June 23, 2014

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

SUBJECT: FOURTH REQUEST FOR ADDITIONAL INFORMATION FOR RENEWAL APPLICATION TO SPECIAL NUCLEAR MATERIALS LICENSE NO. 2505 FOR THE CALVERT CLIFFS SITE SPECIFIC INDEPENDENT SPENT FUEL STORAGE INSTALLATION (TAC NO. L24475)

Dear Mr. Gellrich:

By letter dated September 17, 2010, as supplemented February 10, March 9, and June 28, 2011; July 27, 2012; and April 24 and June 14, 2013. Calvert Cliffs Nuclear Power Plant (CCNPP), LLC, submitted a license renewal application to the U.S. Nuclear Regulatory Commission (NRC) for the CCNPP site-specific independent spent fuel storage installation. The NRC staff has reviewed the April 24 and June 14, 2013, request for additional information (RAI) responses and has determined that additional information is required to complete its detailed technical review. The RAI is identified in the enclosure to this letter. We request that you provide the information by August 27, 2014. Please inform us in writing at your earliest convenience, but no later than July 15, 2014, if you are not able to provide the information by the requested date. This information was discussed with Mr. Ken Greene of your staff on June 4, 2014.

To assist us in re-scheduling your review, you should also include a new proposed submittal date and the reasons for the delay. Please reference Docket No. 72-8 and TAC No. L24475 in future correspondence related to this licensing action. If you have any questions, please contact me at (301) 287-9250.

Sincerely,

/RA/ B. J. Davis For

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.: L24475

Enclosure: 4th RAI

cc: CCNPP Service List

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NAME:	JGoshen	WWheatley	DDunn	RTorres	JBorowsky	NJordan
DATE:	5/27/2014	6/ 6 /2014	6/ 11 /2014	6/17/2014	6/ 10/2014	6/ 17/2014
OFC:	SFST	SFST	SFST	SFST		
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CALVERT CLIFFS NUCLEAR POWER PLANT, LLC

SPECIAL NUCLEAR MATERIALS LICENSE NO. 2505

DOCKET NO. 72-8

LICENSE RENEWAL REQUEST

FOURTH REQUEST FOR ADDITIONAL INFORMATION

By letter dated September 17, 2010, as supplemented February 10, March 9, and June 28, 2011; July 27, 2012; and April 24 and June 14, 2013. Calvert Cliffs Nuclear Power Plant (CCNPP), LLC, submitted a license renewal application to the U.S. Nuclear Regulatory Commission (NRC) for the CCNPP site-specific independent spent fuel storage installation. The NRC staff (staff) has reviewed the April 24 and June 14, 2013, request for additional information (RAI) responses and have determined that additional information is required to complete its detailed technical review.

REQUEST FOR ADDITIONAL INFORMATION (RAI)

NUREG 1927, Appendix E: Component Specific Aging Management

RAI-1: Confinement Integrity

Revise the evaluation that demonstrates dry storage canisters (DSCs) in the horizontal storage modules (HSMs) at the Calvert Cliffs Nuclear Power Plant (CCNPP) Independent Spent Fuel Storage Installation (ISFSI) will maintain design basis confinement integrity and include (1) relevant information on the minimum chloride for stress corrosion cracking (SCC), (2) an assessment of the time to develop the minimum chloride concentration for SCC based on results of the surface chloride concentration measurements conducted in 2012, and (3) activation energy for chloride-induced stress corrosion cracking (CISCC) propagation rates.

By letter dated June 14, 2013, (ADAMS Accession No. ML13170A574) in response to the RAI E-1, CCNPP provided a response to the RAI on confinement integrity that addressed the time necessary for CISCC initiation and through wall propagation of the DSCs. The consequences of CISCC during the license renewal period did not consider how CISCC would be addressed in detailed evaluations, including the dose assessments discussed in the "Maintain Doses within 10 CFR 72.104 and 72.106 Requirements" section. In addition, this response used inaccurate information on the critical chloride for SCC initiation, it did not consider the measured chloride concentration on the canisters from the June 2012 collected sample measurements, and it did not consider the effect of temperature on SCC propagation rates.

The critical chloride concentration cited in the June 14, 2013, submittal was 100 mg/m^2 based on NRC sponsored research that has now been published in NUREG/CR-7170 (ADAMS Accession No. ML14051A417). In that study, CISCC was observed on test specimens with deposited simulated sea salt concentrations of 100 mg/m^2. However, NUREG/CR-7170 clearly indicates that concentrations of 100 mg/m^2 were the lowest deposited salt concentrations tested. The relatively short time for the initiation of CISCC for type 304 stainless steel at surface concentrations of 100 mg/m^2 reported in NUREG/CR-7170 suggests that SCC could occur at lower surface concentrations. Because no tests were performed at concentrations less than

100 mg/m^2 where CISCC was not observed, the critical chloride concentration for SCC was not established in the NUREG/CR-7170.

Measurements of the critical surface concentration for CISCC have been examined and reported by Tokiwai et al. (1985). This study showed that CISCC of sensitized 304 stainless steel was observed with surface chloride concentrations of 8 mg/m^2.

As indicated in Attachment 2 of the April 24, 2013, submittal the measured surface chloride concentration from x-ray fluorescence of the SaltSmart collection sample was determined to be 5.2 mg/m^2 obtained on DSC 11 after 19 years of storage. The average accumulation rate for this canister is 0.27 mg/m^2/yr. In order to reach the minimum chloride concentration reported by Tokiwai et al. (1985), a total exposure time of just over 29 years would be required assuming an average rate of 0.27 mg/m^2/yr.

The analysis in the response to RAI E-1 assumes that once the environmental conditions for CISCC are reached, a properly oriented crack will initiate and propagate at a constant rate of 9.6 x 10^{-12} m/s without the crack arresting. The constant crack growth rate is based on the mean of CISCC propagation rates in Figure 6 of Kosaki (2008) which were obtained in natural exposure tests of type 304 base metals and welds, type 304L welds and type 316LN welds. The natural exposure conditions used by Kosaki (2008) took place on Miyakojima Island which is located about 250 km east of Taiwan with an average temperature of 23°C. Typical minimum and maximum temperatures on Miyakojima Island range from 14°C to 31°C, respectively.

The CISCC rates measured by Kosaki (2008) on Miyakojima Island at ambient temperatures are comparable to atmospheric CISCC rates determined from operational experience at both domestic and foreign nuclear power plants including events at San Onofre, Turkey Point, St. Lucie, and Koeberg (South Africa) (NRC, 2012). Rates from these events back calculated from time of initial operation to time of detected failure for the thickness of the component range from 3.6 x 10^{-12} m/s to 2.9 x 10^{-11} m/s. However, all of these instances involve components that are exposed at near ambient temperatures.

CISCC propagation rates are known to be strongly temperature dependent. Testing by Hayashibara et al. (2008) reported activation energy for crack growth in type 304 stainless steel of 5.6 to 9.4 kcal/mol (23 to 39 kJ/mol) based on testing conducted at temperatures of 50 to 80°C. Taking the median crack propagation rate reported by Kosaki (2008) of 9.6 x 10^{-12} m/s and assuming that rate was measured under exposure temperatures typical of Miyakojima Island (average temperature of 23°C) and the median activation energy of 31 kJ/mol reported by Hayashibara et al. (2008), the SCC propagation rate increases by 2× at 40°C, 3× at 51°C, and 4× at 60°C. Because the temperature of the canisters will initially be at temperatures well above ambient, the effect of temperature on crack propagation rates must be included in the assessment of the time necessary for through wall cracking.

This information is required to evaluate compliance with 10 CFR 72.24 (d) and 10 CFR 72.122 (b)(1) and (h)(5)

RAI-2: Provide a revised aging management plan (AMP) that considers the potential for CISCC at the CCNPP ISFSI.

Revise the AMP that considers the potential for CISCC at the CCNPP ISFSI to (1) consider the timing of inspections based on corrected minimum chloride concentration for SCC initiation, (2) frequency of inspections considering the effect of temperature on CISCC propagation rates and

(3) include all necessary sections of an AMP including specific information methods used for the detection of aging effects, monitoring and trending, acceptance criteria, corrective actions, confirmation process, and administrative controls.

The AMP provided in Jun 14, 2013, response to RAI E-2 indicates that inspections would be conducted once measured surface concentrations reach 100 mg/m^2. Based on NRC sponsored testing documented in NUREG/CR-7170 and information available in the literature (Tokiwai et al., 1985) the critical chloride concentration for SCC is below 100 mg/m^2 even for 300 series stainless steel base materials and may be closer to 8 mg/m^2 for sensitized 300 series stainless steels. The frequency of inspections does not consider the effects of temperature on the expected CISCC propagation rates which may be 3x faster at 51°C assuming an activation energy of 31 kJ/mol reported by Hayashibara et al. (2008), compared to the rate reported by Kosaki (2008).

The June 14, 2013, response to RAI E-2 does not include information on the requested AMP and is not organized in a manner that allows the required components of the AMP to be reviewed. Specifically the inspection methods do not identify requirements for the detection of aging effects such as localized corrosion of CISCC. The RAI response indicates that visual inspection will be performed "in a manner of equal or better quality to that performed in June 2012." The requirements for inspections must consider the degradation process to be detected. Reference to the standardized criteria for visual testing (VT) (e.g. VT-1, EVT-1, VT-3) may be appropriate. Acceptance criteria for visual examination should be included in the AMP. In addition, information on the AMP elements including monitoring and trending, confirmation process, and administrative controls are necessary and were not provided in the response to RAI E-2.

Because visual testing cannot be used to determine the depth of localized corrosion or cracking, volumetric examination methods are necessary to quantify the extent of damage if visual examination indicates the presence of corrosion on the canister surfaces. Volumetric examination methods should be considered for crevice locations such as between the support rail and the canister where the concentration of chlorides may occur and temperatures as a result of heat transfer may be low enough to allow deliquescence of deposited salts. Acceptance criteria, monitoring and trending, confirmation process, and administrative controls for volumetric examination methods are also necessary.

This information is required to evaluate compliance with 10 CFR 72.122 (f) and (h)(4), 10 CFR 72.162 and 10 CFR 72.172.

RAI-3: Transfer Cask Lifting Yoke AMP

Revise the Transfer Cask Lifting Yoke AMP of the CCNPP ISFSI license renewal application Appendix A, Section A2.3 (ADAMS Accession No. ML102650247) and include (1) standards and acceptance criteria for visual examination methods; and (2) details of magnetic particle testing (MT) as described in response to RAI A-2 in Attachment 1 dated June 28, 2011 (ADAMS Accession No. ML11180A270) including appropriate standards and acceptance criteria.

The Application for Renewal of the Specific License for the CCNPP ISFSI Appendix A (ADAMS Accession No. ML102650247) contains the AMPs for the structures systems and components (SSC) that are important to safety. The AMP for the transfer cask lifting yoke is provided in Section 3.6 and Appendix A Section 2.3 of the application (ADAMS Accession No. ML102650247). The application identifies only visual inspection for evidence of degradation on

external surfaces. The requisite standard for the visual inspection is not described. In addition, the acceptance criteria stated, "no unacceptable loss of material that could result in a loss of component intended function(s)," is ambiguous.

Further, the response to RAI A-2 in Attachment 1 dated June 28, 2011 (ADAMS Accession No. ML11180A270), indicates that magnetic particle testing (MT) of the transfer cask lifting yoke will be conducted. The description of the transfer cask lifting yoke MT should be included in the license renewal application AMP along with specific information on the requirements and standards for the MT, acceptance criteria, corrective actions if acceptance criteria are exceeded, how monitoring and trending of the MT results will be conducted.

This information is required to evaluate compliance with 10 CFR 72.122 (f) and (h)(4), 10 CFR 72.162 and 10 CFR 72.172.

RAI-4: Transfer Cask AMP

Revise the transfer cask AMP of the CCNPP ISFSI license renewal application Appendix A, Section A2.2 (ADAMS Accession No. ML102650247) and include (1) standards and acceptance criteria for visual examination methods; (2) details of penetrant testing (PT) of the transfer cask trunnions as described in response to RAI A-2 in Attachment 1 dated June 28, 2011 (ADAMS Accession No. ML11180A270) including appropriate standards and acceptance criteria.

The Application for Renewal of the Specific License for the CCNPP ISFSI Appendix A (ADAMS Accession No. ML102650247) contains the AMPs for the SSC that are important to safety. The AMP for the transfer cask is provided in Section 3.5 and Appendix A Section 2.2 of the application (ADAMS Accession No. ML102650247). The application identifies only visual inspection for evidence of degradation on external surfaces. The standard for the visual inspection and how monitoring and trending will be performed is not described. In addition, the acceptance criteria for the visual inspection in Section A2.2 states, "no unacceptable loss of material that could result in a loss of component intended function(s), "is ambiguous.

Further, the response to RAI A-2 in Attachment 1 dated June 28, 2011 (ADAMS Accession No. ML11180A270), indicates that penetrant testing (PT) of the transfer cask trunnions will be conducted. The description of the transfer cask trunnion PT should be included in the license renewal application along with specific information on the requirements and standards for the PT, acceptance criteria, and corrective actions if acceptance criteria are exceeded.

This information is needed to determine compliance with 10 CFR 72.42, 72.122(b)(1) and (f), , 72.162 and 72.172.

RAI-5:

Revise Section A.2.1 (Reference 1), "HSM Aging Management Program," to manage, at a minimum, the following aging effects/mechanisms, ensuring consistency with ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures." Address these aging effects/mechanisms for both above-grade (accessible and inaccessible) and below-grade (underground inaccessible areas), or provide detailed justifications for any specific exclusion from the Aging Management Review.

- Cracking or loss of material (spalling, scaling) due to freeze-thaw degradation
- Cracking or loss of material (spalling, scaling) due to chemical attack

- Cracking and loss of strength due to cement aggregate reactions
- Cracking, loss of material, and loss of bond due to corrosion of embedded steel
- Increase in porosity/permeability and loss of strength due to leaching of $Ca(OH)_2$
- Cracking due to settlement

Table 3.4-1, "Aging Management Review Results for the HSM," does not properly identify the applicable aging effects and mechanisms for the concrete components of the horizontal storage module (HSM). More specifically, the table lists "Freeze-Thaw" and "Change in Material Properties" as aging effects. The first term is not an aging effect, but an aging mechanism. The second term "Change in Materials Properties" is also not properly defined, so the adequacy of the AMP cannot be verified. The licensee has stated that ACI 201.1R and 349.3R will be used for qualification of inspectors, inspection methods, and acceptance criteria (Response to RAI O-7, Reference 2). Therefore, a complete HSM AMP should address the listed aging effects and mechanisms (all defined in ACI 349.3R). Any exclusion should be justified with a site-specific technical basis (e.g., engineering analysis, operational experience data), which demonstrates that these aging mechanisms will not adversely affect the ability of the HSM to perform its intended important-to-safety (ITS) functions during the license period of extended operation. If the licensee intends on relying on the degradation of accessible areas as a precursor for degradation in below-grade areas, the justification should demonstrate that such an approach will be sufficient to prevent a loss of ITS function. Note that per ACI 349.3R, testing activities may be used to quantify the environment to which the below-grade or inaccessible structure is exposed. These tests could include a program for analysis of soils and groundwater chemistry, as well as an evaluation of their propensity to cause concrete degradation or steel reinforcement corrosion. Similar guidance and acceptance criteria are provided in ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

This information is needed to determine compliance with 10 CFR 72.42, 72.122(b)(1) and (f), 72.162 and 10 CFR 72.172.

RAI-6:

Define and justify the use of other codes, standards or quantitative guidelines for the acceptance criteria of stainless and carbon steel components in the HSM.

The "Acceptance Criteria" in Section A.2.1 (Reference 1), "HSM Aging Management Program," states that the inspection attributes and acceptance standards for steel and concrete will be "commensurate with industry codes, standards and guidelines." The licensee later stated that ACI 201.1R and 349.3R would be used for acceptance criteria of the concrete (Response to RAI O-7, Reference 2). However, the licensee did not define the industry codes, standards and quantitative guidelines to be used for acceptance criteria of the stainless and carbon steel components in the HSM.

This information is needed to determine compliance with 10 CFR 72.42, 72.122(b)(1) and (f), 72.162 and 72.172.

RAI-7:

Revise the HSM Aging Management Program to include inspections of the interior (above-grade) and underground foundation (below-grade) at intervals consistent with ACI 349.3R, or provide detailed justifications for any deviations from this criteria.

Section A2.1 (Reference 1), "HSM Aging Management Program," states that exterior surfaces of the HSM will be inspected annually, yet interior surfaces are only inspected prior to cask loadings. The proposed inspection frequency for interior surfaces is inconsistent with ACI 349.3R and Calvert Cliffs' lead canister inspection findings (Reference 3). ACI 349.3R states that all safety-related structures should be visually inspected at intervals not to exceed 10 years. Specifically, Table 6.1 in ACI 349.3R, "Frequency of Inspection," states that above-grade (directly and indirectly exposed to a natural environment) and below-grade (underground) structures are to be inspected every five and 10 years, respectively. Reference 3 also identified secondary efflorescence and formation of $CaCO_3$ stalactites at the concrete ceilings of both HSM-15 and HSM-1. The issued condition report (CR-2012-006781) included an action to conduct internal inspections through the rear outlet vents every five years to track the size and appearance of the stalactites. Any deviation from inspection frequencies in ACI 349.3R should include a detailed justification. Note that a revised AMP should include sufficient detail about the 10 program elements, as detailed in NUREG 1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance." More specifically, sufficient detail should be provided about the adequacy of the system (e.g. fiber optic, camera) to be used for evaluating per acceptance criteria in ACI 349.3R.

This information is needed to determine compliance with 10 CFR 72.42, 72.122(b)(1) and (f), 72.162 and 72.172.

RAI-8:

Revise Section A2.1 (Reference 1), "HSM Aging Management Program," to include a groundwater chemistry program. The program should provide results (chloride/sulfate composition, pH) representative of water in the near proximity to the HSM. Otherwise, provide an engineering justification for why it is not required for the management of the following aging effects/mechanisms:

- Cracking or loss of material (spalling, scaling) due to chemical attack; and
- Cracking, loss of material, and loss of bond due to corrosion of embedded steel

Section A2.1 (Reference 1), "HSM Aging Management Program," does not include a periodic water chemistry program as an aging management activity. Response to RAI 3-4 (Reference 4) provided results from a sample taken in May 2011 to justify not needing to manage below-grade aging effects due to chemical attack of the HSM concrete, or corrosion of the reinforcing steel. These results showed that chloride/sulfate concentrations did not exceed threshold concentrations and groundwater pH was above the threshold limit for potential degradation (criteria established in IWL-2512, ASME Code Section XI). However, the staff is not convinced that data from one sample can provide reasonable assurance that an aggressive soil/ground water environment will ever be present during the 40 years of extended operation. As stated in ACI 349.3R, chemical attack may occur from exposure to aggressive groundwater, acidic rain/condensation, seawater/salt-spray, exposure to any acids, caustics or other aggressive chemicals (including pesticides for weed and rodent control). The groundwater chemistry program should be included as part of the HSM AMP and sufficient detail about the 10 AMP elements should be provided, as detailed in NUREG 1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance."

This information is needed to determine compliance with 10 CFR 72.42, 72.122(b)(1) and (f), 72.162 and 72.172.

RAI-9:

Confirm if HSMs containing BISCO NS-3, or other neutron shielding material, in the cask structure exist while in storage. In addition, if such casks are or will be present, provide clarification regarding how they will be addressed as part of the AMR. Where applicable, provide a valid time-limited aging analysis (TLAA) addressing time-dependent degradation of the neutron shielding material used in the casks or an appropriate aging management program.

Although the LRA does not specify the addition of neutron shielding material within the storage casks (HSM), staff identified information alluding to the possible use of NS-3 neutron shielding material within the door of the HSM for some earlier casks. Table 4.1-1 in Reference 5, "Generic NUHOMS-24P Design Neutron Shielding," states that the HSM door uses 10.75" of concrete as the neutron shield material. However, a subscript reference in this table states: "This HSM door design is an improvement of the one originally presented in the initial submittal of the CCNPP ISFSI SAR." This statement implies that HSM modules might have been constructed and installed with the alternate Phase I design criterion stated in Reference 5, (i.e., 2" of NS-3 material instead of concrete). Reference 6 is cited as a primary reference for the Aging Management Review in Reference 1 (Section 3.1.6, "Documentation of Sources Used for the Aging Management Review"). Reference 7 also lists a condition report (IR-046-040), which references the Phase I design. The licensee is asked to confirm if there are any HSM modules using NS-3 as a neutron shield material, and to provide clarification regarding whether this will be addressed using the appropriate TLAA or AMP.

This information is required to determine compliance with 10 CFR 72.24(d) and (e), 10 CFR 72.104, 10 CFR 72.106, 10 CFR 72.120a), 10 CFR 72.124(a) and (b), 10 CFR 72.128(a).

RAI-10:

Regarding external ISFSI operating experience:

- Clarify if any of the HSM systems presently in-service have experienced freeze-thaw degradation at the anchor bolts of the outlet vents. If so, provide details of any corrective action or aging management activity implemented as a result of this degradation.
- Revise Table 3.4-1 to remove subscript note 1: "Aging effects conservatively included to meet NRC position for 10 CFR Part 54 plant license renewal (ISG-3)."
- Revise the Operating Experience subsection of the HSM Aging Management Program with results from review of HSM interior inspections performed at other ISFSI sites.

Section A2.1 (Reference 1), "HSM Aging Management Program," does not reference any operational experience from other ISFSIs using the HSM system. NRC Information Notice 2013-07 (Reference 8) notified licensees of issues related to freeze-thaw degradation and leaching of $Ca(OH)_2$ near the bolt hole blockouts on the HSM ceilings. The licensee is asked to clarify if similar cracking has been observed at Calvert Cliffs, and any corrective action or AMP implemented as a result. The footnote on Table 3.4-1 should also be removed since it is inconsistent with this external OE and the Calvert Cliffs lead canister inspection (Reference 3), which also identified leaching of $Ca(OH)_2$.

Response to RSI-1 (Reference 7) also states that, prior to the lead canister inspection in June 2012 the licensee would review the results of NUHOMS HSM interior aging management inspections performed by other utilities with designs similar to those used at Calvert Cliffs. The licensee is asked to provide the results and conclusions from such findings in the Operating Experience section of the HSM Aging Management Program.

This information is needed to determine compliance with 10 CFR 72.172, and 72.174.

RAI-11:

Regarding the CCNPP Corrective Action Program (CAP) and the HSM Aging Management Program:

- Clarify the criteria applied to determine which inspection results will require either
  i. an Action Request,
  ii. a modification to the existing AMP, and/or
  iii. official notification to the NRC.
- Provide details on how the CAP will capture and evaluate operating experience (OE) from other ISFSIs using Horizontal Storage Modules. Clarify the CAP criteria applied to determine which external OE will require any of the action items listed above.
- Revise subsection "Monitoring and Trending" in Section A.2.1 (Reference 1), "HSM Aging Management Program," to include details on how the CAP will ensure proper monitoring and trending when an aging effect is identified but not corrected in a previous inspection.

Section A.2.1, "HSM Aging Management Program" (Reference 1) provides generalized three-tier acceptance criteria, namely (1) acceptable, (2) acceptable with defects, and (3) acceptable without defects. Similarly, ACI 349.3R includes quantitative three-tier acceptance criteria for visual inspections of concrete surfaces, namely (1) acceptance without further evaluation, (2) acceptance after review, (3) acceptance requiring further evaluation. The staff requires clarification on the CAP criteria used to determine which inspection results categorized under either Tier 2 or Tier 3 acceptance will require either (i) an Action Request, (ii) a modification to the existing AMP (e.g. inspection frequency), and/or (iii) official notification to the NRC. The licensee should clarify any differences in CAP criteria for these same action items based on OE obtained at other ISFSIs using similar HSM designs. The staff also requires details on how the baseline properties for a given HSM component will be updated based on results from previous inspections, to ensure proper monitoring and trending once an aging effect is identified but not corrected (e.g., monitoring of crack growth rates, corrosion rate, pore density).

This information is required to determine compliance with 10 CFR 72.42, 72.170, 10 CFR 72.172, and 10 CFR 72.174.

RAI-12:

Revise Section A2.1 (Reference 1), "HSM Aging Management Program," to include details of the scope of rebar inspections in the HSMs.

Table A-1 (Reference 1), "ISFSI Aging Management Examination and Inspection Procedures," states the following inspection activity: "To perform HSM rebar inspection and looking for spalled and cracking concrete." However, the HSM AMP does not include details of the scope, acceptance criteria and frequency of rebar inspections (for both above-grade and below-grade

areas). The licensee is asked to provide a revised AMP addressing this inspection activity. The revised AMP should include sufficient detail for all 10 program elements, as detailed in NUREG 1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance."

This information is needed to determine compliance with 10 CFR 72.42, 72.122(b)(1) and (f), 72.162 and 72.172.

RAI-13:

Revise the "Operating Experience" in Section A2.1 (Reference 1), "HSM Aging Management Program," to include the results of the engineering evaluation used to determine the concrete degradation mechanisms in the following condition reports (CRs). Identify any corrective action or aging management activity implemented as a result of this evaluation. Justify the assessment that the cause of the identified issues in some of these condition reports is not age-related degradation.

Condition Report	Identified in RSI-3 as age-related degradation
IR3-028-233	Yes
IR3-046-040	No
IR3-054-104	No
IR3-058-556	No
IR3-033-810	No
CR-2009-003634	No
IRE-022-449	No
IRE-000-318	No

Response to RSI-3 (Reference 7) provided a list of CRs for the in-service HSMs, some of which were identified as involving issues due to aging degradation. However, no justification was provided for those categorized as not age-related. When referring to Response to RSI-3, the licensee stated in Response to RAI A-3 (Reference 4): "To provide a more thorough assessment of the current conditions, Calvert Cliffs commits to conduct an engineering evaluation of the identified degradations performed by a qualified structural engineer." The licensee is requested to include the findings of this evaluation (e.g., identified degradation mechanisms, number of affected HSMs) and any resulting corrective actions in the "Operating Experience" section of the HSM AMP.

This information is needed to determine compliance with 10 CFR 72.42, 72.122(a), 10 CFR 72.170, 10 CFR 72.172, and 10 CFR 72.174.

RAI-14

Clarify the normal and off-normal doses presented on page 7 of the June 2013 Attachment (1) RAI response and confirm that the December 2011 confinement release calculations are correct.

Page 7 of the June 14, 2013, Attachment (1) RAI response stated that the total doses for normal and off-normal conditions were 67 mrem and 16 mrem, respectively. These doses are different from the results of previously submitted confinement release calculations found in Calculation CA07718, dated December 15, 2011.

This information is required to evaluate compliance with 10 CFR 72.104.

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RAI-15

Provide an AMP for the high burnup fuel behavior addressing the elements indicated in Section 3.6 of NUREG-1927 and include it in Appendix A of the LRA which will be incorporated by reference in the license.

It is specified in Reference 14 that storage casks specially designed for the storage of high burnup fuel designs (HSM-HB) will be added into the ISFSI Aging Management Program as referenced in the LRA.

Information regarding the testing of high burnup fuel and cladding should be considered in the development of this AMP. The work being performed as part of the DOE Cask Demonstration test plan (EPRI, 2014) should be considered, Other information such as QA records and corrective action and inspection plans should also be considered where appropriate with specific section references being cited.

This information is needed to meet the requirement of 10 CFR 72.42(a)(2).

References

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2. Attachment 1, “Second Request for Additional Information for Renewal Application,” to letter from G.H. Gellrich (Calvert Cliffs Nuclear Power Plant, LLC) to NRC, “Response to Second Request for Additional Information for Renewal Application to Special Nuclear Materials License No. 2505 for the Calvert Cliffs Independent Spent Fuel Storage Installation,” dated December 15, 2011 (ADAMS Accession No. ML11364A024).
3. Enclosure 1, “Calvert Cliffs Independent Spent Fuel Storage Installation Lead and Supplemental Canister Inspection Report,” to letter from G.H. Gellrich (Calvert Cliffs Nuclear Power Plant, LLC) to NRC, “Response to Request for Supplemental Information, re: Calvert Cliffs Independent Spent Fuel Storage Installation License Renewal Application,” dated July 27, 2012 (ADAMS Accession No. ML12212A216).
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7. Enclosure 1, “Response to Request for Supplemental Information,” to letter from G.H. Gellrich (Calvert Cliffs Nuclear Power Plant, LLC) to NRC, “Response to Request for Supplemental Information, re: Calvert Cliffs Independent Spent Fuel Storage Installation License Renewal Application,” dated February 10, 2011 (ADAMS Accession No. ML110620120).
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11. Chloride and Non-Chloride Salts,” NUREG/CR-7170, U.S. Nuclear Regulatory Commission, February 2014, ML14051A417.
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