December 23, 2008

MEMORANDUM TO: Nader Mamish, Deputy Director
Licensing and Inspection Directorate
Division of Spent Fuel Storage and Transportation, NMSS

FROM: Pierre Saverot, Project Manager **/RA/**
Licensing Branch
Division of Spent Fuel Storage and Transportation, NMSS

SUBJECT: SUMMARY OF DECEMBER 18, 2008, MEETING WITH ENERGYSOLUTIONS REGARDING THE OPEN TECHNICAL ISSUES FOR THE 3-60B PACKAGE

Background

By letter dated October 30, 2008, staff informed EnergySolutions (ES) that it was suspending its review of the application requesting a Certificate of Compliance (CoC) for the Model No. 3-60B transportation package because of significant issues identified with the finite element modeling which undermined the reliability of results for the structural evaluation under both normal and hypothetical accident conditions. Staff said that it was available for a public meeting to discuss these issues in more detail prior to deciding on a course for action. The purpose of this December 18, 2008, meeting was to allow ES the opportunity to discuss issues identified by the staff related to the structural analysis and hydrogen generation, and solicit comments from the staff on establishing a path forward.

Discussion

In his opening remarks, Licensing and Inspection Directorate Deputy Director, Nader Mamish, stated that the meeting was an opportunity for (i) ES to obtain a complete understanding of the staff's concerns, (ii) the staff to gain a complete understanding of ES views on issues and proposed path forward.

ES agreed with that approach and said that its intention was to discuss fully and openly all issues and more particularly to (i) resolve issues regarding the fundamental modeling technique of the LS-DYNA analyses, (ii) address all results and conclusions that did not appear to be consistent with the "conventional wisdom" and (iii) show that ES was "not doing anything physically impossible" e.g., in reference to either slap-down impacts and negative energy.

Regarding the HAC drop analysis results that seemed to indicate that the slap-down impact was less severe than the side drop impact, ES explained that the LS-DYNA results were consistent with the fact that, for a "slender" cask, the second impact is more severe than the initial impact and that its results compared well with those of Sandia National Laboratory.

Regarding time-history plots of various energies during a corner drop that exhibited a negative total energy, ES explained that the model was analyzed for a time longer than the duration of the first impact through the use of the flexible to rigid material conversion technique and that the adjustment of the internal energy and the total energy of the system led to a negative amount of

internal energy. However, ES also explained that when replotting the curves to discount the material conversion effect, the so-called “negative energy issue” is now eliminated and all curves move back to positive values.

Regarding the cases where hour-glass energy was significant compared to the total energy, ES explained that (i) the LS-DYNA model of the 3-60B cask used a “fully integrated” solid elements - to represent the foam material - which do not undergo hour-glassing, (ii) the final element modeling did not have any hour-glass energy in the foam material, (iii) the use of the Belytschko formulation did result in some hour-glass energy as represented on the plot, (iv) a new analysis with no hour-glass energy in the model for the cask shell elements showed that the results are similar with maximum values within 1% of each other.

Staff asked questions on the pulse on the time-history plots, considering that the hour-glass energy was significant compared to the internal energy, and on the methods for control of hour-glass energy. Staff said that the LS-DYNA model of the Very High Level Waste (VHLW) cask did not use fully integrated solid elements to represent foam material and that those elements do have significant hour-glassing. Staff said that an hour-glassing energy of 50% raises concerns and that there are ways to control it through either element size formulation or internal hour-glass control. Staff also said that it is mindful of any undue burden on the applicant but that ES should justify its analyses with and without hour-glassing.

ES provided proposed responses to a number of Open Technical Issues identified in NRC letter dated October 30, 2008, to convince staff that the review of the 3-60B application can be continued. In particular, staff confirmed that it needs complete output files such as d3plot, per ISG-21, for design validation purposes and ES agreed to send the full calculation packages. Staff requested a sensitivity analysis justifying the element size used even if ES can show it does not have an effect; staff also commented on the fact that a 15º angle may not be the most damaging angle per a Sandia National Laboratory report that defined a 7º angle for such evaluation. ES justified the “puncture wall” results (where apparently the model showed a steel bar being dropped onto the cask, as opposed to dropping the cask onto a steel bar) and explained the use of the “energy balance method” to analyze the problem in a quasi-static way.

ES explained the contents of the package in more detail than what was in the Safety Analysis Report. ES discussed the hydrogen generation issue and said they would provide supporting calculations, as well as handling procedures for flammable gases. Staff thought that the methodology was not a bounding methodology and that the decay heat specification in the Certificate of Compliance (CoC) was not limiting. Staff suggested ES to revise the gas generation methodology to a bounding one and to categorize the contents of the package according to the gas generation methodology. Staff also requested the G value detailed calculation (in the gas generation rate formula) to ensure the values were conservative to meet the gas generation limit. Staff also requested ES to (i) clarify the maximum shipping period, (ii) clarify which waste forms are appropriate for inerting and prove the effectiveness of the method, (iii) justify the reliance on the package user to demonstrate that the CoC conditions are met to ensure flammable gas generation safety.

In conclusion, ES did present information that addressed most of staff’s concerns, particularly on the structural issues. Staff agreed that there was merit in continuing the review of the 3-60B application as soon as ES provides supplemental information to address fully and completely the Open Technical Issues.

ES will provide a tentative date for such submittal within the next few days. Staff stated that it is looking for clarity and consistency in the SAR language and that it would prefer to receive the supplemental information as a revised consolidated SAR.

The enclosures are the agenda, the list of meeting attendees, and a copy of the slides (which are proprietary) that ES presented at the meeting. The staff did not make any regulatory commitments at the meeting.

Docket No. 71-9321
TAC No. L24186

Enclosures: As stated.

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Docket No. 71-9321
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Enclosures: As stated

Distribution: NRC Attendees BWhite NMamish BBrach RLorson

OFC	SFST	C	SFST	C	SFST			
NAME	PSaverot		MDeBose		EBenner			
DATE	12/19/2008		12/22/2008		12/23/2008			

C=Without attachment/enclosure E=With attachment/enclosure N=No copy **OFFICIAL RECORD COPY**

Agenda
December 18, 2008, 9:00 p.m. – 3:00 p.m.
ENERGYSOLUTIONS

1. Introduction

2. Development of the Modeling for the ES 3-60 B Package

   Key Issues related to the LS-DYNA model

   Presentations of Examples and Brief Responses to Open Technical Issues including 2.1, 2.2, 2.3, 2.4, 2.5, 2.26, 2.28, and 2.29

3. Hydrogen Generation Issue – Issues 1.5 & 4.9

4. Definition of Package Contents – Issue 1.1

5. Thermal Modeling of the HAC Fire – Issue 3.10

6. Questions and Answers – ES Propositions for A Path Forward

7. Conclusions

Meeting Between EnergySolutions and the
Nuclear Regulatory Commission
December 18, 2008
Meeting Attendees

NRC/NMSS/SFST

Neil Day
Ata Istar
Nader Mamish
Peter Lien
Haile Lindsay
Pamela Longmire
Nancy Osgood
Mathew Panicker
Jason Piotter
Chris Regan
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David Tarantino
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