Application of Guidance to Implement 10 CFR 72.48 (NEI-96-07 Appendix B) - Examples of Potential Realistic Activities Reviewed through the 72.48 Process
Attachment 6 – Example 5 – Reduction in Diameter of Concrete Over-Pack

Proposed Activity

The storage system is a vertical canister-based system with a cylindrical concrete ventilated outer cask. The CoC holder seeks to reduce the diameter of the outer concrete cask by 12 inches (six inches radially) in order to meet the needs of a particular cask user. The remaining characteristics of the cask structure, concrete, reinforcing bar, etc. remain the same. Structurally the modified cask meets all acceptance criteria for normal, off-normal, and accident conditions (e.g., cask drop and tipover). All other technical evaluations remain unaffected.

The shielding calculations for the proposed modification to the concrete cask indicate that if the current design basis fuel assembly is used in all storage locations, the dose rate limit specified in the CoC cannot be met. The CoC holder revises its shielding calculation for the proposed modification to change the design basis fuel assembly to reflect only the limiting combinations of cooling time and burnup permitted for loading in the cask (5 years & 35,000 MWd/MTU; 10 years & 50,000 MWd/MTU; and 15 years & 65,000 MWd/MTU), rather than the conservative 5 years cooled, 65,000 MWd/MTU burned assembly. A sufficient number of cooling time/burnup combinations are analyzed to ensure the CoC dose rate limit is not exceeded. In fact, across the board, the calculated dose rates are less than the CoC limit for all cooling time/burnup combinations.

Performing the shielding analysis for the reduced diameter cask yields surface dose rates within the CoC/TS limits for all selected cooling time/burnup combinations when applying the same method as used for the original diameter cask.

NRC Approved Licensing Basis

The licensing basis for the cask system, comprised of the CoC (including Appendix A and Appendix B), the SER, and the FSAR (as updated) describe a canister-based, vertical storage cask system.

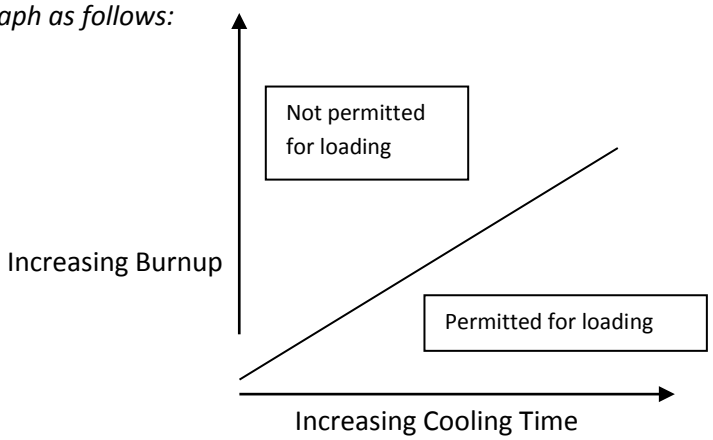
The CoC and TS are silent with respect to the diameter of the concrete cask. The description of the cask system in the SER and FSAR (including drawings), and the supporting structural, thermal and shielding analyses are more detailed.

CoC, TS and Approved Contents

> *The CoC description states that the cask system consists of the canister, which contains the spent fuel, and the concrete cask, which contains the canister during storage. The CoC describes the concrete cask as the storage overpack which provides structural support, confinement, shielding, protection from environmental conditions, and natural convection cooling of the canister during long term storage. It further describes the storage cask as a reinforced concrete structure with a carbon steel inner liner. The concrete cask has an annular air passage to allow passive convection air flow around the canister.*
>
> *The CoC permits loading fuel cooled as little as five years and burned as high as 65,000 MWd/MTU, although not in that combination. The design basis shielding analysis uses a hypothetical 5-year cooled, 65,000 MWd/MTU fuel as the design basis assembly in all fuel storage locations. The NRC's SER does not discuss the choice to assume design basis assembly in*

all locations. The CoC includes a contact dose rate limit at the cask mid-plane that was determined by calculation, using the design-basis fuel assembly.

The CoC permits fuel to be loaded into the storage system in accordance with a burnup/cooling time graph as follows:



Limiting combinations of cooling time and burnup for fuel assemblies that are permitted for loading (i.e., they fall on the line in the graph) are:

5 years, 35,000 MWd/MTU
10 years, 50,000 MWd/MTU
15 years, 65,000 MWd/MTU

Thus, the design basis fuel assembly used in the shielding analysis, cooled 5 years and having a burnup of 65,000 MWd/MTU is clearly in the "Not Permitted for Loading" Zone of the CoC graph.

The CoC Appendix A, Design Features, includes a maximum surface dose rate for the concrete cask.

72.48 Applicability Determination

{*72.48 applies if Yes is answered to the first question and No is answered to last two questions*}
[NEI B4.1.1]: Does the proposed activity require a change to the ISFSI, cask design or procedure in the FSAR that is more than an editorial change (B4.1.3) and is not a managerial procedure (B4.1.4)?

Response: Yes. This modification involves a change to the concrete cask design as described in the cask FSAR. It also changes the depictions and description of the cask system in several figures, license drawings and text in the FSAR.

[NEI B4.1.1 1st bullet]: Does the proposed activity require a change in the CoC, including appendices?

Response: No. Neither the CoC, nor the appendices, describe the diameter of the over-pack, or the conservative five-year burned 65,000 MWd/MTU design basis combination. The burnup-cooling time limits are not being changed in the CoC or appendices. Changes are only being

made to the assumed burnup-cooling time limits assumed in the shielding analyses. No change to either of the CoC or the TS is required.

[NEI B4.1.1 2nd bullet]: Does a different regulation provide more specific criteria for accomplishing the proposed activity?

Response: No.

Conclusion: 72.48 applies and the proposed activity must be screened.

72.48 Screening

{*72.48 evaluation is required if Yes is answered to any of the following questions*}
1. [NEI B4.2.1.1]: Does the proposed activity involve a change to an SSC that adversely affects a cask FSAR described design function? [NEI Page 36 footnote, and page 38]: Does the proposed activity involve an alteration to a design basis limit for a fission product barrier?

Response: Yes. [NEI Page 36, last sentence] Because the effect of reducing the cask diameter is such that existing safety analyses (shielding analyses) are no longer bounding and therefore FSAR safety analyses must be re-run to demonstrate that all required safety functions and design requirements are met, the change is considered to be adverse. It is noted that the shielding analysis for the new configuration still comply with the TS limit. Structurally, the modified cask meets all acceptance criteria for normal, off-normal, and accident conditions. Structural, thermal, criticality and confinement analyses remain unaffected as the results of the original analyses contained in the FSAR bound the new configuration.

2. [NEI B4.2.1.2]: Does the proposed activity involve a change to a procedure that adversely affects how cask FSAR described SSC design functions are performed or controlled?

Response: No. Procedures performing or controlling FSAR described SSC design functions remain unchanged by the proposed modification. Reducing the diameter of the concrete cask does not alter any procedure that adversely affects how the design functions of the concrete cask are performed or controlled.

3. [NEI B4.2.1.3]: Does the proposed activity involve an adverse change to an element of a cask FSAR described evaluation methodology, or use of an alternative evaluation methodology, that is used in establishing the design bases or used in the safety analyses?

Response: No. The change (i.e. cask diameter) is not an element of the method of evaluation, but rather it is an SSC, which is not part of the calculational framework. The method used is identical to that for the original configuration as described in the FSAR. The reduced diameter of the concrete cask is an input to the shielding analysis, not an element of the method of evaluation.

4. [NEI B4.2.2]: Does the proposed activity involve a test or experiment not described in the cask FSAR, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the cask FSAR?

> Response: No. This change is not a test or experiment because it is intended to be a permanent modification for an alternate design that will perform in the same manner in which the cask provides for safe storage of the spent fuel as described in the FSAR (as updated).

5. [NEI B4.2.2]: Does the proposed activity result in the CoC/TS needing to be changed?

> Response: No. The CoC, including appendices do not specify the diameter of the concrete cask. The concrete cask contact dose rate limit contained in the TS remains unchanged. The general description of the concrete cask in the CoC also remains unchanged.

Conclusion: A 72.48 evaluation is required. One or more "yes" answers to the screening questions indicates a 72.48 evaluation is required to be performed. In this case, only Screen question 1 was answered 'yes', therefore, only evaluation questions 72.48(c)(2)(i-vii) are applicable.

72.48 Evaluation

{*Prior NRC approval is required if Yes is answered to any of the following questions*}
[NEI B4.3 2nd para]: "Criteria (c)(2)(i—vii) are applicable to activities other than changes in methods of evaluation. Criterion (c)(2)(viii) is applicable to changes in methods of evaluation. Each activity must be evaluated against each applicable criterion."

> Since only question 1 was answered 'yes', then only the first 7 evaluation questions, 72.48(c)(2)(i—vii), are applicable.

Question 1: [NEI 96-07 B4.3.1] Does the change result in more than a minimal increase in the frequency of an accident previously evaluated in the UFSAR?

> Response: No. Reduction of the concrete cask diameter does not increase the likelihood of occurrence any of the accidents previously evaluated in the FSAR because the smaller cask diameter is not an accident initiator.

Question 2: [NEI 96-07 B4.3.2] Does the change result in more than a minimal increase in the likelihood of occurrence of a malfunction of a system structure, or component (SSC) important to safety previously evaluated in the UFSAR?

> Response: No. The affected design function is shielding of the spent fuel content. The modified cask meets all acceptance criteria for normal, off-normal and accident conditions. Shielding is provided by the concrete cask as a passive system. No malfunctions of passive systems are evaluated in the FSAR (as updated).

Question 3: [NEI 96-07 B4.3.3] Does the change result in more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR?

Response: No. The radiological consequences of all accidents described in the FSAR remain the same as currently evaluated because loading of fuel in the modified cask system is limited to a combination of cooling time and burnup which meets the CoC limit for maximum surface dose rate.

Question 4: [NEI 96-07 B4.3.4] Does the change result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the UFSAR?

Response: No. The concrete cask storage system is a passive system. No malfunctions are described in the FSAR (as updated) for the passive storage system. Reducing the diameter of the concrete cask by 12 inches will not result in any increase in the radiological consequences of a malfunction of any SSC important to the safety of the storage system.

Question 5: [NEI 96-07 B4.3.5] Does the change create a possibility for an accident of a different type than any previously evaluated in the UFSAR?

Response: No. Reduction of the concrete cask diameter by 12 inches does not create the possibility of occurrence of a different accident previously not evaluated in the FSAR because the accidents for the reduced-diameter cask are bounded by the accidents for the original diameter cask.

Question 6: [NEI 96-07 B4.3.6]: Does the proposed activity create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the UFSAR?

Response: No. The concrete cask storage system is a passive system. No malfunctions are described in the FSAR (as updated) for the passive storage system. Reducing the diameter of the concrete cask by 12 inches will not result in creating the possibility of a malfunction of any SSC important to safety of the storage system with a different result.

Question 7: [NEI 96-07 B4.3.7] Does the change result in a design basis limit for a fission product barrier as described in the UFSAR being exceeded or altered?

Response: No. The fission product barriers are the fuel cladding and the canister confinement boundary. Reducing the diameter of the concrete cask by 12 inches will not result in any change to these fission product barriers

Question 8: [NEI 96-07 B4.3.8] Does the activity result in departure from a method of evaluation described in UFSAR used in establishing the design bases or safety analyses?

Response: Not applicable. The change (i.e. cask diameter) is not an element of a method of evaluation, but rather it is an SSC, which is not part of the calculational framework. The method of evaluation used is identical to that for the original configuration as described in the FSAR. The reduced diameter of the concrete cask is an input to the shielding analysis, not an element of the method of evaluation.

Conclusion: <u>No prior approval from the NRC is required</u> for this change because questions 1-8 of the 72.48 evaluation are answered “no.”

Additional Considerations

The following variations to the main example demonstrate how small changes in the specific conditions can result in different conclusions from the 72.48 review.

Variant 1

The design basis in the cask FSAR includes fuel assemblies with 5-year cooling time and 65,000 MWd/MTU burnup. The SER recognizes the 5-year cooled, 65,000 MWd/MTU design basis fuel assembly was chosen conservatively, however this was the basis for the NRC approval of the cask design and contents.

The CoC holder re-performs its shielding calculation for the proposed modification to change the design basis fuel assembly to reflect only the limiting combinations of cooling time and burnup permitted for loading in the cask (5 years & 35,000 MWd/MTU; 10 years & 50,000 MWd/MTU; and 15 years & 65,000 MWd/MTU), rather than the conservative 5 years cooled, 65,000 MWd/MTU burned assembly. A sufficient number of cooling time/burnup combinations are analyzed to ensure the CoC dose rate limit is not exceeded. In fact, across the board, the calculated dose rates are less than the CoC limit for all cooling time/burnup combinations.

> *Screening – Answer to Q- 3 is "Yes." Changing the design basis fuel assembly to reflect only the limiting combinations of cooling time and burnup permitted for loading in the cask has an adverse impact on the previously-approved user-inputs to the combination of cooling time/burnup, which represent an "element of the method." Use of the new combinations reduces the conservatism provided by this "element" (Refer to NEI 96-07, Appendix B, Section B3.8, two bullet points).*
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> *Evaluation – Answer to Q-8: Yes. Revision of the MOE (changing assumed fuel parameters) would have non-conservative results, i.e. further from design limit (for an equivalent cask diameter for the original design), therefore the results are not 'essentially the same' or 'conservative' and therefore it is a departure from a MOE, and prior NRC approval is required.*