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Prairie Island Independent Spent Fuel Storage Installation End Of Life Cavity Pressure License Amendment Request Pre-Submittal Meeting

Rockville, Maryland

March 5, 2014

Attendees

NSPM

- **Mike Baumann – Director, Nuclear Fuel Supply**
- **Gene Eckholt – Manager, Licensing Projects**
- **Terry Pickens – Director, Regulatory Policy**
- **Oley Nelson – Engineer, Spent Nuclear Fuel Projects**

Agenda

- Introductions
- Purpose of Meeting
- Background
- Proposed Changes
- Reason for Amendment Request
- Technical Evaluation
- Summary / Closing Remarks
- Discussion / Q&A

Purpose Of Meeting

- Explain reasons, benefits of the LAR
- Explain proposed TS and SAR changes
- Answer Staff questions

Background

- Protect against degradation of fuel and cladding by maintaining inert environment
- PI ISFSI SAR design criterion
  - Cask Pressure ≥ 1 atm on coldest day at End Of Life (EOL)
- Stated purpose
  - Preclude air in-leakage

Background

- Amendment 7 of TS explicitly made the criterion part of the Bases for the final helium backfill pressure
- Calculations demonstrate that criterion is satisfied for first 20 years of storage
- First cask reaches 20 years in May 2015
- Unable to demonstrate that criterion is satisfied beyond the 20-year period in the calculation
- Unless changed, will require cask re-pressuization

Background

- Not linked to License Renewal Application
- Per NUREG-1927, potential aging effects are evaluated “in terms of material and environment combination”
- Review of EOL pressure calculation concluded that it does not “consider the effects of aging”
- Calculation does not have second TLAA attribute
- However, EOL pressure was recognized as a design criterion that must be maintained or changed

Proposed Changes

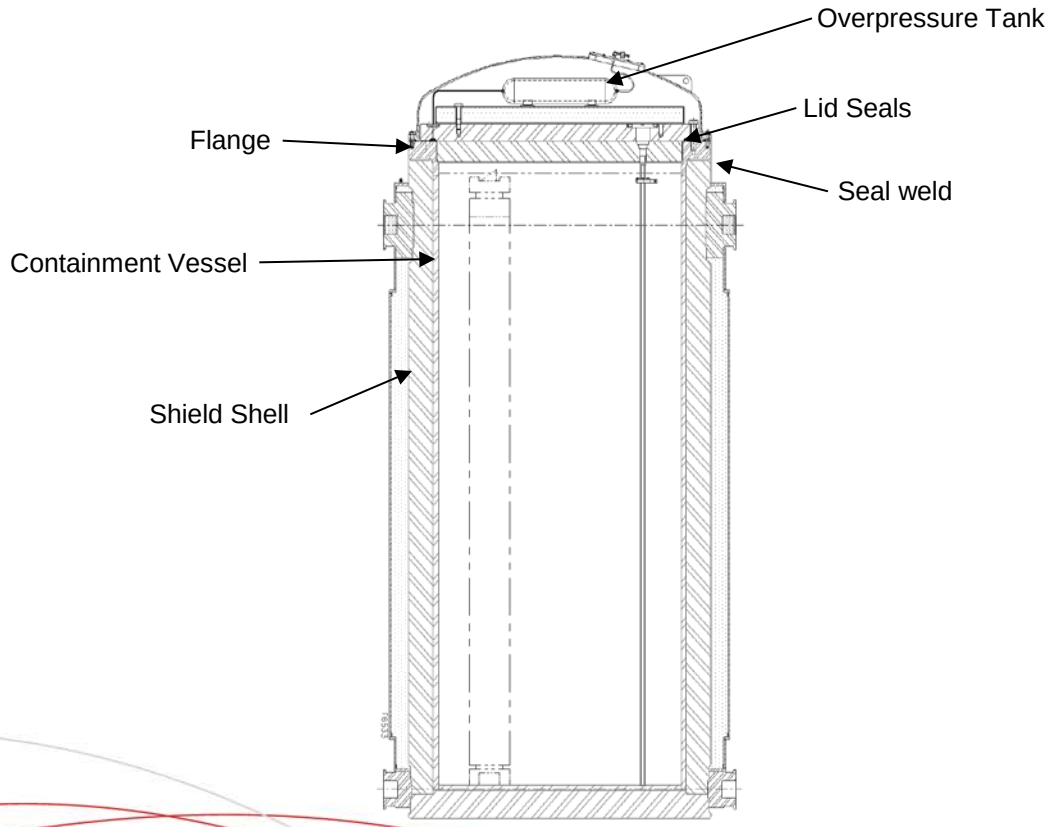
- Remove EOL pressure criterion from SAR
- Add new TS SR to verify cask evacuated to ≤ 14 mbar prior to final helium backfill
- Basis of TS values changed to:
  - Ensuring ≤ 0.25% (volume) oxidizing gases in cask

Reasons for Amendment Request

- Air in-leakage precluded by maintaining containment integrity, not cask pressure
- Criterion would require re-pressurization of casks prior to the calculated 20-year service period
- Re-pressurization of cask not warranted
  - Worker exposure
  - Industry operating experience indicates unlikely to get meaningful leak test results
  - Likely to have to off-load casks

Technical Evaluation

TN-40 & TN-40HT Design



Technical Evaluation

- In-leakage of air prevented by containment integrity:
  - Welded containment vessel
  - Double O-ring seals
  - Pressurization of seal interspace
- Shield shell provides defense-in-depth

Technical Evaluation

- Leakage through containment vessel is beyond design and licensing basis
- If leakage through containment vessel did occur:
  - Cask/Ambient pressure would equalize regardless of initial cavity pressure
  - As pressure changes due to ambient temperature fluctuations, gases could flow in/out of cask
- Impacts of beyond design-basis leak independent of cask cavity pressure

Technical Evaluation

- **Basis for proposed TS changes:**
  - **Limit oxidizing gases to ≤ 0.25% (volume)**
- **Consistent with NUREG-1536 and PNL-6365**

Technical Evaluation

Sequence of Steps for Helium Backfill

- Complete vacuum dryness test (SR 3.1.1.1)
- Backfill with helium to approximately 1 atmosphere (potential for air exposure)
- Break vacuum (potential for air exposure)
- Install quick connect fitting and vacuum/helium fill lines
- Evacuate to ≤ 14 mbar (proposed new SR)
- Backfill with helium to between 1345 and 1445 mbar

Technical Evaluation

Determination of % Oxidizing Gases

- Assuming:
  - Air prior to evacuation (21% oxidizing gases)
  - Evacuate to 15 mbar
  - Backfill to 1320 mbar
  - No change in gas temperature
- Using Ideal Gas Law
  - 21*15/1320 = 0.239 % oxidizing gases

Summary

- In-leakage prevented by maintaining containment integrity
- Proposed changes ensure less than 0.25% (volume) oxidizing gases
- No changes to loading process
- Limited technical content to LAR
- Proposed changes do not impact the health and safety of the public

Schedule

- Submit April 2014
- Approval March 2015
  - Prior to the calculated time at which the first cask's cavity pressure decays below atmospheric (theoretically)

Discussion

Discussion

Q&A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