Industry Perspective on NRC Guidance for Dry Storage Confinement Boundary (ISG-25)

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Summary of Industry Perspective

- ISG-25 represents a change in NRC’s established regulatory position
- Industry does not understand the problem that the NRC seeks to solve with ISG-25, and is unable to propose alternatives to the guidance because:
  - NRC has not articulated a basis for its change in position on He leak testing (e.g., a safety concern or enhancement benefit)
  - Specific language used in the guidance implies that the new position is a requirement
  - NRC practice has been to impose the new position as requirement
  - Industry’s data does not indicate change in position is necessary
- Revision to guidance is necessary to assure effective regulation
- Industry is prepared to respond to NRC’s questions on our position (8/4/11 letter)
ISG-25 established new NRC positions

**Previous NRC position**
- Many cask licensing bases do not leak test lids and some do not test shells (other testing, e.g. ASME used to satisfy 72.236 (j) and (l))
- NRC’s did not express concern for leakage through base materials (neither in guidance, SER’s nor RAI’s)
- Storage confinement boundary not treated the same as transportation containment boundary

**New NRC position**
- Helium leak test is necessary to demonstrate base materials are leak tight (Shell, base plate, lid)
- Applying a standard for transportation containment to storage confinement
- NRC states that ANSI N14.5 includes base materials, but this is not explicitly stated and industry believes this was not the intent
Specific ISG-25 language implies guidance is a requirement

- Introductory statement is important...
  “This ISG provides guidance to the staff and is not a regulatory requirement.”
- ...but is not consistent with specific language
  “A shop helium leakage test, using ANSI N14.5 [sic], must be performed...”
  “...requirements for the helium leakage test should be specified in the CoC...”
- NEI commented on this language in the draft ISG

- Similar concern with NUREG-1536
  “The canister shell has been helium leak tested prior to its loading as required by 10 CFR 72.236”(l)
  — There is no requirement in 10 CFR 72 for this test
- Multiple RAIs indicate ISG is being enforced as requirement
  1) RAI on HI-STORM 100, May 28, 2010, ML101480829
  2) RAI on HI-STORM 100, June 11, 2011, ML111662010
  3) RAI on MAGNASTOR, July 1, 2011, ML111890351
NRC has not articulated a basis for the new position

- “Basis” articulates the rational connection between the facts found and the choice made.
- Is there a safety concern with existing practices or is this an enhancement?
  - If NRC is addressing a safety concern, what is the NRC’s technical basis for concluding that the concern exists? How would the proposed testing resolve the concern?
  - If NRC is proposing an enhancement, how would the proposed testing enhance safety?
  - How does NRC intend to reconcile new positions for casks fabricated/loaded under previous NRC positions?
Required Ingredients for Effective Regulation

- NRC must articulate a well-reasoned basis for regulatory actions that demonstrates a rational connection between the facts found and the choice made.
  - See, e.g., *Shieldalloy v. NRC*; *Honeywell v. NRC*.

- This foundational principal of administrative law is appropriately infused throughout NRC’s Principals of Good Regulation.
  - **Clarity:** “Agency positions should be readily understood and easily applied.”
  - **Reliability:** “Regulations should be based on the best available knowledge from research and operational experience.”
  - **Efficiency:** “Regulatory activities should be consistent with the degree of risk reduction they achieve. Where several effective alternatives are available, the option which minimizes the use of resources should be adopted.”
  - **Independence:** “Final decisions must be based on objective, unbiased assessments of all information, and must be documented with reasons explicitly stated.”
Industry testing experience does not reveal concern with base materials

- Industry experience with helium leakage testing of base materials
  - Over 1,000 canisters and casks tested
    - Typically include shell, sometimes include baseplate or lid
  - 100% passed (i.e., met leak tight criterion)\(^1\)
  - Range of thickness (1/2 in. to 7 in.)
  - Location of testing (Fab. Shop or field depending on component)
  - Lids: either forged, made from plate or rolled
  - Shell: typically rolled with material working direction parallel to boundary
  - Baseplate: either made from plate, or forged with material working direction perpendicular to boundary

\(^1\) Some differences in leak-tight leakage criteria ranging from $10^{-7}$ to $10^{-4}$ depending on cask design
Demonstration testing shows no concern

- Investigation of whether helium leakage through stainless steel base material can occur\(^1\)
  - Stainless steel tubes (austenitic, pearlite and nickel-base alloy)
  - Seamless tubing, and sleeves made of cast metal
  - Temperatures up to 800 °C
  - He Pressures up to 100 atm
  - Thickness from 0.02 in. to 0.14 in. (0.5 mm to 3.5 mm)
- Concluded no helium leakage up to 800 °C and 60 atm
  - Determined by leak detectors and indirect methods
  - Leakage in 3 cases determined to be caused by sub-microscopic defects (caused by high temperature and pressure)
  - No helium diffusion observed

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Anecdotal evidence of leakage through base material is condition specific

- Savannah River bulk tritium shipping packages\(^1\)
  - CV Protective cap (bar stock, machined to 1/8 in. thick)
  - Material working direction perpendicular to containment boundary
  - Microscopic defects
  - Savannah River’s recommended solutions in this case
    - Helium leak testing of bar stock, or
    - Use forging instead of bar stock, or
    - Bar stock with cold working (e.g. flow forming)

- This experience is not directly applicable to industry canisters
  - Industry can not identify any relevant experience elsewhere

- This unique case is an insufficient basis for requiring base metal tests

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Blanket application of ANSI N 14.5 to storage is problematic

- ANSI N14.5 addresses transportation containments
- Guidance should recognize that individual sections of standards may be used in specific circumstances
  - E.g. cask designer choice to use selected criteria from ANSI N14.5 for storage design does not imply that entire standard applies to storage
- Accordingly, ANSI N14.5 should not be invoked in its entirety to storage confinement because there are:
  - Differences between “confinement” and “containment” boundaries
  - Differences in service conditions
  - Differences in scope of Part 71 and Part 72 (e.g. Part 71 includes materials other than spent fuel, e.g. gaseous materials)
- Current ISG-25 position both interprets and extends the applicability of ANSI N 14.5
Industry’s recommended path forward

- Re-evaluate need for guidance on helium leak testing
  - Address whether safety concern or enhancement benefit exists
  - Consider *relevant* experience (e.g. 1000 industry casks vs. Savannah River example)

- If guidance is necessary, publish as a Regulatory Guide (the appropriate vehicle for guidance intended for industry)
  - Articulate basis (i.e. explain the phenomenon of leakage through base materials)
  - Incorporate all aspects of confinement boundary leakage (e.g. ISG-18, SRP excerpts)
  - Base materials: Identify conditions under which NRC considers leak testing unnecessary (e.g. range of material properties, manufacturing processes, and thickness threshold)
  - Type of test: address the use of alternative tests to establish a maximum leakage rate (used when leak-tight is not part of the licensing basis)
  - ANSI N14.5: Avoid blanket use of standard, identify applicable sections/criteria

- These actions will enable industry to understand and address the problem/NRC concern