

September 10, 2003

MEMORANDUM TO: Kathy Halvey Gibson, Acting Chief  
Special Projects and Inspection Branch  
Division of Fuel Cycle Safety  
and Safeguards  
Office of Nuclear Material Safety  
and Safeguards

Thru: Brian W. Smith, Acting Chief **/RA/**  
Special Projects Section  
Special Projects and Inspection Branch  
Division of Fuel Cycle Safety  
and Safeguards, NMSS

FROM: Andrew Persinko, Sr. Nuclear Engineer **/RA/**  
Special Projects Section  
Special Projects and Inspection Branch  
Division of Fuel Cycle Safety  
and Safeguards, NMSS

SUBJECT: SEPTEMBER 5, 2003 SUMMARY OF PHONE CALL WITH THE  
APPLICANT: NUCLEAR CRITICALITY SAFETY OPEN ITEM FOR THE  
MIXED OXIDE (MOX) FUEL FABRICATION FACILITY

On September 5, 2003, the U.S. Nuclear Regulatory Commission (NRC) reviewed the outstanding nuclear criticality safety open item with Duke Cogema Stone & Webster (DCS) via phone. The open item is associated with the Revised Construction Authorization Request (CAR) for the Mixed Oxide Fuel Fabrication Facility (MFFF) submitted by DCS on October 30, 2002. The purpose of this memorandum is to: 1) document the phone call in preparation for a meeting on September 11, 2003; and 2) convey the resolution status of NRC questions contained in previous requests for additional information. The information is provided as an Attachment.

Attachment: Phone Summary

Docket: 70-3098

cc: P. Hastings, DCS    J. Conway, DNFSB    G. Carroll, GANE    D. Silverman, DCS  
    J. Johnson, DOE    H. Porter, SCDHEC    L. Zeller, BREDL    D. Curran, GANE

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<b>OFC</b>	SPIB		SPIB		SPIB	
<b>NAME</b>	A Persinko		LGross		BSmith	
<b>DATE</b>	9/ 10 /03		9/ 10 /03		9/ 10 /03	

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The following statements and requests were conveyed by NRC (Chatterton, Persinko) to DCS (Doering, Henkel, Foster, Peters, Ashe, Hastings) via phone call during a phone call on September 5, 2003, with DCS:

## NUCLEAR CRITICALITY SAFETY

### General Comments

1. NRC agrees that the issue of concern is in the number of applicable benchmark experiments for AOA 3 and AOA 4. The sole purpose for DCS using the S/U method was to increase the number of benchmarks in order to eliminate the non-parametric margin since the data is non-normally distributed. The bias and uncertainty do not change with additional benchmarks since they are based on the lowest predicted  $K_{\text{eff}}$  for non-normal data and additional data will not change the lowest value unless a still lower one is included.

Additional justification for the validity of using the value of 0.8 for the correlation coefficient  $c_k$  needs to be provided.

### Specific Comments

1. Page 2 Second to last paragraph in section 2 - Background  
It is stated that criticality plutonium experts from Los Alamos and Livermore and SCALE experts from ORNL all agree that bias and uncertainty of **about 2% should** be bounding. In order for NRC to be able to consider this information, the name of the expert, what was stated and the basis for the conclusion would need to be provided for each expert.
2. Page 3 Last sentence before section 3.2 and Page 5 last sentence before Section 3.3.  
NRC agrees that the ORNL corrected data demonstrated no change to the DCS conclusion that no non-parametric margin was needed. However, the statement that it "further identified additional un-credited conservatism" is not substantiated.
3. Section 3.4.3 first paragraph  
The ORNL errors were in the sensitivity to the resonance self-shielding calculations and the differences in some cases were significant. This demonstrates that the errors were basic physics errors in a pre-released version of the code. To rely on the results of the S/U methodology there needs to be demonstration of the validity of the version of the code now being used to produce results. A version of the code that is not ready for release may still contain physics errors. The extent to which the quality assurance measures have been completed needs to be addressed in order to use results from a pre-released version of a code. This information should be provided by the code developer.
4. Section 3.4.5 Table 3  
How were the experiments listed in the table identified as applicable?

**Attachment**

In particular, address why the experiments with a H/X ratio of 0 are applicable given the fact that the amount of H has such a large effect on the calculations.

5. Section 3.4.5 Table 4  
How were the experiments listed in the table identified as applicable?
6. Page 10 Section 3.4.6 Paragraph just below Figure 1  
Explain how the value of 0.0108 was obtained. The validity of the arguments in Section 3.4.6 is uncertain without involving the skills of a statistician and detailed review. The argument appears to be that if a particular, non-linear fit is used, then for both AOA(3) and AOA(4) the residuals (deviations of benchmarks from the fit) follow a normal distribution. The particular fit chosen does not appear to be a good fit to the data, and it is not clear that if another fit was used (e.g., quadratic, cubic, logarithmic, etc.) that the same would be found. However, the report uses a particular method, and that method requires not that the residuals to some arbitrary fit be normal, but that the actual distribution of values be normal. It is not clear how this new procedure fits into the methodology described in the validation report or whether it is a statistically valid approach.
7. Page 11 Section 3.4.6 Paragraph just below Figure 2  
Explain how the value of 0.0035 was obtained.

## Disposition of Validation Questions

### June 25, 2003 Request for Additional Information (RAI)

Prior to receiving the RAI Response on July 29, 2003, a revised Validation Report was submitted on July 2, 2003. Based on staff's review of the revised submittal, many of the questions became moot or changed by the time the RAI response was received. Therefore, many of the questions were reformulated and resubmitted in the July 25, 2003 memo before responses were received.

- 1 PARTIALLY ANSWERED. Answers did not resolve all concerns or raised new questions; the remaining parts were incorporated into Question 1 in the July 25, 2003 memo.
- 2 PARTIALLY ANSWERED. Restriction of AOA range partially addressed concerns; the remaining parts were incorporated into the July 25, 2003 memo as follows:
  - A. ANSWERED BUT NOT SATISFACTORILY. Restated as Question 4 in the July 25, 2003 memo.
  - B. ANSWERED BUT NOT SATISFACTORILY. Restated as Question 5 in the July 25, 2003 memo.
  - C. ANSWERED BUT NOT SATISFACTORILY. Restated as Question 6 in the July 25, 2003 memo (somewhat different form).
  - D. ANSWERED.
- 3 RESOLVED BY INDEPENDENT ANALYSIS
- 4 RESOLVED BY INDEPENDENT ANALYSIS
- 5 ANSWERED
- 6 ANSWERED
- 7 ANSWERED BUT NOT SATISFACTORILY.

Data Needs SUBMITTED (HAS NOT BEEN REVIEWED) → See comment Question 4 below.

### July 25, 2003 Phone Call Summary

Because the questions were submitted to DCS prior to receiving their RAI responses, questions in the July 25, 2003 memo reflect the status of the RAI issues as of that date. Thus, the July 25, 2003 memo in effect replaces the June 25, 2003 RAI. Responses have not been received to these new questions.

- 1 PARTIALLY ANSWERED/RESOLVED BY INDEPENDENT ANALYSIS
- 2 RESOLVED

- 3 RESOLVED
- 4 SUBMITTED (HAS NOT BEEN REVIEWED) → The reason this has not been reviewed is that basic concerns with the application of the S/U method arose after the question was posed. Until these questions are answered, these data cannot be effectively utilized.
- 5 NOT ANSWERED
- 6 NOT ANSWERED

PARTIALLY ANSWERED = Response addressed parts of the concern, but staff questions remain.

ANSWERED = Response addressed concern in full.

ANSWERED BUT NOT SATISFACTORILY = Response did not address concern at all.

RESOLVED (BY INDEPENDENT ANALYSIS) = Resolved based on staff's review of the revised Validation Report and/or independent analysis by the staff.

SUBMITTED = Information purported to address question has been received but not reviewed, for the reasons given.

NOT ANSWERED = No response addressing the concern has been received, and staff has not been able to resolve by independent analysis.

Regardless of the status, the staff has sufficient information to write an SER approving construction with the use of additional margin.