AmerenUE
Callaway Plant

PO Box 620
Fulton, MO 65251

September 1, 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop P1-137
Washington, DC 20555-0001

ULNRC-05194

Ameren UE

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
SEPTEMBER 1, 2005 RESPONSE TO GENERIC LETTER 2004-02:
"POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS"

Ref: ULNRC-005124, dated March 7, 2005

Enclosed is the Union Electric Company (AmerenUE) September 1, 2005 response to NRC Generic Letter 2004-02. "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors." The generic letter requires licensees to provide information related to conformance with regulatory requirements and corrective actions associated with the analysis of the impact of debris-laden fluids during design basis accidents.

In addition this letter transmits a change in a AmerenUE regulatory commitment contained in the reference letter. This commitment change is being submitted in accordance with guidance provided by industry document NEI 99-04, "Guidelines for Managing NRC Commitment Changes," as endorsed in Regulatory Issues Summary 00-017, "Managing Regulatory Commitments Made by Power Reactor Licensees to the NRC Staff."

The reference letter contains a commitment to perform an analysis of the susceptibility of the Emergency Core Cooling System and Containment Spray System recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids by September 1, 2005. Although analysis activities

A116

are ongoing as described in this letter, Callaway has not completed the entire analysis package at this time. Commitments contained in this letter supercede the aforementioned commitment.

Enclosure I to this letter provides AmerenUE's September 1, 2005 response to the requested information. Enclosure II lists AmerenUE's commitments contained in this letter.

If you have any questions concerning this matter, please contact Mr. Keith Young at (573) 676-8659, or Mr. Dave Shafer at (314) 554-3104.

I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,

Executed on: September 1, 2005

T. E. Herrmann

Timothy E. Herrmann
Manager – Nuclear Engineering Services

BFH/
Enclosure I September 1, 2005 Response
II List Of Commitments

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Response to Requested Information Item 2 of Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors"

Below is the Callaway response to Requested Information Item 2 of Generic Letter 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors. As described below, portions of the Generic Letter 2004-02 requested information cannot be provided at this time since associated analyses, testing, and evaluations are not yet complete. An update to applicable portions of the information provided below will be submitted by June 1, 2006. The generic letter's "Requested Information" is shown in bold followed by Callaway's response.

NRC Requested Information 2:

2(a) Confirmation that the ECCS and CSS recirculation functions under debris loading conditions are or will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. This submittal should address the configuration of the plant that will exist once all modifications required for regulatory compliance have been made and this licensing basis has been updated to reflect the results of the analysis described above.

Response 2(a):

Activities are currently underway to ensure that the Emergency Core Cooling System (ECCS) and Containment Spray System (CSS) recirculation functions under debris loading conditions at Callaway will continue to be in full compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of Generic Letter 2004-02. This will be achieved through analysis, evaluations, plant modifications, and plant program and process changes that will be implemented by December 31, 2007. Following the implementation of plant modifications and other changes described below, the ECCS and CSS recirculation functions will continue to support the 10 CFR 50.46 requirement for the ECCS to provide long-term cooling of the reactor core following a loss of coolant accident (LOCA), as well as the requirements of 10 CFR 50 Appendix A, General Design Criteria (GDCs), GDC 35 for ECCS design, GDC 38 for containment heat removal systems, and GDC 41 for containment atmosphere cleanup. In addition, the CSS will continue to provide a mechanism to reduce the accident source term to support meeting the limits of 10 CFR Part 100.

By the end of the Spring 2007 refueling outage, Callaway replacement sump strainers will be installed at Callaway Plant to increase the available strainer area from less than 400 square feet currently available to an expected area of approximately 6400 square feet. The exact strainer size that will be installed has not yet been finalized as of this date. The proposed replacement strainer size is based on the largest available sump strainer area that would fit within the bounds of the current containment sump area (i.e. not extend into adjacent areas) and be compatible with the containment post-accident water level. Callaway anticipates that the sump strainer size selected will exceed the maximum required sump strainer surface area required to support the debris generation and transport evaluations; thereby providing margin.

Several supporting activities require completion to fully address Generic Letter 2004-02. These activities are:

- Calculation of debris generation and debris transport, consistent with applicable industry guidance and regulatory requirements

- Confirmation that the replacement sump strainer design provides for available net positive suction head (NPSH) to be in excess of required NPSH

- A sump strainer structural analysis, consistent with industry accepted practices and applicable regulatory guidance will be performed with the final design of the replacement sump strainer

- An evaluation of the downstream effects of debris passing through the containment sump strainer, consistent with industry guidance

- An evaluation of the potential water inventory holdup points (i.e. upstream effects)

- An evaluation of the chemical effects impact on sump-strainer head loss

- Other potential modifications based on the Generic Letter 2004-02 analysis

2(b) A general description of and implementation schedule for all corrective actions, including any plant modifications, that you identified while responding to this generic letter. Efforts to implement the identified actions should be initiated no later than the first refueling outage after April 1, 2006. All actions should be completed by December 31, 2007. Provide justification for not implementing the identified actions during the first refueling outage starting after April 1, 2006. If all corrective actions will not be completed by December 31, 2007, describe how the regulatory requirements discussed in the Applicable Regulatory Requirements section will be met until the corrective actions are completed.

Response 2(b):

As provided in the response to Requested Information Item 2(a) above, Callaway will fully implement all Generic Letter 2004-02 required corrective actions by December 31, 2007.

Table 1 below lists all currently identified actions, including previously completed actions and planned future actions, related to evaluations requested by Generic Letter 2004-02 as well as the completion date or planned completion schedule. The corrective actions listed in Table 1 are more fully described in responses to items 2(c), 2(d) and 2(f) below.

Table 1 – Description of and Implementation Schedule for Generic Letter 2004-02 Corrective Actions

Corrective Action Description	Completion Date or Expected Schedule
1. Containment walkdown consistent with the guidance given in NEI 02-01 (Reference 1)	Completed Fall 2002
2. Containment walkdown to provide current assessment of Callaway's containment coatings	Fall 2005 Refueling Outage
3. Containment walkdown to provide current assessment of Callaway's containment dirt, dust, and lint (latent debris).	Fall 2005 Refueling Outage
4. The following corrective action activities will be completed: a. Downstream effects evaluation b. Upstream effects evaluation c. Resolution of debris generation calculation unverified assumption of 5D zone of influence (ZOI) for qualified coatings (via coatings testing)	May 1, 2006
5. An update of the information contained in Generic Letter 2004-02 Requested Information Item 2	June 1, 2006

Corrective Action Description (Con't)	**Completion Date or Expected Schedule**
6. The following evaluations and testing will be completed: a. Industry chemical effects testing b. NEI 04-07 (Reference 3) debris generation calculation c. NEI 04-07 (Reference 3) debris transport calculation d. Evaluation of the chemical effects impact on sump-strainer head loss e. Replacement sump strainer head loss testing f. Confirmation that the replacement sump strainer design provides for available NPSH to be in excess of required NPSH g. Replacement sump strainer structural analysis	September 1, 2006
7. Completion of the final site acceptance review of the Westinghouse evaluation team analysis final report	September 1, 2006
8. The following items will be completed: a. Replacement of containment recirculation sump strainers b. Modification of containment debris interceptors and debris barriers c. Evaluation and implementation of potential modification of safety injection system to address downstream effects	Prior to restart from Spring, 2007 refueling outage
9. Removal of containment spray system (CSS) pump cyclone separators, if required based on the results of the downstream effects evaluation	December 31, 2007
10. The following programs and controls will be implemented to control sources of debris. a. Programmatic controls on potential sources of debris introduced into containment b. Implementation of a containment coatings assessment program c. Implementation of a containment latent debris assessment program	December 31, 2007
11. Implementation of changes to the inspection processes for the installed sump strainers	December 31, 2007
12. Full implementation of all plant modifications and related administrative controls that support the NEI 04-07 analysis package.	December 31, 2007

2(c) A description of methodology that was used to perform the analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. The submittal may reference a guidance document (e.g., Regulatory Guide 1.82, Rev. 3, industry guidance) or other methodology previously submitted to the NRC. (The submittal may also reference the response to Item 1 of the Requested Information described above. The documents to be submitted or referenced should include the results of any supporting containment walkdown surveillance performed to identify potential debris sources and other pertinent containment characteristics.)

<u>Response 2(c)</u>:

Analysis is currently being performed to determine the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. These analyses conform to NEI 04-07 (Reference 3) except for the refinements and exceptions noted in the paragraphs below. As indicated above, some portions of the analyses, including vendor specific testing of the sump strainer utilizing bounding debris mix, as well as the chemical effects evaluation utilizing representative materials are not complete.

For many of the areas requiring analysis and/or evaluation, these analyses and evaluations are being performed by an analysis team under contract with Ameren UE. The Utilities Service Alliance (USA) selected Westinghouse Electric Company as the team lead to supply analysis services for participating utilities to support the Generic Letter 2004-02 requested evaluations. The analysis team is comprised of Westinghouse Electric Company, Alion Science and Technology (Alion), Enercon Services (Enercon), and Transco Products (Transco). This effort is being performed under Westinghouse's 10CFR50 Appendix B quality assurance program. Upon completion of the individual reports and evaluations, Westinghouse will provide a final report to Callaway, which will contain all evaluations and analyses that were performed. Callaway will then perform a site acceptance review of the final report and, upon approval, will retain it as a quality assurance record. Callaway expects this to be complete by September 1, 2006.

Westinghouse is responsible for performing the debris ingestion evaluation, downstream effects component wear evaluation, reactor vessel blockage, and reactor fuel blockage evaluations. Alion is responsible for performing the debris generation and debris transport evaluations and analyses. Enercon is responsible for performing the upstream effects evaluation and the downstream effects for ECCS and CSS components blockage evaluation. As of this date, Transco has not performed any analysis or evaluation for Callaway in support of Generic Letter 2004-02 issues.

As described above, the general methodology used for analysis of Generic Letter 2004-02 issues is that contained within NEI 04-07 except for the refinements and exceptions noted in the paragraphs below. Specific references to NEI 04-07 in the following paragraphs may refer to either one of the two volumes that compromise NEI 04-07. NEI 04-07 Volume 1 is the

PWR sump performance evaluation methodology. NEI 04-07 Volume 2 is the associated NRC safety evaluation.

The following areas are included in the analyses to determine the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of debris generation:

1. Break Selection
2. Debris Generation/ Zone of Influence (Excluding Coatings)
3. Debris Characteristics (Excluding Coatings)
4. Latent Debris
5. Debris Transport
6. Coatings Evaluation
7. Head Loss
8. Chemical Effects
9. Upstream Effects
10. Downstream Effects

The specific approaches used for each of these areas are described below.

1. Break Selection

Break selection consisted of determining the size and location of the high energy line breaks (HELBs) that will produce debris and potentially challenge the performance of the containment emergency sump strainer. Since this break location is not known prior to the evaluation, the break selection process required evaluating a number of break locations in order to identify the location that is likely to present the greatest challenge to post-accident sump performance. The debris inventory and the transport path were both considered when making this determination.

Sections 3.3.4 and 4.2.1 in the NEI 04-07 Vol. 1 recommend that a sufficient number of breaks in each high-pressure system that rely on recirculation be considered to ensure that the breaks that bound variations in debris generation by the size, quantity, and type of debris are identified. At a minimum, the following break locations were considered:

- Breaks with the largest potential for debris
- Large breaks with two or more different types of debris
- Breaks in the most direct path to the sump
- Large breaks with the largest potential particulate debris to insulation ratio by weight
- Breaks that generate a "thin bed" – high particulate with 1/8 inch fiber bed

A review of the accident analysis and operational procedures was performed to determine the scenarios that require the ECCS and CSS to take suction from the containment emergency recirculation sump. This review identified the high energy piping systems that were evaluated for a postulated HELB and associated debris generation.

Break location selection identified the breaks that produce the maximum amount of debris and also the worst combination of debris with the possibility of being transported to the recirculation sump strainer. From Section 3.3.4.1, Item 7, of NEI 04-07 Vol. 2, piping under 2 inch diameter was excluded when determining the limiting break conditions.

Large Break Loss of Coolant Accidents (LBLOCAs)

The Callaway FSAR Section 15.6.5 classifies LBLOCAs as equal to or greater than one square foot cross sectional break area. These events will result in full engineered safety features initiation, which initiates two centrifugal charging pumps (CCPs), two safety injection (SI) pumps, two residual heat removal (RHR) pumps, and two CSS pumps (refer to FSAR Sections 6.2.2 and 6.3.2).

A review of the piping drawings associated with the Reactor Coolant System (RCS) was performed to identify those lines directly attached to the RCS. Loss of Reactor Coolant boundary limits (isolation points) assumed in the Callaway licensing bases are defined in FSAR Figure 3.6-2. Four cases are characterized for RCS attached piping based upon flow and valve position. High energy break locations and break types are shown in FSAR Figure 3.6-1. In each of the piping configurations depicted in Figure 3.6-1, the applicable LOCA boundary (isolation point) is located within the secondary shield wall. It is concluded, therefore, that LOCAs outside the secondary shield wall are not included within the current licensing bases, are not evaluated for debris generation, and will not lead to emergency containment sump recirculation.

The design basis LOCA is based upon a postulated double ended cold leg guillotine break on the reactor coolant pump (RCP) discharge line. From a debris generation perspective, however, the hot leg and crossover legs are larger in diameter, which increases the zone of influence. The lack of compartmentalization also increases the potential for debris generated since break zones of influence (ZOIs) may extend to adjacent loops.

Three separate LBLOCAs were assessed to identify the break with the potential to generate the largest quantity of debris. Additionally, all of the breaks noted below generated two or more types of debris. These break locations were:

1. 31 inch RCS crossover line in loop A
2. 31 inch RCS crossover line in loop D
3. 29 inch RCS hot leg steam generator nozzle in loop D

In addition, LBLOCA locations were assessed to identify the break with the potential to generate the largest particulate debris to fibrous insulation ratio. The LBLOCA location that was chosen to have the largest potential particulate debris to fibrous insulation ratio by weight was a break in a Reactor vessel nozzle. This break was chosen since there is Min-K microporous insulation installed in the reactor cavity with limited amounts of fibrous insulation.

Small Break Loss of Coolant Accidents (SBLOCAs)

The Callaway FSAR classifies SBLOCAs as a rupture of the reactor coolant pressure boundary with a total cross-sectional area less than 1 square foot in which the normally operating charging system flow is not sufficient to sustain pressurizer level and pressure. Since SBLOCAs may not be able to be isolated, they must still be considered for debris generation, as many could eventually lead to emergency sump recirculation. According to NEI 04-07 Vol. 2, only SBLOCA lines 2 inches and larger are included in this evaluation up to the first isolation point.

As discussed in the LBLOCA section above, Loss of Reactor Coolant boundary limits (isolation points) assumed in the Callaway licensing bases are defined in FSAR Figure 3.6-2. Four cases are characterized for RCS attached piping based upon flow and valve position. High energy break locations and break types are shown in FSAR Figure 3.6-1. In each of the piping configurations depicted in Figure 3.6-1, the applicable LOCA boundary (isolation point) is located within the secondary shield wall. It is concluded, therefore, that LOCAs outside the secondary shield wall are not included within the current licensing bases, are not evaluated for debris generation, and will not lead to emergency containment sump recirculation.

Although a LBLOCA scenario presented above may have resulted in the largest amount of debris generated, the Callaway minimum water level following a SBLOCA may not be sufficient to completely submerge the replacement containment sump strainers. Specifically, a 3 inch pipe break or smaller may result in RCS pressure that would not be low enough to discharge the safety injection accumulators or containment pressure high enough to actuate containment spray. Therefore a 3 inch or smaller pipe break would result in a containment water inventory that may not be sufficient to submerge the replacement containment sump strainers. A break in the 3 inch alternate charging line was assessed to provide a debris value associated with the resultant lower water level and partially submerged replacement sump strainers.

Other High Energy Line Break (HELB) Scenarios

While LOCAs were considered the most likely type of debris generating HELBs that could lead to containment emergency sump recirculation, other scenarios were evaluated to determine whether or not these breaks result in debris generation followed by the need for ECCS recirculation as a means of long term core cooling.

The Main Steam Line Break (MSLB) is included in the debris generation calculation for Callaway since operational actions necessary to terminate ECCS injection or containment spray after a MSLB may not be reached prior to commencement of containment emergency recirculation.

Exception(s) to NEI 04-07 Taken to Date for Break Selection

At this time, the only identified exception taken to NEI 04-07 for break selection is the use of the "every five feet" criteria described in Section 3.3.5.2 of NEI 04-07, Vol. 2.

NEI 04-07 Vol. 2 Section 3.3.5.2 advocates break selection at 5-ft intervals along a pipe in question but clarifies that "the concept of equal increments is only a reminder to be systematic and thorough." It further qualifies that recommendation by noting that a more discrete approach driven by the comparison of debris source term and transport potential can be effective at placing postulated breaks. The key difference between many breaks (especially large breaks) will not be the exact location along the pipe, but rather the envelope of containment material targets that is affected. A more comprehensive approach was taken for break selection, which accounts for the consistent use of Nukon insulation throughout the reactor building and the extensive zone of influence associated with that material. The ZOI equivalent to 17 pipe diameters (17D ZOI) for the Nukon insulation used on RCS piping is equivalent to a sphere with an approximate 40 ft radius, dependant upon the size of the particular pipe break. A spherical ZOI of that size is bounded by structural barriers surrounding the RCS, i.e., the reactor cavity and secondary shield wall, the floor and operating floor slabs, etc. The specific location along a particular pipe has little if any impact on debris generated. Specific break locations were selected by plotting the ZOI along the RCS piping to maximize major targets that fall within the perimeter of the ZOI sphere.

2. Debris Generation/Zone of Influence (Excluding Coatings)

The debris generation evaluation consisted of two primary steps:

- Determine the Zone of Influence (ZOI) in which debris is generated
- Identify the characteristics (size distribution) of the destroyed debris

The ZOI is defined as the volume about a given HELB in which the fluid escaping from the break has sufficient energy to generate debris from insulation, coatings, and other materials within the zone. NEI 04-07 defines the ZOI as spherical and centered at the break site or location. The radius of the sphere is determined by the pipe diameter and the destruction pressures of the potential target insulation or debris material. All significant debris sources (insulation, fixed debris, etc.) within the ZOI were evaluated.

Section 4 of NEI 04-07 Vol. 1 allowed for the development of target-based ZOIs, taking advantage of materials with greater destruction pressures. The Callaway evaluation used multiple ZOIs at the specific break location dependent upon the target debris. The destruction pressures and associated ZOI radii for common PWR materials were taken from Table 3-2 of NEI 04-07 Vol.2.

Materials that were absent applicable experimental data or documentation were conservatively assumed to have the lowest destruction pressure adopted. That destruction pressure is equivalent to a ZOI equal to 28.6 pipe diameters (28.6D ZOI).

Robust barriers consisting of structures and equipment that are impervious to jet impingement were utilized in the evaluation. Some of these barriers included the primary shield wall, the refueling cavity walls, and the steam generators. Per the guidance given in Section 3.4.2.3 of NEI 04-07 Vol. 2, when a spherical ZOI extended beyond a robust barrier, the barriers may prevent further expansion of the break jet but they can also cause deflection and reflection. Section 3.4.2.3 of NEI 04-07 Vol. 2 states that when a spherical ZOI extends beyond robust barriers such as walls or encompasses large components such as tanks and steam generators, the extended volume may be conservatively truncated. NEI 04-07 Vol. 2 also stipulates that "shadowed" surfaces of components should be included in the analysis. These approaches were utilized within the debris generation evaluation.

The general methodology that is used in the debris generation calculation consisted of identifying a HELB, establishing the corresponding ZOI, mapping the ZOI volume over the spatial layout of insulated piping, and calculating the volume of insulation within that ZOI.

As discussed in NEI 04-07 Vol. 1, a sufficient number of breaks in each high-pressure system that rely on containment emergency recirculation should be evaluated to ensure the most limiting quantity of debris is generated and transported to the sump.

The following break locations were considered for the debris generation calculation:

Break No. 1: Break at loop A crossover leg
Break No. 2: Break at loop D crossover leg
Break No. 3: Break at loop D steam generator hot leg nozzle
Break No. 4: Reactor vessel cold leg nozzle break
Break No. 5: Alternate charging line at loop D cold leg (for small break LOCA)
Break No. 6: Main Steam Line Break at loop D steam generator discharge

<u>Basis for selecting Breaks No.1 – 3</u>

As discussed in 2(c) Item 1 above for LBLOCAs, breaks on the hot leg and crossover legs were chosen based on their larger diameter, which increases the zone of influence. The debris generation calculation determines that there is approximately 15 percent difference between the largest and smallest debris values among the four loops, but breaks in loops A and D generate more debris than a break in either loop B or C. A break in loop A has potential to impact loop B, due to the compartment wall configuration, as well as adjacent loop D. A break in loop D has the potential to impact pressurizer piping in addition to adjacent loop A. Break locations in loop A and loop D are evaluated to ensure the RCS break with the largest potential for debris is identified consistent with the guidance of NEI 04-07 Vol. 2 Sections 3.3.4.1 and 4.2.1.

Breaks in loop D impact the pressurizer compartment and generate more debris than breaks in loop A. Evaluation of the loop D hot leg and loop D crossover leg breaks indicates that there is little difference (approximately 5 percent) between the fibrous debris generated for these two locations. However, the spool piece in the middle of the crossover leg is approximately 10 feet below the steam generator nozzles and other RCS piping. The closer proximity to the concrete floor results in significantly more coatings debris from a break in this location. The results of the analysis reveal that an RCS break at the loop D crossover leg is most limiting for debris generation based on the combined quantities of fibrous and particulate (coating) debris.

<u>Basis for selecting Break No.4</u>

Among the break locations recommended in NEI 04-07 Vol. 2 Sections 3.3.4 and 4.2.1 is a break with the largest potential particulate debris to fibrous insulation ratio by weight. Callaway has Min-K microporous insulation installed in the reactor cavity with limited fibrous insulation. A break in the reactor cavity is assessed, therefore, consistent with this criterion. The loop A cold leg is selected since the insulation volume is the largest among the hot/cold legs in the four loops.

<u>Basis for selecting Break No.5</u>

The limiting case for a "thin bed" effect was determined to be a small break LOCA. A break in the 3 inch alternate charging line at the loop D cold leg was determined to produce a significant amount of coating particulate with minimal fibrous debris as well as representing the lowest water level. Loop D was selected since it generates more coatings debris than the other RCS-attached lines 3 inches and smaller.

<u>Basis for selecting Break No.6</u>

Based on the discussion in 2(c) item 1 regarding Callaway's susceptibility to recirculation for a secondary side break, a break in the 28 inch main steam line from the D steam generator is analyzed in the debris generation calculation because of the insulation debris volume that could be generated. The postulated break affects the main steam and feedwater lines for D and A steam generators, the upper section of both steam generators, and containment cooler piping below. Additionally, the selected break location has a relatively short transport path (open grating below) to the sumps.

<u>Exception(s) to NEI 04-07 Taken to Date for Debris Generation/Zone of Influence</u>

At this time, Callaway has not identified any exceptions to NEI 04-07 for evaluating debris generation/zone of influence except as described in the response to the Break Selection above.

3. Debris Characteristics (Excluding Coatings)

The debris generation evaluation determined the debris source term by review of existing applicable specifications and drawings. The results of the reviews were compiled in the debris generation evaluation. The following insulation types are considered in the evaluation:

- Nukon
- Transco Thermal Wrap
- Transco Reflective Metal Insulation (RMI)
- Diamond Power Mirror RMI
- Min-K
- AlphaMat D
- No-Wrap (Anti-Sweat)

Additionally, fire barrier materials Thermo-Lag 330-1 Subliming Coating Envelope System and Darmatt KM1 are present in the containment.

Although a two-size debris size distribution for insulation materials is adequate for a baseline analysis, it allows for only limited benefit when computational fluid dynamics (CFD) analyses are used to refine the recirculation pool debris transport fractions. The NRC recognized this limitation in NEI 04-07 Vol. 2 Section 4.2.4 which recommends a four category size distribution including: (1) fines that remain suspended, (2) small piece debris that is transported along the pool floor, (3) large piece debris with the insulation exposed to potential erosion, and (4) large debris with the insulation still protected by a covering, thereby preventing further erosion. The methodology that can be used to determine the fraction of debris falling within each of the four size categories was explained in Appendices II and VI of NEI 04-07 Vol. 2, but the percentages to allot for each debris type was not specified. The vendor performing the debris generation evaluation utilized proprietary analysis to develop a four-size category debris distribution for Nukon and Thermal Wrap insulation materials.

The debris size distribution for reflective metal insulation (RMI) is based on the size distribution presented in NUREG/CR-6808 (Reference 5).

An assumed maximum destruction, 100 percent fines, is used for materials for which insufficient debris generation data is not readily available to conservatively estimate debris size.

Exception(s) to NEI 04-07 Taken to Date for Debris Characteristics

At this time, Callaway has not identified any exceptions to NEI 04-07 associated with debris characteristics.

4. Latent Debris

Callaway has elected to use a bounding value of 200 lbm for the latent debris source term evaluated in containment. To justify the acceptability of that value, a containment walkdown will be performed during the Fall 2005 refueling outage to collect and quantify the latent debris that exists. The determination of latent debris quantity will be performed in a manner consistent with the NEI 04-07 Vol. 2 Section 3.5.2.2 Option 2.

Tags, tape, and other miscellaneous latent debris are also included the NEI 04-07 debris generation calculation.

Exception(s) to NEI 04-07 Taken to Date for Latent Debris

At this time, Callaway has not identified any exceptions to NEI 04-07 associated with latent debris.

5. Debris Transport

The methodology used in the debris transport analysis is based on NEI 04-07 Vol. 1 for refined analyses as modified by NEI 04-07 Vol. 2, as well as the refined methodologies suggested by NEI 04-07 Vol. 2 Appendices III, IV, and VI. The specific effect of each mode of transport was analyzed for each type of debris generated, and a logic tree was developed to determine the total transport to the sump strainers for each type of debris. The size distribution and characterization for the specific debris types comes from the debris generation calculation.

The basic methodology being used for transport analysis is summarized as follows:

- Based on relevant containment building drawings, a three-dimensional model is built using computer aided drafting (CAD) software
- A review is made of the drawings and CAD model to determine transport flow paths. Potential upstream blockage points are taken into consideration
- Debris types and size distributions are gathered from the debris generation calculation for each postulated break location
- The fraction of debris blown into upper containment is determined based on the volumes of upper and lower containment
- The quantity of debris washed down by spray flow is determined
- The quantity of debris transported to inactive areas or directly to the sump screens is calculated based on the volume of the inactive and sump cavities proportional to the water volume at the time these cavities would be filled
- The location of each type/size of debris at the beginning of recirculation is determined
- A CFD model is developed to simulate the flow patterns that would occur during recirculation

- The recirculation transport fractions from the CFD analysis is gathered to input into the logic trees
- The quantity of debris that could experience erosion due to the break flow or spray flow is determined
- The overall transport fraction for each type of debris is determined by combining each of the previous steps in logic trees

The CFD calculation for Callaway utilized a minimum containment flood level of 1 foot - 11 inches above the annulus floor for the LBLOCA scenario and a minimum containment flood level of 8 inches above the annulus floor for the SBLOCA scenario. This pool depth occurs following the switchover to recirculation. These minimum flood levels were based on vendor calculations in support of the Generic Letter 2004-02 analysis.

The debris generated at the limiting LBLOCA break location at loop D crossover leg was selected for the debris transport. As stated above, a LBLOCA on loop D crossover leg yields the highest quantity of fiber and coating debris. This event also generates micro-porous particulate and RMI debris.

The CFD model includes proposed debris barriers at the secondary shield wall entrances to loops A and D. Since the flow transport path from loops A and D secondary shield wall entrances would be the shortest to the containment sumps, the addition of the debris barriers at loops A and D was selected to increase the distance from the break to the containment sumps. Flow from the break would need to travel from the B and C loop secondary shield wall entrances to reach the containment sumps. It is anticipated that this increased flowpath from loops B and C secondary shield wall entrance doors will reduce the amount of transportable debris at the containment sumps by taking advantage of low velocity areas of the pool.

For conservatism, the debris generated from the loop D break was assumed at loop C. Loop C was selected for the most direct path to the sump since debris barriers will be placed at the loop A and D secondary shield wall entrance doors. (i.e., the limiting flow path will be combined with the limiting debris value).

A modification may be used to reduce the amount of debris that reaches the containment sump by installing debris interceptors at locations deemed beneficial and appropriate by the CFD analysis.

Exception(s) to NEI 04-07 Taken to Date for Debris Transport

At this time the only exception taken to NEI 04-07 for Debris Transport is the assumption of uniform debris distribution.

The Debris Transport Analysis does not broadly assume a uniform distribution of debris in the containment pool, but considers a distribution of debris based on the following:

a. Since the various types and sizes of debris transport differently during the blowdown, washdown, and pool fill-up phases, the initial distribution of this debris at the start of recirculation could vary considerably. Insulation debris on the pool floor would be scattered around by the break flow, as the pool fills, and debris in upper containment would be washed down at various locations by the spray flow. Due to the fact that the containment pool does not flow preferentially in any given direction after the inactive and sump cavities have been filled and before recirculation begins, it is assumed that the debris washed down by containment sprays would remain in the general vicinity of the washdown locations until recirculation starts.

b. Latent Debris - With the exception of latent debris washed to the sump strainer or to inactive cavities during pool fill-up, it is assumed that all of the latent debris in containment (particulate matter and fibers) would be uniformly distributed on the containment floor at the beginning of recirculation.

c. Fine Debris - With the exception of debris washed directly to the sump strainers or to inactive areas, it is assumed that the fine debris in lower containment at the end of the blowdown would be uniformly distributed in the pool at the beginning of recirculation. The fine debris washed down from upper containment is assumed to be in the vicinity of the locations where spray water reaches the pool.

d. Small and large pieces of insulation debris (RMI and Nukon) not blown to upper containment are assumed to be uniformly distributed throughout the containment area carried by flows through the pool. The small piece debris blown to upper containment is assumed to washdown in the same locations as the fine debris.

6. Coatings Evaluation

As described in Sections 3.4.3.3.3 and 3.4.3.3.4 of NEI 04-07 Vol. 1, qualified and unqualified coatings within the coating ZOI were assumed to fail and all unqualified coatings outside the coating ZOI were assumed to fail. Based on recommendations in NEI 04-07 Vol. 2, all coatings inside and outside the ZOI were assumed to fail as 10-micron spherical particles for head loss considerations.

In accordance with NEI 04-07 Vol. 1, unqualified coatings that are under intact insulation were not considered to fail.

The ZOI for qualified coatings that is used for Callaway is 5D based on testing that is presently underway. The Utility Service Alliance (USA), of which Callaway is a participating utility, has contracted with Westinghouse Electric Company to have qualified coatings tested under two phase flow conditions to determine appropriate ZOI for assuming that 100 percent of the coatings will fail. It is expected that the results of this testing will support the 5D ZOI utilized for the generation of qualified coatings debris.

Exception(s) to NEI 04-07 Taken to Date for Coatings

An exception to the NEI 04-07 Vol. 2 Section 3.4.2.1 regarding the qualified coatings ZOI of 10D is being taken based on the expected results of testing that will be performed. This effort is described in more detail earlier in this section.

7. Head Loss

As stated above, Callaway's existing recirculation sump strainers will be replaced. Callaway has selected the strainer supplier who can provide the largest strainer surface area available for the existing plant configuration and LOCA water level. The supporting analysis and design details of the replacement sump strainers are not final but are expected to be complete by the September 1, 2006. The sump strainer supplier will also perform head loss testing on the replacement strainer utilizing the results of the site-specific debris generation and debris transport evaluations. Head loss testing is currently planned for the LBLOCA and SBLOCA containment water levels and the associated debris loadings. The testing activities are expected to be complete by September 1, 2006. The replacement recirculation sump strainer will be of a modular design utilizing perforated plate. The replacement sump strainer was selected with the smallest hole size reasonably available from any of the strainer suppliers, a no larger than nominal 1/16 inch diameter hole in the perforated plate of the strainer.

Exception(s) to NEI 04-07 Taken to Date for Head Loss

At this time, Callaway has not identified any exceptions to NEI 04-07 associated with the head loss evaluation.

8. Chemical Effects

Callaway has reviewed the results from the Industry and NRC Sponsored Integrated Chemical Effects Testing (ICET) and has determined that Test 2 (TriSodium Phosphate with fiberglass insulation) is similar to conditions at Callaway. A visual, qualitative review of ICET test 2 results determined that those plants that use TSP as a pH buffering agent and have fibrous debris as the predominant interacting debris source (including Callaway) do not experience sufficient chemical constituent formation that could lead to significant impact to sump strainer headloss. Based on the general observations of ICET 2, the potential for significant sump head loss as a result of chemical constituents appears to be less of a concern for Callaway. Callaway is continuing to evaluate the results of ICET Test 2 to determine plant applicability to the test parameters and to finalize implications of the test results to Callaway.

Callaway does not expect a significant impact to sump strainer head loss as a result of chemical effects in the sump pool. In the event that some impacts are identified, the overall approach that Callaway is utilizing for resolution of the issue will provide substantial margin to account for any unexpected impacts. The largest available sump strainer size that could fit within the current containment sump pit has been selected. It is anticipated that this sump strainer size will exceed the maximum required sump strainer surface area required by the debris generation and transport evaluations; thereby providing margin. Callaway intends to utilize a portion of the tested head loss (i.e. "bump up" factor) to account for the impact of chemical effects on overall sump strainer head loss.

Additional margins for chemical effects include:

- Following a HELB, the flow required to maintain the necessary core cooling decreases significantly after about the first 24 hours of the event. This allows for a significant reduction from the flow that is assumed to be creating the headloss across the strainer. As the flow decreases, the head loss also decreases, thus minimizing the impact of the debris laden strainer.

- It is anticipated that additional margin will exist in the difference between the assumed latent debris loading in containment and the conservatively calculated latent debris loading. As stated above, Callaway has included 200 lbm of latent debris in the debris generation calculation and anticipates the calculated latent debris mass to be less than 200 lbm. The calculation of estimated latent debris in containment will be done in the Fall 2005 refueling outage.

- Margin is incorporated into the debris generation calculation for tags, tape, and miscellaneous latent debris.

Exception(s) to NEI 04-07 Taken to Date for Chemical Effects

At this time, Callaway has not identified any exceptions to NEI 04-07 recommendations associated with chemical effects.

9. Upstream Effects

The vendor supplied upstream effects evaluation for Callaway determines flowpaths, holdup volumes, and restricted flow areas upstream of the containment sump strainers. The evaluation results in changes to the minimum water level calculation to account for additional water inventory hold up points not previously considered.

Even though these evaluations have not been fully approved and accepted by Callaway, Callaway does not expect the results to significantly change.

Exception(s) to NEI 04-07 Taken to Date for Upstream Effects

At this time, Callaway has not identified any exceptions to NEI 04-07 recommendations associated with upstream effects.

10. Downstream Effects

A downstream effects evaluation is being performed for Callaway by the vendor. The basic methodology used for performing these evaluations is consistent with the methods and approaches in the NEI 04-07 and WCAP-16406-P (Reference 2). Even though these evaluations have not been fully approved and accepted by Callaway, Callaway does not expect the results to significantly change.

Testing is currently being developed to determine the potential impact of chemical effects for the downstream effects evaluation. Any impact on the downstream effects evaluation from chemical effects will be addressed as necessary.

The approach to these evaluations is to:

- Determine the flow paths, including all intervening components, that are required to function following a LOCA and subsequent transfer to containment emergency recirculation.
- Utilizing the designed sump strainer screen opening of no larger than a nominal 1/16 inch, calculate the quantity of debris that would be expected to bypass (pass through) the sump strainer.
- Determine the characteristics of the debris that is calculated to pass through the strainer.
- Evaluate the components previously identified to determine if any of the components could potentially become blocked as a result of the debris laden ECCS or CSS fluid.
- Evaluate the potential wear of critical components to determine if their design basis functions could be maintained for the required mission time.

These evaluations have not been fully approved and accepted by Callaway. The preliminary results identified that there are several required components or flow paths that are susceptible to blockage by debris or susceptible to abrasive wear downstream of the sump strainer.

These components are:

- The safety injection system throttle valves
- The containment spray pump cyclone separators
- Centrifugal Charging Pumps
- Safety Injection Pumps

If the final results of these evaluations determine that the blockage or wear of these components would result in unacceptable ECCS performance during postulated design basis accidents, the necessary modifications or enhanced evaluations will be performed to ensure the established functions and mission time for the ECCS and CSS will be maintained throughout the course of the accident. The use of NEI 04-07 Chapter 6 Alternate Evaluation methodology and the potential incorporation of debris interceptors may be used to reduce debris quantity.

Exception(s) to NEI 04-07 Taken to Date for Downstream Effects

At this time, Callaway has not identified any exceptions to NEI 04-07 recommendations associated with downstream effects.

2(d) The submittal should include, at a minimum, the following information:

(i) The minimum available NPSH margin for the ECCS and CSS pumps with an unblocked sump screen.

Response 2(d)(i):

The minimum available NPSH with an unblocked sump screen has not been determined at this time since the head loss across the replacement sump strainers will be determined as part of the head loss testing in conjunction with the sump strainer procurement process.

(ii) The submerged area of the sump screen at this time and the percent of submergence of the sump screen (i.e. partial or full) at the time of the switchover to sump recirculation.

Response 2(d)(ii):

The replacement sump strainer will be completely submerged at the time of ECCS switchover to recirculation for LBLOCA water level conditions. The replacement sump strainer is anticipated to be partially submerged, at approximately 85 percent submerged, at the time of ECCS switchover to recirculation for SBLOCA water level conditions. A section of the minimum containment water level calculation specifically addresses a SBLOCA condition when the safety injection accumulators do not discharge and the containment spray system does not activate.

(iii) The maximum head loss postulated from debris accumulation on the submerged sump screen, and a description of the primary constituents of the debris bed that result in this head loss. In addition to debris generated by jet forces from the pipe rupture, debris created by the resulting containment environment (thermal and chemical) and CSS washdown should be considered in the analyses. Examples of this type of debris are disbonded coatings in the form of chips and particulates and chemical precipitants by chemical reactions in the pool.

Response 2(d)(iii):

As previously provided in response to 2(c), item 7, the maximum predicted head loss will be determined through replacement strainer head loss testing. The primary constituents of the debris bed that result in this head loss include fiberglass fibers, coatings particulate, latent debris particles and latent debris fibers.

Callaway intends to utilize a portion of the tested head loss (i.e. "bump up" factor) to account for the impact of chemical effects. Refer to the response provided for 2(c), item 8, for discussion of the areas of margin that will ensure adequate margin will exist in the design and function of the replacement strainer to ensure sufficient NPSH is available for the ECCS and CSS pumps.

(iv) **The basis for concluding that the water inventory required to ensure adequate ECCS or CSS recirculation would not be held up or diverted by debris blockage at choke-points in containment recirculation sump return flowpaths.**

Response 2(d)(iv):

An Upstream Effects evaluation has been completed by the vendor that confirms that potential water inventory, diversions, flow paths, choke points, etc. have been adequately included in the containment LOCA water level calculations. The results indicate that all water holdup areas have been appropriately included in the containment minimum water level calculation. Callaway will confirm the accuracy of these results during site acceptance of the vendor analysis package.

(v) **The basis for concluding that inadequate core or containment cooling would not result due to debris blockage at flow restrictions in the ECCS and CSS flowpaths downstream of the sump screen, (e.g., a HPSI throttle valve, pump bearings and seals, fuel assembly inlet debris screen, or containment spray nozzles). The discussion should consider the adequacy of the sump screen's mesh spacing and state the basis for concluding that adverse gaps or breaches are not present on the screen surface.**

Response 2(d)(v):

As previously described in response to 2(c) Item 10, a downstream effects evaluation is being performed for Callaway consistent with the methods and approaches provided in WCAP-16406-P (Reference 2). Even though these evaluations have not been approved and accepted by Callaway, the results are not expected to change.

The downstream effects evaluation describes required corrective actions that once implemented, will ensure that inadequate core and containment cooling will not result due to debris blockage at flow restrictions in the ECCS and CSS flow paths downstream of the sump strainers. As discussed in 2(c) item 10, above, several corrective actions may be necessary. For example, based on the preliminary results of the downstream effects equipment blockage evaluation, a modification to the safety injection system throttle valves may be necessary to correct the potential blockage concerns identified in the downstream effects analysis. Additionally, based on the results of the downstream effects equipment blockage evaluation, the containment spray pump cyclone separators may need to be removed.

These evaluations are based on a maximum sump strainer screen opening of no larger than 1/16 inch nominal diameter. The sump strainer vendor's unit, by design, will ensure that there are no openings or gaps in its design or construction that would be in excess of the maximum strainer opening. Callaway will ensure that the installation of the replacement strainers will not result in openings in excess of the strainer screen opening as part of the design and installation. Additionally, as part of the programmatic and process changes that will be implemented, the necessary inspections will be established to ensure continuing compliance with this requirement.

(vi) **Verification that close-tolerance subcomponents in pumps, valves and other ECCS and CSS components are not susceptible to plugging or excessive wear due to extended post-accident operation with debris-laden fluids.**

Response 2(d)(vi):

As previously described in response to 2(c) Item 10, a downstream effects evaluation is being performed for Callaway consistent with the methods and approaches provided in WCAP-16406-P (Reference 2). Even though these evaluations have not been approved and accepted by Callaway, the results are not expected to change.

The Downstream Effects evaluation describes required corrective actions that once implemented, will ensure that ECCS and CSS components are not susceptible to plugging or excessive wear during post-accident operation. As discussed in 2(c) item 10 and 2(d)(v) above, several corrective actions may be necessary including:

a. A modification to the safety injection system throttle valves to correct potential plugging and wear concerns identified in the downstream effects analysis.
b. A modification to the containment spray pump cyclone separators to correct the potential plugging concerns identified in the downstream effects analysis.

Additionally, based on the results of the downstream effects equipment wear evaluation, modifications may be necessary to reduce vibration in the CCP and SI pumps.

(vii) **Verification that the strength of the trash racks is adequate to protect the debris screens from missiles and other large debris. The submittal should also provide verification that the trash racks and sump screens are capable of withstanding the loads imposed by expanding jets, missiles, the accumulation of debris, and pressure differentials caused by post-LOCA blockage under predicted flow conditions.**

Response 2(d)(vii):

The location of the Callaway recirculation sump strainers, outside the secondary shield walls, eliminates the requirements for missile barrier resistance since the

LOCA break locations that could lead to ECCS recirculation are located inside the secondary shield walls. The structural evaluation of the replacement sump strainer will be completed as part of the replacement containment sump strainer procurement process. The replacement strainers will be designed to be sufficiently robust so that the strainer can also function as a trash rack simultaneously.

(viii) If an active approach (e.g., backflushing, powered screens) is selected in lieu of or in addition to a passive approach to mitigate the effects of the debris blockage, describe the approach and associated analyses.

<u>Response 2(d)(viii):</u>

The Callaway replacement sump strainer will be a passive strainer. Callaway is not pursuing any form of active strainer design; therefore this item is not applicable.

2(e) **A general description of and planned schedule for any changes to the plant licensing bases resulting from any analyses or plant modifications made to ensure compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. Any licensing actions or exemption requests needed to support changes to the plant licensing basis should be included.**

Response 2(e):

At the present time, Callaway has not identified the need for any regulatory relief requests, or required changes to the operating license or Technical Specifications.

The only potential license amendment being considered is the NEI 04-07 Chapter 6, Alternate Evaluation. The use of the Chapter 6 methodology would be considered if additional margin is necessary after the completion of the downstream effects analysis.

If relief requests or license amendments are identified, the NRC will be promptly notified.

The portions of the Callaway licensing basis impacted by ongoing analyses or planned plant modifications to ensure compliance with the regulatory requirements described in this Generic Letter will be changed upon implementation of the associated analysis or plant modification. If the analysis or modification is implemented prior to the final implementation of the NEI 04-07 analysis, the basis for acceptability of the analysis or plant modification will be the licensing basis prior to the implementation of the NEI 04-07 analysis. If the analysis or modification is implemented in conjunction with the final implementation of the NEI 04-07 analysis, then the basis for acceptability of the analysis or plant modification will be the licensing basis after the implementation of the NEI 04-07 analysis. Callaway licensing basis documents will be updated in accordance with the requirements of 10CFR50.71.

2(f) A description of the existing or planned programmatic controls that will ensure that potential sources of debris introduced into containment (e.g. insulations, signs, coatings, and foreign materials) will be assessed for potential adverse effects on the ECCS and CSS recirculation functions. Addressees may reference their responses to GL 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating deficiencies and Foreign Material in Containment," to the extent that their responses address these specific foreign material control issues.

Response 2(f):

Programmatic controls that were implemented as interim compensatory measures are described in Callaway's response to NRC Bulletin 2003-01 (References 6 and 7). The programmatic, process, and procedural changes currently proposed to be reviewed and revised in support of Generic Letter 2004-02 analyses and evaluations are listed below.

1. Callaway will implement changes to administrative process controls necessary to ensure consideration of potential impacts on Generic Letter 2004-02 analyses and evaluations. The impacted process controls currently identified include:

    a. Changes to design change process procedures to ensure that necessary engineering evaluations will be performed when preparing a change to the plant design that either directly or indirectly affects containment, ECCS, or CSS.

    b. Changes to containment entry and material control procedure requirements for control of materials during work activities conducted in the containment.

    c. Changes to programs and procedures that have the potential to add tags and labels inside containment. These programs and procedures include, but are not limited to, scaffold construction and use, Worker Protection Assurance (WPA), radiological postings, work requests, and material control.

2. Callaway will implement a containment inspection program to ensure that the attributes necessary to support the continued validity of the inputs and assumptions associated with the Generic Letter 2004-02 analyses and associated plant design features. This includes a containment coatings condition assessment program in accordance with EPRI 1003102, Rev. 1 (Reference 4) and a containment latent debris assessment program in accordance with the guidance of NEI 04-07, Vol. 2.

3. Callaway will implement changes to inspection procedures to ensure that the installed replacement strainers will not have openings in excess of the maximum designed strainer opening.

The programmatic, process, and procedural changes described above will be implemented in stages as previously described in response to item 2(b).

References

1. NEI 02-01, Revision 1, Condition Assessment Guidelines: Debris Sources Inside PWR Containments, Nuclear Energy Institute, 17776 1 Street N. W., Suite 400, Washington D.C., September 2002
2. WCAP-16406-P, Evaluation of Downstream Sump Debris Effects in Support of GSI-191, Westinghouse Electric Company LLC, P.O. Box 355, Pittsburgh, PA 15230-0355, June 2005
3. NEI 04-07, Pressurized Water Reactor Sump Performance Evaluation Methodology, Revision 0, Nuclear Energy Institute, 17776 1 Street N. W., Suite 400, Washington D.C., December 2004
4. EPRI 1003102, Rev. 1, Guidelines on Nuclear Safety-Related Coatings, Electric Power Research Institute, 3412 Hillview Avenue, Palo Alto, CA 94304, November, 2001
5. NUREG/CR-6808, Knowledge Base for the Effect of Debris on Pressurized Water Reactor Emergency Core Cooling Sump Performance, LA-UR-03-0880, Los Alamos National Laboratory, Los Alamos, NM 87545, February 2003
6. Letter ULNRC04884, dated August 8, 2003, from Keith D. Young, AmerenUE to USNRC
7. Letter ULNRC05026, dated June 9, 2004, from Keith D. Young, AmerenUE to USNRC.

LIST OF COMMITMENTS

The following table identifies those actions committed to by AmerenUE in this document. Any other statements in this document are provided for information purposes and are not considered commitments. Please direct questions regarding these commitments to Mr. David E. Shafer at (314) 554-3104.

COMMITMENT	Due Date/Event
1. Containment walkdown to provide current assessment of Callaway's containment coatings and latent debris.	Refuel 14 (Fall 2005)
2. The following corrective action activities will completed: a. Replacement sump strainer structural analysis. b. Downstream effects evaluation. c. Upstream effects evaluation. d. Resolution of debris generation calculation unverified assumption of 5D ZOI for qualified coatings (via coatings testing). e. Replacement sump screen head loss testing.	May 1, 2006
3. Provide an update of the information contained in section 2(c) regarding analysis methodology.	June 1, 2006
4. The following evaluations and testing will be completed: a. Industry chemical effects testing. b. NEI 04-07 debris generation calculation. c. NEI 04-07 debris transport calculation. d. Evaluation of chemical effects impact on sump-strainer head loss. e. Confirmation that the replacement sump strainer design provides for available NPSH to be in excess of required NPSH. f. Completion of the final site acceptance review of the Westinghouse team analysis summary report.	September 1, 2006

5. Callaway will complete the following items during Refuel 15: a. Replacement of containment recirculation sump strainers. b. Modification of containment debris barriers and interceptors as required. c. Evaluation and implementation of potential modification to the safety injection system to address downstream effects.	Refuel 15 (Spring 2007)
6. Callaway will complete removal of containment spray system (CSS) pump cyclone separators, if required based on the results of the downstream effects evaluation.	December 31, 2007
7. The following programs and controls will be implemented at Callaway to control debris sources: a. Changes to design change process procedures to ensure that necessary engineering evaluations will be performed for plant design that either directly or indirectly affects containment, ECCS, or CSS. b. Changes to containment entry and material control procedure requirements for control of materials during work activities conducted in the containment. c. Changes to programs and procedures that have the potential to add tags and labels inside containment. d. Implementation of a containment coatings assessment program. e. Implementation of a containment latent debris assessment program. f. Implementation of changes to the inspection processes for the installed sump strainers.	December 31, 2007
8. A final response will be submitted to the NRC to provide a final status of actions requested by Generic Letter 2004-02.	December 31, 2007