Open Item CS-05b.