CHAIRMAN Resource

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Sent:	Wednesday, March 13, 2019 11:25 PM
To:	RulemakingComments Resource; Allen, William; Lohr , Edward
Cc:	Mike Levin; Hutt, Heather (Harris); Jeff McDonald; Teri Sforza; Joseph Street; Toni Iseman; Decommission; CHAIRMAN Resource; CMRBARAN Resource; CMRCaputo Resource; CMRBurns Resource; Ace Hoffman; Len Hering; Gregory Jaczko; Tom English; Subrata Chakraborty; Bart Ziegler; Layton, Michael
Subject:	[External_Sender] NUHOMS canister system CoC 1029, Amendment 4 Docket ID NRC-2018-0265 Areva TN Americas Donna Gilmore comments

Ms. Gilmore,

Thank you for comments on the “List of Approved Spent Fuel Storage Casks: TN Americas LLC Standardized Advanced NUHOMS® System, Certificate of Compliance No. 1029, Amendment No. 4,” rulemaking received by the NRC on March 13, 2019 (NRC ADAMS Accession Number ML19073A105). Although the public comment period for the rulemaking closed on January 28, 2019, the NRC staff reviewed your comments. Based on the review of the comments, the NRC staff determined that they were not substantive and would not have changed the NRC’s decision on issuing the rule. Specific responses to the comment are provided in the following paragraphs.

1. **License Amendment 4 will eliminate the requirement to report peak radiation levels from the outlet air vents of the Areva TN Americas NUHOMS canisters at San Onofre and elsewhere. Through-wall cracks in canisters will have highest radiation readings from the outlet air vents`. What is the purpose of not reporting peak levels from the outlet air vents other than to hide high radiation levels?**

   I have requested the NRC provide radiation levels of the outlet air vents at San Onofre. The NRC has repeatedly refused to share the outlet air vent radiation levels of the NUHOMS canisters that are up to 15 years old. Why? Are they already leaking? What are you hiding?

   Response: The history of the dose rate measurements for the CoC 72-1029 and the Amendments to the CoC are provided in the subsequent paragraphs. The CoC was originally approved on February 2, 2003. Amendments to the CoC include Amendments 1 (approved May 31, 2005), 3 (approved February 20, 2015) and 4 (approved February 5, 2019). The CoC holder withdrew the application for Amendment 2.

The only changes to CoC 1029 Technical Specification Section 5.2.4 from the original CoC (ML030100468) have been the addition of required dose rate limits for DSCs and transfer casks as new systems were added to the CoC.

The Technical Specifications for CoC 1029 (ML030100468) and Amendment 1 of the CoC 1029 (ML051520131) did not include dose rate measurements requirements for the exterior of the Advanced Horizontal Storage Module (AHSM) loaded with either a 24PT1 or a 24PT4 dry shielded canister (DSC).

Amendment 3 of the CoC 1029 added the Advanced Horizontal Storage Module for High Burnup Fuel and High Seismic (AHSM-HS) and the 32PTH2 DSC. Additional technical specifications were included with the addition of the 32PTH2 DSC and the AHSM-HS. These additional technical specifications included the requirement for dose rate measurements at the AHSM-HS inlet bird screen and at the outside surface of the AHSM-HS door. The dose rate measurement requirements and dose rate limits are provided in CoC 1029 Amendment 3 Technical Specifications section 5.4.2 (ML15054A513).

Amendment 4 of CoC 1029 added the requirement to measure dose rates for the Advanced Horizontal Storage Module loaded with either a 24PT1 or a 24PT4 DSC. Additional clarifications were included on the locations of the dose rate measurements but the dose rate limit and the number of measurements required for the AHSM-HS with a 32PTH2 DSC were not changed. The dose rate limits for the AHSM with either a 24PTH1 or a 24PTH4 DSC and the dose rate limits for the AHSM-HS with a 32PTH2 DSC are provided in CoC 1029 Amendment 4 Technical Specifications section 5.4.2 (ML19036A558).

Any general licensee using the CoC 1029 system must comply with the CoC Technical Specification Section 5.2.3 Radiological Environmental Monitoring Program, which requires (a) the implementation of a program to ensure that the annual dose equivalent to an individual located outside the ISFSI controlled area does not exceed the annual dose limits specified in 10 CFR 72.104(a); and (b) operation of the ISFSI will not create any radioactive materials or result in any credible liquid or gaseous effluent release.

Also, a general license using the CoC 1029 system must comply with the CoC Technical Specification Section 5.2.4 Radiation Protection Program and establish administrative controls to limit personnel exposure to As Low As Reasonably Achievable (ALARA) levels in accordance with 10 CFR Part 20 and Part 72. Pursuant to 10 CFR 72.212, the general licensee must perform an analysis to confirm that the limits of 10 CFR Part 20 and 10 CFR 72.104 will be satisfied under the actual site conditions and configurations considering the planned number of DSCs to be used and the planned fuel loading conditions. In addition, the general licensee must have a monitoring program to ensure the annual dose equivalent to any real individual located outside the ISFSI controlled area does not exceed regulatory limits. The Radiological Environmental Monitoring Program is included in CoC Technical Specification Section 5.2.3.

2. **The NUHOMS canisters at Calvert Cliffs in Maryland are up to 27 years old. They already have approval to hide peak radiation levels from the outlet air vents. Are those already leaking? What are the radiation levels from the outlet air vents of those canisters?**

   Response: As a specifically licensed ISFSI under 10 CFR Part 72, the Calvert Cliffs ISFSI must comply with the regulatory requirements for dose rate limits to any individual located on or beyond the nearest boundary of the controlled area specified in 10 CFR Part 72.104 and 72.106. The Calvert Cliffs Nuclear Power Plant (CCNPP) has thermoluminescent detectors (TLDs) positioned on the ISFSI perimeter fencing that are read semiannually to provide a record of radiation exposure at the ISFSI perimeter. In addition, CCNPP has an environmental monitoring program that includes dosimeters, air samplers, and vegetation and soil samples at the ISFSI site.

3. **The NRC on August 5, 2014 stated once cracks start in canisters they can grow through the wall in 16 years. At the time they said it would be 30 years before canisters would be cool enough for moist salt air to start the corrosion cracking process. However, with the EPRI investigation of a 2-year old Diablo Canyon canister that already had a low enough canister temperature and corrosive salt particles, you know your 30 year estimate is wrong. Why do you continue to ignore this issue?**

   Response: The NRC staff has not ignored this issue. Specific answers to these and similar questions have been provided multiple times including published responses to public comments on NUREG-1927 Revision 1 (ML16125A534) and ISG-2 Revision 2 (ML16117A082). Specific responses are provided below.

   August 5, 2014 NRC Meeting Summary

   https://pbadupws.nrc.gov/docs/ML1425/ML14258A081.pdf

   The August 5, 2014 NRC/NEI chloride inducted stress corrosion cracking (CISCC) Regulatory Issue Resolution Protocol (RIRP) meeting did not include an assessment of potential canister crack growth rates. The meeting was held to discuss the progress towards understanding CISCC and developing approaches to predict susceptibility and growth rates.

   The NRC staff comment was based on calculated CISCC growth rates using the Arrhenius equation (i.e., crack growth rate was function of temperature). The NRC staff had not paired the Arrhenius equation that included parameters for CISCC as a function of temperature with environmental parameters that were required to model crack growth rates. At the time, the data available to develop a temperature dependent crack growth rate equation was limited and the uncertainty of the available data and operational experience of CISCC events were not quantified. Nevertheless, the NRC staff needed to assess the minimum inspection interval for aging management program (AMP) inspections for upcoming 10 CFR Part 72 renewals. To address the uncertainty in the available data, the NRC used a conservative assumptions that included a temperature of

50°C (122°F) and the assumption that the conditions for CISCC to occur would be continuously present. In reality, these conditions occur infrequently and are typically limited to a few hours per day over a duration of a few days. These conservative assumptions resulted in a calculated crack growth rate slightly greater than 0.8 mm/year (0.03 in/year) which would penetrate 13 mm (0.5 in) stainless steel section in a period of 16 years.

During the next CISCC RIRP meeting on April 21, 2015, EPRI (NRC ADAMS package ML15142A805) presented the results of their work published in, "Flaw Growth and Flaw Tolerance Assessment for Dry Cask Storage Canisters," EPRI-3002002785, Palo Alto, CA: 2014. The NRC independently developed an CISCC model which also used data from the National Oceanic and Atmospheric Administration (NOAA) coupled to the temperature dependent crack growth rate calculation that the NRC presented at the August 5, 2014 CISCC RIRP meeting. Although the EPRI and the NRC temperature dependent crack growth rate calculations were based on different sets of data, the results of the CISCC assessments were similar. In a hot and humid environment such as Florida, the conditions for CISCC are more prevalent compared to the milder California coastal environment. Using the developed CISCC model, through wall CISCC in Florida was determined to be possible in approximately 26-30 years whereas in California, through wall CISCC was calculated to take approximately 80 years.

A plot of the crack growth rate as a function of temperature and the sources of data (Kosaki 2008; Hayashibara et al. 2008) for the Arrhenius equation parameters is shown on slide 4 of the NRC presentation included in ML15146A115. These are the same Arrhenius equation parameters used in the August 5, 2014 CISCC RIRP meeting. As stated in slide 11, the model still included multiple conservative assumptions which likely over predict CISCC growth rates resulting in shorter calculated times for through wall cracking.

Diablo Canyon: conditions for stress corrosion cracking in 2 years

Conditions necessary for CISCC are not present on the canisters stored at the Diablo Canyon ISFSI. The NRC staff are aware of a publicized assertion regarding the Diablo Canyon ISFSI made by a member of the public October 23, 2014, "Diablo Canyon: conditions for stress corrosion cracking in 2 years."
https://sanonofresafety.files.wordpress.com/2011/11/diablocanyonscc-2014-10-23.pdf

This assertion assumes unrealistic humidity values, inaccurate information regarding both the composition of the dust deposits on the Diablo Canyon canisters and conditions for deliquescence resulting in an improbable assessment of crack initiation and crack growth rate.

The staff considers the assumed absolute humidity values of 40-45 g/m^3 are unrealistic based on the range of observed atmospheric weather conditions. An absolute humidity of 40 g/m^3 would result in a dew point of ~37° (98 °F) which is greater than any recorded dew point measured in the U.S. (such conditions would be immediately life threating to the general population). Ambient absolute humidity values above 30 g/m^3 are rare and are typically limited to a few hours per day over a duration of a few days.

CISCC at 85°C (185°F) by the deliquescence of $MgCl_2$ (conservatively using a relative humidity of 18% which was the lowest measured relative humidity for efflorescence of sea salt at 80°C (176°F) reported by He et al., 2014) would only be possible in an ambient environment with an absolute humidity of 63 g/m^3 corresponding to a dew point of 46°C (115°F). In order for such conditions to continuously occur, the ambient low temperature during the diurnal cycle must continuously be at or above 46°C (115°F). Such conditions have never been observed in an ambient environment.

The assessment of the conditions on the Diablo Canyon and Hope Creek canisters and the analyses of samples obtained from the surfaces of canisters at these ISFSI are described in SANDIA REPORT SAND2014-16383, "Analysis of Dust Samples Collected from Spent Nuclear Fuel Interim Storage Containers at Hope Creek, Delaware, and Diablo Canyon, California," Albuquerque, New Mexico: Sandia National Laboratories, July 2014 (Bryan and Enos, 2014). As described in the analytical results reported by Bryan and Enos (2014), the deposited material on the Diablo Canyon canisters is sodium chloride (NaCl) with some magnesium sulfate ($MgSO_4$). No magnesium chloride ($MgCl_2$) was found on the Diablo Canyon canisters. The conclusion section of Bryan and Enos (2014) report explains the limitations for the sample collection and analyses.

Bryan, C.R. and D.G. Enos. SAND2014-16383, "Analysis of Dust Samples Collected From Spent Nuclear Fuel Interim Storage Containers at Hope Creek, Delaware, and Diablo Canyon, California." Albuquerque, New Mexico: Sandia National Laboratories, July 2014. https://prod-ng.sandia.gov/techlib-noauth/access-control.cgi/2014/1416383.pdf.

He, X., et al., "Assessment of Stress Corrosion Cracking Susceptibility for Austenitic Stainless Steels Exposed to Atmospheric Chloride and Non-Chloride Salts," NUREG/CR-7170, U.S. Nuclear Regulatory Commission, February 2014, ADAMS Accession No. ML14051A417.

4. Amendment 4 will eliminate the requirement for a spent fuel pool once pools are empty. Why isn't there a requirement to have a hot cell on-site or a pool on-site in case of need to replace canisters? To assume there will not be through-wall cracks or other failures of the canisters or a need to repackage fuel for transport is not justified. As you know, either a pool or hot cell is required for these conditions.

Response: CoC 72-1029 Amendment 4 does not eliminate the requirement for a spent fuel pool. CoC 72-1029 Amendment 4 includes revised procedures that address the eventual decommissioning of the spent fuel pool. CoC 1029 UFSAR Revision 9 Section 11.2.5.4 Corrective Actions states:

The recovery operations listed in this section assume the cask drop occurs during initial transfer and loading of the DSC into the AHSM, when the spent fuel pool is still operational and available. If a drop of the transfer cask with a loaded DSC occurs during *transfer to a transportation cask and an inspection determines that the DSC is damaged and a spent fuel pool is not available onsite, the DSC shall be placed into a safe condition. If required, the DSC could be transported offsite to a site licensed for either dry or wet unloading of the DSC.*

This UFSAR revision is applicable to the 24PT1, 24PT4 and the 32PTH2 DSCs. Enclosure 3 to E-53756 Replacement Pages for ANUH-01.0150, Standardized Advanced NUHOMS® UFSAR, Revision 9 (Public Version) (ML19073A200) is publicly available in ADAMS.

NRC licensees are required to maintain systems to comply with NRC regulations, system technical specifications and NRC license conditions. If safety issues are identified with a spent fuel storage system, the licensee must pursue corrective actions to ensure that the spent fuel is safely stored. These actions would not necessarily involve replacement of major dry storage system components (e.g., canister or cask) or repackaging the spent fuel in a new system. Corrective actions would more likely include further assessment and inspection, in-place repairs to components similar to those that have actually been used on components in commercial nuclear power reactors such as the application of remote repair welding techniques or creating a secondary confinement boundary for the spent fuel if needed (e.g., nesting a canister within another container).

The NRC does not prescribe how licensees would take corrective action with respect to specific spent fuel canister designs. The NRC evaluates whether the corrective action taken is effective and sufficient to maintain the intended functions of the important-to-safety structures, systems, and components, and remain compliant with the requirements in 10 CFR Part 72. Proposed repair methods require demonstration and compliance with an NRC-approved quality assurance program.

In the event that a storage canister must be unloaded, procedures for removing fuel from welded stainless steel canisters are included in operational procedures of licensed designs. These procedures are included in the dry storage system Safety Analysis Report. These procedures have been reviewed and approved by the NRC. Per the regulatory requirements in 10CFR 72.236(h), spent fuel storage systems must be compatible with wet or dry spent fuel loading and unloading facilities. Performing such an activity should not be undertaken unless there is a specific safety need, based on indications that the canister is not performing adequately and only after evaluating other measures to remedy the circumstance with the canister along with the potential risks such activities, including opening the canister, could present.

5. **The Nuclear Waste Policy Act requires the ability to retrieve fuel assemblies for the purpose of transporting the fuel to another site by the DOE. Why are you eliminating the only method to comply with this law?**

   Response: The design, construction and operation of the 72-1029 system is compliant with the NWPA and the NRC regulatory requirements with respect to retrievability in 10 CFR Part 72.236(m).

   The DSCs included in the 1029 CoC, as well as most of the welded stainless steel canisters used in dry storage systems, are designed to be transportable inside a specially designed transportation overpack. This allows the fuel to be stored and transported without the need for additional fuel handling. The welded stainless steel canisters are leak tested prior to being put into service. This assures that the inert helium environment will be maintain inside the canister. The inert environment prevents degradation of the stored spent fuel and eliminates the need to inspect the fuel or the interior of the canister. However, if there is a safety need to open a welded canister, there is a procedure in the Safety Analysis Report which has been reviewed and approved by the NRC.

   The Nuclear Waste Policy Act (NWPA) does not require the ability to retrieve fuel assemblies for the purpose of transporting the fuel to another site by the DOE. The NWPA addresses transportation of spent nuclear fuel in Title I—Disposal and Storage of High-Level Radioactive Waste, Spent Nuclear Fuel, and Low-Level Radioactive Waste, Subtitle H-Transportation. NWPA Title I, Subtitle H, Section 180(a) states that no spent nuclear fuel or high-level radioactive waste may be transported by or for the Secretary (DOE) under Subtitle A (Repositories for Disposal of High-Level Radioactive Waste and Spent Nuclear Fuel) or under Subtitle C (Monitored Retrievable Storage) except in packages that have been certified for such purpose by the Commission (NRC). The NRC's transportation regulations are in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material." The NRC has certified systems for the transportation of spent nuclear fuel that use loading and unloading of individual fuel assemblies as well as systems for transportable storage canisters that do not require handling of individual fuel assemblies.

   The regulatory requirements for retrievability are in 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste." Retrievability is specifically mentioned in 10 CFR 72.122(l), which states that "storage systems must be designed to allow ready retrieval of spent fuel, high-level radioactive waste, and reactor-related greater than class C waste for further processing or disposal." 10 CFR 72.236(m) states that certificate of compliance (CoC) holders should design for retrievability; "[t]o the extent practicable in the design of spent fuel storage casks, consideration should be given to compatibility with removal of the stored spent fuel from a reactor site, transportation, and ultimate disposition by the Department of Energy."

   Interim Staff Guidance (ISG) – 2 Revision 2 (ML16117A080) provides guidance to the staff for determining whether an application submitted under 10 CFR Part 72, sufficiently demonstrates that the system is designed to allow ready retrieval of spent fuel. ISG-2, Revision 2 defines ready retrieval as "the ability to safely remove the spent fuel from storage for further processing or disposal." In order to demonstrate the ability for ready retrieval, a licensee should demonstrate it has the ability to perform any of the three options below. These options may be utilized individually or in any combination or sequence, as appropriate.

A. remove individual or canned spent fuel assemblies from wet or dry storage,
B. remove a canister loaded with spent fuel assemblies from a storage cask/overpack,
C. remove a cask loaded with spent fuel assemblies from the storage location.

Public comments on ISG-2 Revision 2 and the NRC's responses to the comments received are publicly available in ML16117A082.

6. **These Sierra Club comments to the NRC busted the NRC false assumptions that nothing can go wrong once fuel is in dry storage. Why are you ignoring them? Sierra Club comments to NRC proposed rule for regulatory improvements for decommissioning power reactors, Docket NRC-2015-0070, March 2016 http://www.nrc.gov/docs/ML1608/ML16082A004.pdf**

   Response: Many of the subjects included in Susan Corbett's letter regarding Docket ID NRC-2015-0070 Advanced Notice of Proposed Rulemaking (ANPR): Regulatory Improvements for Decommissioning Power Reactors Comments have previously been addressed by the NRC as responses to public comments including (1) inspection of dry storage systems; (2) the potential for aging effects including chloride induced stress corrosion cracking (CISCC); (3) security and protection against terrorism; (4) potential pyrophoricity of spent fuel storage systems contents such as zirconium hydrides; (5) risks of dry storage of spent nuclear fuel. Many of these issues were addressed in the published responses to public comments on NUREG-1927 Revision 1 (ML16125A534) and ISG-2 Revision 2 (ML16117A082). The NRC staff have not ignored these comments. See the link: https://www.regulations.gov/docket?D=NRC-2015-0070

   The comments from Ms. Corbett were on the advance notice of proposed rulemaking and, while the staff did not prepare an explicit response to those comments, there is a general discussion of comment themes and NRC staff response in the final regulatory basis document (ML17215A010). The current NRC staff position on various topics in the proposed rule package which is before the Commission (ML18012A019).

   The staff considered all comments received and used them to develop the proposed rule package but will not be providing detailed responses. The staff will consider comments on the proposed rule (when it is published in the Federal Register), and the staff will provide responses to significant public comments in the final rule package.

7. **Amendment 4 eliminates the requirement of daily visual inspections of air vents. Why are you only requiring temperature monitoring? Previously, you required both. Why did you previously require both, but now you don't? Why are you reducing safety?**

   Response: Temperature monitoring is an acceptable method to demonstrate the storage system vents are free from blockage allowing decay heat removal. Use of a temperature monitoring program instead of a visual inspection program does not result in a reduction of safety.

   CoC Technical Specification Section 5.2.5 addresses the AHSM/AHSM-HS Thermal Monitoring Program. Amendment 4 allows the use of temperature monitoring programs for the AHSMs loaded with the 24PT1 DSC.

   In the original CoC Technical Specification (ML030100468) visual inspection of the AHSM air vents was required. In Amendment 1 of the CoC 1029, the CoC Technical Specification (ML051520131) was revised to include requirements for the AHSM air vents for the 24PT4 DSC. The air vent monitoring program credited the temperature measurements obtained in the thermal monitoring program for the AHSMs loaded with the 24PT4 DSCs. Similarly, the 32PTH2 DSCs and the AHSM-HS were added to the CoC in Amendment 3. The CoC Technical Specification (ML15054A513) also credited the temperature measurements obtained in the thermal monitoring program for the AHSM-HSs loaded with the 32PTH2 DSCs. Amendment 4 of the CoC 1029, the CoC Technical Specifications revised the requirements for the AHSMs loaded with 24PT1 DSCs to credit the temperature measurements obtained in the thermal monitoring program. As stated in the Technical Specifications, visual inspection of all AHSMs will be used if the temperature measurements from the thermal monitoring program are not available.

8. **This approval allows increased temperatures. Why are you allowing increased temperatures? What was the reason you required lower temperatures previously? Why are you reducing safety? At the NRC RIC Conference on March 12, 2019, during the Q&A for NRC Chairman Svinicki, it was mentioned that one of the improvements NRC employees would like to see is for their management to have the courage to do the right thing. Please heed your employees' requests for our safety and yours by denying license Amendment 4 and amending any others you have approved that lowered these safety standards.**

   Response: The allowable temperatures of important to safety structures, systems and components were not increased in Amendment 4 of the 1029 CoC. Allowable temperatures of the important to safety structures systems and components including the 24PT1, 24PT4 and the 32PTH2 DSCs as well as the AHSM and AHSM-HS are provided in publicly available versions of the UFSARs. The NRC ADAMS Accession numbers for the 72-1029 FSARs are listed below.

   CoC 72-1029 FSAR: ML031040379, ML050410252, ML031040379 and ML031040312

CoC 72-1029 Amd 1 FSAR: ML17167A234 and ML17167A241

CoC 72-1029 Amd 3 FSAR: ML16228A017

CoC 72-1029 Amd 4 FSAR: ML19073A204

9. **Also, please see petition to recall the Holtec canister system at San Onofre. The system is a lemon and must be replaced. Holtec's lack of a precision downloading system unavoidably causes the walls of all canisters to be damaged the entire length of the canister wall as they are downloaded into the storage holes. Michael Layton confirmed the NRC approved this system and told me he didn't know whether the NRC knew that the Holtec system was not a precision downloading system. All the above-ground Holtec systems may likely have a similar problem, based on my research of the HI-STORM 100 FSAR. The NRC needs to reevaluate their policy of giving exemptions to destroy spent fuel pools. Rejecting Amendment 4 would be a good start. https://www.change.org/p/san-onofre-nuclear-waste-recall-defective-storage-system**

   Response: The petition has been reviewed.