NRC FORM 699
(9-2003)

U.S. NUCLEAR REGULATORY COMMISSION

CONVERSATION RECORD

DATE
08/05/2010

TIME
3:00 PM

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU
See below

TELEPHONE NO.
888-942-9036

TYPE OF CONVERSATION
- ☐ VISIT
- ☒ CONFERENCE
- ☒ TELEPHONE
  - ☐ INCOMING
  - ☒ OUTGOING

ORGANIZATION
Calvert Cliffs and Transnuclear

SUBJECT
Calvert Cliffs ISFSI - LAR 9 - Discussion of Structural RAI 2

SUMMARY ~~(Continue on Page 2)~~
NRC- John Goshen, David Tang, Ata Istar, John Nicholson, Eric Benner, Ray Larson
Calvert Cliffs - Patricia Furio, John Massari, Lloyd Wenger
Transnuclear - Sue Buyaskas, Jayant Bondre, Peter Shih, Raheel Haroon,
PNNL- Nicholas Klymshyn

The purpose of the call was to discuss the final set of RAIs with TN and Calvert Cliffs (CC) staff before formally issuing them. The RAI is attached to this Record of Conversation. The RAI was provided in two parts to address the each of the two analysis methods provided by Calvert Cliffs. Several points were clarified. A response date of no later than 30 days from receipt of document was agreed t

The NRC staff stated that it would be available to discuss technical details and concerns with TNs structural calculations with CC and TN as soon as possible, and would also be available for a public meeting to attempt to clear up specific technical issues with the structural analyses.

TAC No. : L24350
Docket No. 72-8
ADAMS - ML
p
Attachment- Final Draft - CC LAR 9 RAI 2 -
File Locations -
G:\SFST\Calvert Cliffs ISFSI\Amend 9\RAI2CC LAR9 ROC 8 5 2010.pdf
G:\SFST\Calvert Cliffs ISFSI\Amend 9\CC LAR 9 RAI2.docx

Distribution- NRC participants (email), Nicholas.Klymyshyn@pnl.gov, Furio, Patricia.Furio@cengllc.com, sue.buyaskas@transnuclear.com

~~Continue on Page 2~~

ACTION REQUIRED
Schedule public meeting with CC and TN.

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
John Goshen	John Goshen	08/05/2010

ACTION TAKEN
Public meeting scheduled for 8/19/2010.

TITLE OF PERSON TAKING ACTION	SIGNATURE OF PERSON TAKING ACTION	DATE
John Goshen	John Goshen	08/05/2010

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. George H. Gellrich
Vice President
Calvert Cliffs Nuclear Power Plant, Inc.
1650 Calvert Cliffs Parkway
Lusby, MD 20657

SUBJECT: SECOND REQUEST FOR ADDITIONAL INFORMATION FOR LICENSE AMENDMENT REQUEST NO. 9 TO MATERIALS LICENSE NO. SNM-2505, CALVERT CLIFFS INDEPENDENT SPENT FUEL STORAGE INSTALLATION (TAC NO. L24350)

Dear Mr. Gellrich:

By letter dated June 15, 2009, Constellation Energy submitted a license amendment request (LAR) No. 9 to the Nuclear Regulatory Commission (NRC) for Materials License No. SNM-2505 for the Calvert Cliffs Independent Spent Fuel Storage Installation (ISFSI). LAR No. 9 proposes to allow the loading of increased burnup fuel into a NUHOMS® 32P Dry Shielded Canister (DSC). The NRC provided Constellation Energy its first request for additional information (RAI) on January 21, 2010. Constellation Energy submitted its response to the RAI on February 18, 2010. Constellation Energy additionally provided supplemental information to the NRC on March 31, 2010. Additional telephone conversations were held with Constellation Energy on January 7 and 11, 2010. The NRC staff has reviewed the RAI responses and the supplemental information and has determined that additional information is required to assess compliance with 10 CFR Part 72.

The enclosed RAI is provided in two parts. The first part applies to Transnuclear (TN) calculations No. NUH32P+.0201, "NUHOMS® 32P CE14X14 Fuel Cladding Strength Under Accident Side Drop Conditions," Revision 1, December 8, 2008 and No. NUH32P+.0202, "End Drop Structural Evaluation of CE14X14 PWR Fuel Assembly in a 32P+DSC," Revision 1, December 8, 2008, provided in the June 15, 2009, amendment request. The second part applies to Transnuclear (TN) calculations No. NUH32P+.0203, R 0, "Transfer Cask Impact onto the Concrete Pad LS-DYNA Analysis (80 inch end drop)" and Calculation No. NUH32P+.0204, "Fuel End Drop Analysis for NUH32+ Using LS-DYNA, Proprietary Version, Revision 0. These calculations were provided by Constellation Energy in its March 31, 2010, supplement.

Staff review of the approaches used by TN in Calculation Nos. NUH32P+.0201 and +.0202, or in NUH32P+.0203 and +.0204 indicate these may not be consistent with previously reviewed calculations supplied to support licensing actions for similar types of systems. The part 1 and part 2 RAIs address these concerns. The staff welcomes the opportunity to discuss these issues with TN and Constellation Energy in a public meeting if Constellation Energy desires to do so.

The staff understands that Constellation Energy may wish to revise its approach and supporting structural calculations, and that doing so would obviate the need to respond to some specific RAI items. We only request that you respond to each applicable RAI item and provide a justification as to why a specific item may no longer be applicable in your response. The RAI was discussed in telephone conversations with Ms. Patricia Furio of your staff on July 22 and August 5, 2010. A response date of no later than 30 days from receipt of the RAI was established in the August 5, 2010, telephone conversation.

Please reference Docket No. 72-8 and TAC No. L24350 in future correspondence related to this licensing action. If you have any questions, please contact me at (301) 492-3325.

Sincerely

John Goshen, P.E., Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No.: 72-8
TAC No.: L24350

Enclosure: Second RAI

cc: Service List
E. Redmond, NEI

The staff understands that Constellation Energy may wish to revise its approach and supporting structural calculations, and that doing so would obviate the need to respond to some specific RAI items. We only request that you respond to each applicable RAI item and provide a justification as to why a specific item may no longer be applicable in your response. The RAI was discussed in telephone conversations with Ms. Patricia Furio of your staff on July 22 and August 5, 2010. A response date of no later than 30 days from receipt of the RAI was established in the August 5, 2010, telephone conversation.

Sincerely

John Goshen, P.E., Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No.: 72-8
TAC No.: L24350

Enclosure: Second RAI

cc: Service List
E. Redmond, NEI

Distribution: SFST r/f
ADAMS: ML
File location: G:\SFST\Calvert Cliffs ISFSI\Amend 9\RAI2\ CC LAR9 RAI2.docx

Office	SFST	SFST			SFST
Name	JGoshen	WWheatley			EBenner
Date	8/4/2010	8/05 /2010			8/ 05 /2010

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SECOND REQUEST FOR ADDITIONAL INFORMATION FOR LICENSE AMENDMENT REQUEST NO. 9 TO MATERIALS LICENSE NO. SNM-2505 FOR THE CALVERT CLIFFS SITE SPECIFIC INDEPENDENT SPENT FUEL STORAGE INSTALLATION

DOCKET NO. 72-8
TAC NO. L24350

INTRODUCTION

The NRC staff has completed its review of your application and has determined that additional information is required to assess compliance with 10 CFR Part 72.

This request for additional information (RAI) identifies additional information needed by the NRC staff in connection with its review of this application. The enclosed RAI is provided in two parts. The first part applies to Transnuclear (TN) calculations No. NUH32P+.0201, "NUHOMS® 32P CE14X14 Fuel Cladding Strength Under Accident Side Drop Conditions," Revision 1, December 8, 2008 and No. NUH32P+.0202, "End Drop Structural Evaluation of CE14X14 PWR Fuel Assembly in a 32P+DSC," Revision 1, December 8, 2008,, provided in the June 15, 2009, amendment request. The second part applies to TN calculations No. NUH32P+.0203, R 0, "Transfer Cask Impact onto the Concrete Pad LS-DYNA Analysis (80 inch end drop)" and Calculation No. NUH32P+.0204, "Fuel End Drop Analysis for NUH32+ Using LS-DYNA, Proprietary Version, Revision 0. These calculations were provided by Constellation Energy in its March 31, 2010, supplement.

Each individual RAI describes information needed by the staff to complete its review of the application and the UFSAR and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

Chapter 3.0 Structural Evaluation Part 1 (Referring to NUH32P+.0201, +.0202)

The information requested in all the following questions is needed to determine compliance with 10 CFR 72.122.

3-1 In its June 15, 2009, amendment application (LAR No. 9) Constellation Energy cited the approved NUHOMS® 32PTH Dry Storage Canister (DSC) design, Docket 72-1030, as a precedent for the Calvert Cliffs NUHOMS -32P DSC. The NRC reviewed and approved the NUHOMS® HD Storage System for Combustion Engineering 14X14 fuel for storage of fuel up to 60,000 MWd/MTU. However, it appears that the NUHOMS® 32PTH1 system approved as part of the Standardized NUHOMS® Horizontal Modular Storage System, Docket No. 72-1004, Amendment No. 10, may be a more appropriate precedent for LAR N0. 9. Constellation Energy should clarify the specific system it is using as a precedent and provide a difference evaluation between the analyses used to support the previously approved systems, and TN calculations NUH32P+.0201 and NUH32P+.0202.

3-2 Provide a copy of Transnuclear Calculation No. 972-179, Rev. 0, "TN-68 High Burnup Cladding Mechanical Properties." Transnuclear has taken substantial data from this calculation to support the two structural calculations. The staff requires this reference to verify the design information used in the analyses.

ENCLOSURE

3-3 Provide a copy of TN Calculation No. 1095-20, Rev. 1, "Maximum Operating Pressures, Storage and Transfer." TN has taken substantial data from this calculation to support the two structural calculations. The staff requires this reference to check the design information used in the analyses.

3-4 In LAR No. 9 Constellation Energy provided new calculations to support the request to load fuel with up to 52,000 MWd/MTU burnup. It is not clear that these calculations are meant to supersede the design basis for 47,000 MWd/MTU fuel previously supplied as part of the original licensing basis. Constellation Energy needs to provide this clarification.

3-5 Justify the deviation from the SFST-Interim Staff Guide (ISG)-11, Rev.3 regarding the following structural evaluations of 14X14 fuel assemblies subjected to side and end drop cases:

Referring to Section 4.0 of NUH32P+.0201, Rev. 1 and +.0202, Rev. 1, both of these reports state that the "reduction in outside diameter (OD) and thickness of cladding is based on the formation of oxides" as consistent with the ISG-11, Rev 3. However, it appears that in the ANSYS analyses, a nominal OD of 0.4334 inch and a nominal thickness of 0.0252 inch were considered for pipe elements (PIPE16 and PIPE20).

Based on the oxide layer of 125 microns, the nominal OD and nominal thickness of cladding should have been reduced by 0.00281 inch. The absorbed oxide thickness in

the cladding OD should be considered as "wastage" adding no capability of load-bearing.

If the applicant is committing to using the guidance provided in ISG-11, Rev. 3, then it is incumbent on the applicant to apply the guidance correctly when calculating the stress in the cladding by using the "effective cross sectional properties of cladding," as stated in ISG-11, Rev. 3.

3-6 Model sensitivity analyses are requested for NUH32P +.0202, Rev. 1. The single pin evaluation methodology includes some assumptions that are not necessarily conservative. Provide a direct comparison between the final NUH32P +.0202 results and the following three sensitivity analysis cases.

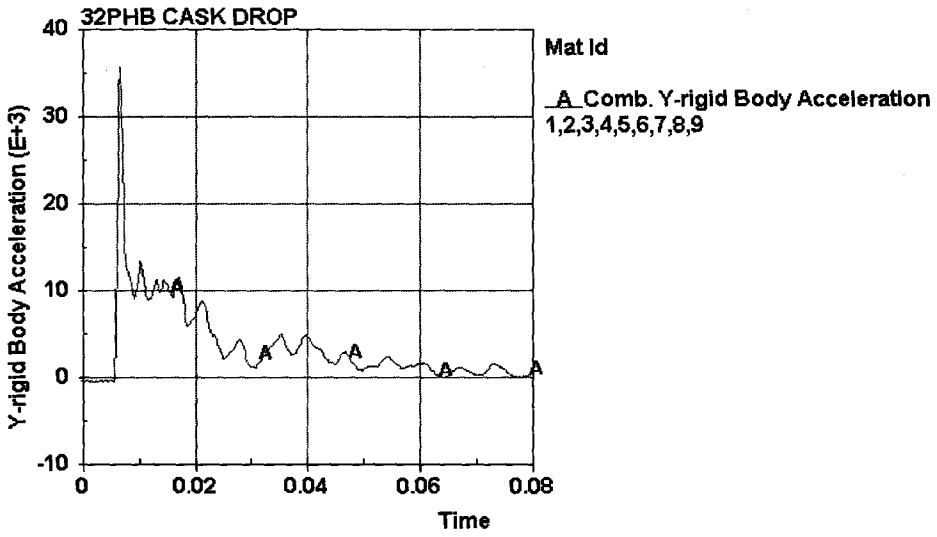
a.) Zero Damping: Eliminate all damping from the model. Section 4.0 of NUH32P+.0202, Rev. 1 states the 5% damping assumption is conservative for various reasons. However, it is standard engineering practice to include the mass of fuel in cladding but to ignore any mechanical benefits the spent fuel might offer. Excessive damping can artificially reduce peak cladding stress and strain. Compare the damped results to the undamped results to demonstrate that damping is not a significant factor in the calculations.

b.) Internal Pressure: Calculate the fuel pin impact response assuming both pressurized and unpressurized conditions. Ignoring internal pressure is not always a conservative assumption. While internal pressure can stabilize a fuel pin against lateral deflections it can also exacerbate plastic strains when they occur. ANSYS pipe elements (PIPE16, PIPE20) can not capture this type of nonlinear effect so a different choice of element type will be needed to represent the cladding. Compare the pressurized results to the unpressurized results to confirm that the most conservative case is being considered.

c.) Realistic Grid Spacer Lateral Motion: Apply grid spacer springs to the fuel pin model (similar to what was done in reference 2.15 of NUH32P +.0202). Applying zero lateral deflection constraints at the spacer grids does not match the reality of the fuel assembly structure. Some amount of lateral deflection is possible at the spacer grids, either through gross relative motion of the spacer grids within the basket compartment or through deflection against the leaf springs. Compare the results of realistic grid spacer representation to the constrained lateral motion results to ensure that the most conservative case is being considered.

3-7 The forcing functions applied to the cladding in NUH32P+.0202, Rev. 1, Figure 3, do not appear to be a reasonable approximation of the load history a fuel assembly or fuel pins would experience in a realistic cask drop. The results of NUH32P+.0203 suggest a far different acceleration history can be expected on the fuel. For example, the rigid body acceleration history of the combined Center of Gravity (CG) of the cask and all its subcomponents shows a 92g peak acceleration, with a positive acceleration beyond 60 ms (see the figure attached below, units are in/s^2.). As another example, the velocity of the cask's combined CG does not reverse sign until after 40 ms. These indicators from the 3 dimensional cask impact model suggest that the family of forcing function curves in NUH32P+.0202, Rev. 1, Figure 3, are not realistic, and because of the differences in magnitude and duration may not form conservatively bounding loading conditions for the fuel cladding evaluation. Realistic loading is required, which may include dynamic

effects associated with end plate flexibility, because end plate to fuel assembly interaction is expected to be significant to load history.



Chapter 3.0 Structural Evaluation Part 2 (Referring to NUH32P+.0203, +.0204)

The information requested in all the following questions is needed to determine compliance with 10 CFR 72.122.

3-8 Compare the impact target (concrete and soil) modeled in NUH32P+.0203 to the actual potential impact sites at Calvert Cliffs and justify the as-modeled geometry and materials. The range of potential impact surfaces at Calvert Cliffs is expected to include a large concrete pad with variable thickness and an asphalt roadway. The concern is that the as-modeled concrete and soil may not adequately represent the actual conditions at the site.

3-9 The LS-DYNA model of the cask bottom plate in NUH32P+.0203 has a slight incline on the impact face. Specifically, node #75584 has a y coordinate value of 0.1, when a value of 0.0 would define a flat surface. This feature of the model geometry is expected to affect the cask impact response by altering the concrete crushing footprint. Justify or remove this feature of the cask model.

3-10 Include the DSC shell assembly bottom end geometry in the cask impact model (NUH32P+.0203) to ensure realistic dynamic interaction between the DSC and the transfer cask is captured. Refer to drawing #84-003-E, near the Shell Assembly Bottom End, Detail 2; these components will be referred to in these RAIs as the "end plate". DSC end plate dynamic (flexibility) effects are expected to have some influence on the

fuel pin response. The fuel assemblies interact directly with the DSC end plate during impact, but that is not currently modeled.

3-11 Implement a physically realistic method of loading the single pin model. The current methodology of NUH32P+.0204 involving the nonlinear spring definition was developed for transportation cask impact limiter behavior and is not appropriate for a hard drop onto concrete (see Ref. 2.1 of NUH32P+.0204). The concern is that the fuel pin must be loaded with a deceleration history that is comparable to the local response of the DSC end plate, because this is the realistic load path. The fuel assemblies contact the DSC, and through that contact the reaction forces are transferred. Even the flexure of the end plate must be considered to calculate realistic fuel cladding stress and strain results.

Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2

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