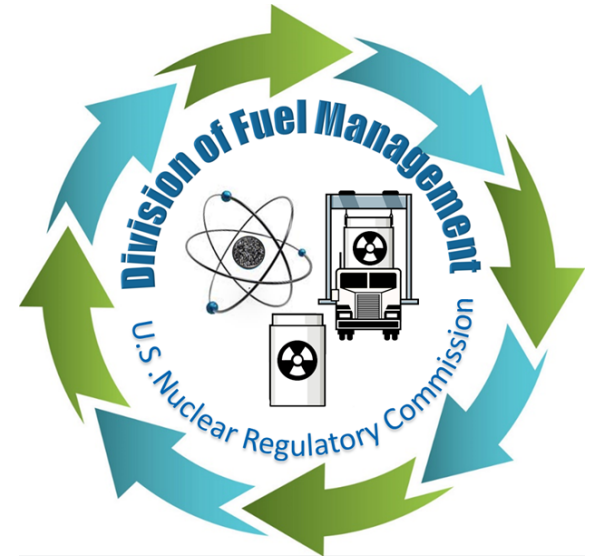


# Shielding Topics

July 28 Public Meeting with NEI

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# Previous Meeting

- June 23: NRC presented its idea for the option of using an NRC approved method of evaluation (MOE) in lieu of specific values within the Technical Specifications (TS) related to shielding and dose regulations
- This is an optional licensing strategy that staff is investigating to potentially improve the licensing process for issuing Certificates of Compliance (CoC) for dry storage system (DSS) designs while maintaining the equivalent level of safety
- This is a move to a more performance based interpretation of the regulations
- NRC staff stated that more details would be provided at the July meeting



# Regulations, 10 CFR 72.234, 236, 238

- 10 CFR 72.234 (a): The certificate holder and applicant for a CoC shall ensure that the design, fabrication, testing, and maintenance of a spent fuel storage cask comply with the requirements in § 72.236.
- 10 CFR 72.236: The certificate holder and applicant for a CoC shall ensure that the requirements of this section are met.
  - (a): Specifications must be provided for the spent fuel to be stored in the spent fuel storage cask, such as, but not limited to, ... burn-up (i.e., megawatt-days/MTU), minimum acceptable cooling time of the spent fuel prior to storage in the spent fuel storage cask ... maximum spent fuel loading limit, ...
  - (b): Design bases and design criteria must be provided for structures, systems, and components important to safety
  - (d): Radiation shielding and confinement features must be provided sufficient to meet the requirements in §§ 72.104 and 72.106.
- 10 CFR 72.238: A Certificate of Compliance for a cask model will be issued by NRC for a term not to exceed 40 years on a finding that the requirements in § 72.236(a) through (i) are met.



# Regulations, 10 CFR 72.104 and 106

- 10 CFR 72.104 Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS.
  - (a) Includes annual dose limit for a real individual beyond the controlled area boundary
    - Includes effluents and contributions from other sources in addition to direct radiation from the dry storage system
  - Also includes requirements for “operational restrictions” and “operational levels” to be established that (b) meet ALARA objectives and direct radiation levels associated with the (c) annual dose limits, respectively, associated with ISFSI or MRS operations
- 10 CFR 72.106 Controlled area of an ISFSI or MRS.
  - 10 CFR 72.106(b) includes a dose limit for any design basis accident



# Inspection of 10 CFR 72.104 and 106

- 72.212(b)(5)(iii) – sites must perform evaluations showing that they meet dose limits in 72.104
- 72.212(b)(6) – sites must review the Safety Analysis Report referenced in the CoC to determine whether or not the reactor site parameters are enveloped by the cask design bases. This would include a review of design basis accidents and their potential affect on 10 CFR 72.106 dose limits
- Site specific details such as:
  - Distance to the controlled area boundary or limiting real individual
  - occupancy factors
  - Site specific fuel limitations
  - Number of casks and resultant cask shadowing
  - Combinations of types of casks used at a facility
  - Use of berms or other supplemental shielding
  - Site specific accident assumptions and limitations
- Inspection procedures require inspectors review evaluations ensuring 72.104 and 72.106 compliance before cask loading and review actual dose rates during routine inspection



# Method of Evaluation within TS

- A specific MOE that has been reviewed and approved by the NRC may be able to limit certain parameters listed in 72.236(a)
- Staff is looking into how MOE including area of applicability would be specified within the TS/FSAR (or topical, if applicable) so that there is a balance between design control and adequate flexibility for the vendor and general licensee to make changes per 10 CFR 72.48
- This is similar to operating reactors that use a Core Operating Limits Report (COLR) and/or Pressure and Temperature Limits Report (PTLR)
  - Values of limits are not specified in the TS but TS states that limits will be derived using NRC approved methods
    - MOE may be the Safety Analysis Report (SAR) methods specific to a design or a more generic topical report
  - NRC is still investigating how fuel specification values (e.g. burnup, enrichment, cooling time) would be communicated to the NRC similar to the COLR or PTLR





# Method of Evaluation Reviews

- MOE reviews would be reviewed similar to current reviews (e.g. using guidance in NUREG-2215 (as updated) and NUREG/CR-6802)
- NRC Staff's review would be slightly different in that the emphasis of the review will be on the method rather than the values in the TS
- The MOE needs to describe how it determines fuel specifications (i.e. burnup, enrichment and cooling time) used to specify the spent fuel to be stored in accordance with 72.236(a)
- This is similar to how some shielding reviews of dry storage system (DSS) designs are currently performed that focus on the method where it is impractical for the staff to review complicated loading tables



# Demonstration Evaluations

- Similar to the current guidance in NUREG-2215, cask vendor has to demonstrate that the system meets these dose requirements in 10 CFR 72.104 and 106
- MOE needs to consider analysis of normal operations, anticipated occurrences and accident conditions. Cask vendor provides design basis criteria for design basis accidents
  - Sites not enveloped by analyzed conditions would need to perform site specific analyses





# Representative Source

- Since the bounding source would no longer be defined by values in the TS, the applicant may use a “representative” source to perform this demonstration.
- The applicant would need to demonstrate that the source represents the contents that would be determined by the MOE
- For example to facilitate discussion:
  - The design criteria required by 72.236(b) and 72.104(b) and (c) could be a radiation level limit at the surface of the dry storage system (DSS), or tied to a site boundary dose
  - Cask vendor demonstrates that the representative source together with system shielding meet radiation level design criteria and 10 CFR 72.104 (and 72.106 if necessary)
  - The allowable fuel parameters (e.g. burnup, enrichment, cooling time) determined by the MOE together with the system shielding would not exceed radiation level design criteria



# How this Proposal Addresses NEI Recommendations

- III-3 – NRC should perform a less detailed review when conservative modeling is used by GL
  - MOE could consider modeling assumptions that reference site specific parameters rather than more conservative parameters
- V-1 – NRC should revise guidance to use representative rather than bounding dose rates
  - MOE Proposal allows the use of representative parameters
- VI-2 – NRC and industry should align fuel qualification with practice in current operating reactors
  - MOE proposal adopts some aspects of current operating reactor COLR and PTLR practices
- VI-1 – CoC holders should amend CoCs to use the graded approach method to reduce TS volume
  - Although this is not a recommendation for the NRC, the MOE proposal builds upon the work performed for the graded approach



# Next Steps

- Collect and consider feedback from this meeting on the ideas proposed today
- Develop and finalize more specific review guidance (Fall 2020)



# Open Item

- V-2 – NRC should revise shielding review guidance to use industry experience showing conservatism within analyses
  - Industry indicated that there are areas of conservatism and would provide appropriate data and use of this data within design review process
  - This could then be used to update staff review guidance and address this recommendation

