Topical Report on the Radiological Fuel Qualification Methodology for Dry Storage Systems

Pre-Submittal Meeting

March 10, 2021

Dr. Stefan Anton, Holtec International

Introduction

- The principal goal of the TR is to establish the methodology (MOE), not just a framework.
- However, some part of the methodology is currently not located in the TR, it is proposed to be located in the FSAR(s). This is discussed further on some of the following slides.
- Advantages and disadvantages of this approach should be discussed, and agreement should be reached if this approach is acceptable or if it should be changed

Overview of the TR

- Overall approach to qualify acceptable contents
  - Chapter 3 of the TR, and part of the MOE
- Source Term Calculation Methodology
  - Chapter 4 of the TR, and part of the MOE
- Radiation Transport Evaluation Methodology
  - Specified in the corresponding FSAR(s), and part of the MOE
  - A description of the aspects that need to be included in this part of the MOE is in Appendix B of the TR
- Qualification report(s)
  - These reports apply the MOE to define and qualify content for a given storage system (and maybe a given site)
  - Appendix A of the TR contains several examples, outlining the aspects that need to be addressed in any such report

Source Term Calculation Methodology

- Text was predominantly taken from current FSARs
- This is part of the MOE, so all approaches, steps and assumptions are requirements, but in some cases, there may be acceptable alternatives based on specified criteria
  - Example is the Scale Version, 6.2.1, or newer with justification showing results are equivalent to 6.2.1

Radiation Transport Calculations

- Reasons for the proposal to have this located in the FSAR(s) instead of the TR
  - This is part of an industry effort. Hence a more generic description in the TR would be preferable, without any vendor-specific details. If that is feasible.
  - The methodology for performing the radiation transport calculations would have to include design details for the system that calculations are to be performed for. Information in the TR can not be changed by the vendor (under 72.48). While an attempt can be made to specify acceptable variations in the TR, there is a possibility that future desired or needed changes would not be possible when details are included in the TR as opposed to the FSAR.

Radiation Transport Calculations (Cont.)

- In the FSAR(s), the following will be established
  - Calculational methods and models
    - Essentially the same methods that are currently used, no plans to introduce anything new
  - Dose rates limits (also in TS)
  - Representative content, consistent with the dose rate limits
  - Presentation of dose rates for standard locations on and around the casks, for the representative content, including locations with and without a specified dose rate limit
  - Site boundary calculations, using the representative content, to satisfy 72.236(d) with respect to 72.104
  - Accident dose calculations, to satisfy 72.236(d) with respect to 72.106
  - Area of Applicability
    - Mainly fuel/NFH types, also same as currently defined
  - Limitations to what can be changed without an LAR (i.e. under 72.48)

Radiation Transport Calculations (Cont.)

- Licensing Efficiency
  - It is recognized that locating the radiation transport calculations in the FSAR instead of the TR may be less efficient, but the difference should not be substantial.
  - In both cases (TR vs FSAR), the radiation transport calculation methodology needs to be reviewed and approved. The main difference is *when* this review is performed.
    - If this is included in the TR, the review is performed at the same time as the review of the TR
    - If it is included in the FSAR, the review is performed as part of the LAR that includes the reference to the TR into the CoC/TS, and so this reference is only included when the radiation transport calculations part of the methodology is considered acceptable.
    - Note that different systems (e.g. HI-STORM 100, FW, UMAX) have different designs and to some degree different content. Hence moving these sections from the FSARs into the TR would not allow to combine them into a single section.
  - In both cases, the final outcome (efficiency gain) is the same, i.e., that contents can be qualified through a qualification report, instead of specifying it in the CoC/TS.

Qualification Report

- The qualification report would be similar to the so-called “CoC Dose Rate” report currently performed on a site-specific basis. This report does the following
  - Define contents to be confirmed
  - Performs dose rate calculations (source term and radiation transport), using the same models as those used to show compliance with 72.104 (see 1014 CoC Appendix A, Section 5.7.2/3)
  - This established the dose rate limits that are to be used for the dose rate measurements in accordance with 1014 CoC Appendix A, Section 5.7.5.
  - Those limits must be below those in 1014 CoC Appendix A, Section 5.7.4, so this also assures that the limits in that section are met.
- Overall, this report, for a selected/given content of the casks, establishes the dose rate limits for the measurements, which then also confirms that the CoC dose rate limits are met.
  - An example of such a report can be provided.
- The qualification report for the TR would be similar, defining a content to be qualified (which may be different from that in the CoC report), using the MOE defined in the TR (which could be slightly different from the 72.104 method), and confirms that using this, the Dose Rate limits are met.
- The qualification reports would be submitted to NRC for information (we understand this to be similar to the COLR reports for nuclear plants). This would have to be done at a still-to-be-defined time before a system is loaded with the fuel qualified in the report

Further Actions and Schedule

- To be discussed at the meeting