June 30, 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: MARCH 20, 2003, MEETING SUMMARY: MEETING WITH DUKE COGEMA STONE & WEBSTER TO DISCUSS NUCLEAR CRITICALITY SAFETY RELATED TO MIXED OXIDE FUEL FABRICATION FACILITY REVISED CONSTRUCTION AUTHORIZATION REPORT

On March 20, 2003, U.S. Nuclear Regulatory Commission (NRC) staff met with Duke Cogema Stone & Webster (DCS), the mixed oxide fuel fabrication facility (MFFF) applicant, to discuss the nuclear criticality safety related to the revised construction authorization request (CAR or revised CAR) submitted to NRC on October 31, 2002. The meeting agenda, summary, handouts, and attendance list are attached (Attachments 1, 2, 3, and 4 respectively).

Docket: 70-3098

Attachments: 1. Meeting Agenda
2. Meeting Summary
3. Meeting Handouts
4. Attendance List

cc: James Johnson, DOE
Henry Porter, SC Dept of HEC
John T. Conway, DNFSB
Louis Zeller, BREDL
Glenn Caroll, GANE
Peter Hastings, DCS
Diane Curran, Esq., DCS
Donald Silverman, Esq., GANE

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*See previous concurrence
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OFC	SPIB*		SPIB*		SPIB*		SPIB	
NAME	APersinko		MChatterton		LGross		BSmith	
DATE	6/ 20 /03		6/ 23 /03		6/ 23 /03		6/30/03	

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MEETING AGENDA
MOX FUEL FABRICATION FACILITY
March 20, 2003

March 20, 2003

10:00 AM	Introduction
10:10 AM	Discussions of nuclear criticality safety validation report
12:00 NOON	Lunch
1:00 PM	Discussions of nuclear criticality safety validation report
3:15	Summary/Actions
3:30	Adjourn

Attachment 1

MEETING SUMMARY
MOX FUEL FABRICATION FACILITY
March 20, 2003

Purpose:

The purpose of the meeting was to discuss nuclear criticality safety issues related to the Mixed Oxide Fuel Fabrication Facility Construction Authorization Request (CAR) submitted by Duke Cogema Stone & Webster (DCS) on October 31, 2002, or identified in the U.S. Nuclear Regulatory Commission (NRC) staff's Draft Safety Evaluation Report (DSER) dated April 30, 2002.

Summary:

The meeting was a technical, working level meeting that covered nuclear criticality safety issues in detail. The normal format was for DCS to respond to staff questions, most of which were related to Open Item NCS-4 identified in the staff's DSER. Handouts were provided by DCS as the basis for discussion. The handouts are provided in Attachment 3.

A summary of the issues discussed is provided below:

Nuclear Criticality Safety

Staff question 1: Justify that validation results cover ranges of parameters in the validation report.

DCS presented Tables 5-1 and 5-2 from Validation Report Part II as examples. These tables describe the range of parameters covered by both the selected benchmark experiments and the set of design applications. When comparing benchmarks to design applications, staff felt that the cases compared were not consistent. The range of parameters covered by the benchmark cases included plutonium isotopics (^{240}Pu/Pu and Pu/(U+Pu) content), energy of average lethargy causing fission, and moderation level.

Staff questioned which column in the table represented the range of parameters that was considered to define the boundaries of the area of applicability (AOA). DCS indicated that the most reactive cases would fall within the range covered by the benchmark experiments. DCS stated that calculations would typically be done at the most reactive values of the system parameters (such as at optimum moderation), and that it did not anticipate performing calculations over the entire range. Other methods such as handbooks would be used in other portions of the AOA, if needed.

Staff made the point that one needs a good definition of the parametric range covered by each AOA. Staff felt that the AOA needs to be more clearly described since the validation report does not specifically give a clear definition of the validated range of the code.

DCS agreed to clarify the range covered by the different AOAs (i.e., the boundaries of the various AOAs).

Staff Question 2: Range of design applications.

Staff stated that the design applications used in the sensitivity/uncertainty (S/U) analysis of Validation Report Part II were not representative of the range of parameters covered by the AOA.

These design applications are hypothetical models used to determine which benchmarks are applicable to anticipated design calculations. DCS appeared to have selectively chosen these design applications from the low H/Pu extreme of AOA(3) and AOA(4).

In addition, in Validation Report Part III, DCS performed a series of sensitivity studies in which the energy of average lethargy causing fission (EALF) was determined as a function of H/Pu for a variety of different systems. Staff agreed with DCS' conclusions regarding high H/Pu ratios but questioned its results for low H/Pu ratios. DCS responded that at low H/Pu values, there is no convergence in EALF values for different chemical forms, geometrical configurations, and reflector materials. The staff felt that the implications of this were not adequately considered in the report. DCS again stated that most of its calculations would be in the optimally moderated range, which would place these cases into the higher H/Pu range. The staff stated that while this might resolve the concern over the energy divergence in the low H/Pu range, DCS had not established that the comparison of EALF values was a sufficient indicator of benchmark applicability.

DCS stated that it will consider the staff's questions and get back to the staff.

Staff question 3: Explain and justify the different methods used in Parts 1-3.

Staff questioned why each of the three parts of the Validation Report used different methods to show the applicability of benchmarks to the relevant design applications. One example discussed was Attachment 5 to Validation Report Part II, in which U systems were used to draw conclusions about Pu systems containing strongly absorbing materials. NRC stated that it intends to use the computer code SCALE 5 when it becomes available to settle these issues. DCS stated that it will consider the staff's question and get back to the staff.

Staff question 4: Discuss use of single parameter control and dual parameter control.

DCS indicated that most of the time it uses two controls on one parameter. Staff indicated that DCS has committed to a preference for dual parameter control. With single parameter control, demonstration of "Highly Unlikely" is more difficult because it is harder to demonstrate that there are no common mode failures (i.e., that all accident sequences have been identified). Staff indicated that where single-parameter control is used it will look at such cases more closely for this reason, during review of the Integrated Safety Analysis (ISA) Summary. DCS agreed to revise its response regarding a preference to dual parameter control. If DCS cannot meet dual parameter control, it will list those systems and state why it cannot.

DCS stated that there are areas in the plant where there is only one control mode that they can practicably take credit for (e.g., exclusion of moderator in powder areas). Staff stated that they

recognized that there would be times when the preferred approach could not be implemented, and that any such exceptions should be justified.

Additional Discussion

The meeting also discussed the observation of apparent “data clusters”, or subsets of benchmark experiments that appear to have significantly larger bias than the rest of the benchmarks. The staff expressed its concern that the deviations appeared non-statistical in nature, and that if design calculations shared systematic errors associated with these clusters, pooling these clusters with the remaining benchmarks could result in underestimating the bias. DCS stated that they would look into this further.

DUKE COGEMA STONE&WEBSTER SLIDES
MOX FUEL FABRICATION FACILITY
March 20, 2003

Attachment 3

MEETING ATTENDEES

NAME	AFFILIATION
Andrew Persinko	Nuclear Regulatory Commission (NRC)
Muffet Chatterton	NRC
Christopher Tripp	NRC
John Lubinski	NRC
Ken Ashe	Duke Cogema Stone & Webster (DCS)
Bill Hennessy	DCS
Bob Foster	DCS
Charles Henkel	DCS
Vincent Chevalier	DCS