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Thoughts on NEI Comments on Draft Regulatory Issue Summary (RIS) - Considerations in Licensing High Burnup Spent Fuel (HBF) in Dry Storage And Transportation

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Draft HBF RIS – Background and Status

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- Provide high level information on **some** approaches acceptable to the NRC based on recently approved applications for HBF storage and transportation
- Issued for 45 day public comment period – ended April 20, 2015
- Received comments from NEI and other members of the public
- Considering all comments – focus of this presentation is NEI comments

NEI Comments

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- Discuss each comment individually in this presentation
- General overarching NEI comments:
  - Creating new requirements
  - Currently available data not realistically representative
  - Beyond 20 years of dry storage
  - Demo
  - Containment/confinement
  - Transportation Flowchart
  - Backfitting

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"Creating new requirements" - Comment

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- Comment from letter
- The RIS inappropriately specifies new requirements beyond 10 CFR Parts 71 and 72 and ISG-24
- These regulations contain qualifiers such as "substantially" and "gross"
- While cladding integrity should be strived for, some level of minor cladding damage should not be a hazard to public health and safety

“Creating new requirements” cont. - Response

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- RIS is a type of generic communication document which cannot impose any requirements
- Facilitates a more efficient review of future HBF applications
- Informs that cladding integrity may be affected by creep, hydride reorientation and ductile-to-brittle transition temperature (DBTT)
- States we are not expecting fuel to fail, only a possibility if there is a pinch mode
- Expect further operating experience and data may remove the confirmations

“Creating new requirements” cont. - Comment

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- Table Comment #3
- The rest of the background section after “Knowledge of mechanical properties…” stipulates additional regulatory requirements
- Uses the word ‘require’ or ‘requires’ with regard to performing structural analysis
- Paragraphs are not clear when discussing storage versus transportation

“Creating new requirements” cont. – Response

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- Paragraphs are giving background on effects that creep, hydride reorientation, and DBTT are expected to have on the structural analyses needed for storage and transportation
- Not regulatory requirements but variables that should be accounted for in the analysis
- Will try to make more clear

“Creating new requirements” cont. - Comment

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- Table Comment #5
- RIS has statement which says, “The ability to predict the effects of hydride reorientation and creep on cladding…required to ensure…contents meet the conditions of the CoC…”
- The statement goes beyond Part 71 requirements
- Should be restated that preventing substantial alteration of contents is the primary goal
- Why is 10 CFR 71.89 is referenced?

“Creating new requirements” cont. - Reponse

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- Not an attempt to revise regulatory requirements
- Implicitly understood that effects of hydride reorientation and DBTT are pieces needed to determine if any substantial alteration has occurred
- Need operating experience that contents after transportation are same as contents before transportation
- 71.89 – confirmation is in the operating procedures of package

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“Currently available data not realistically representative” – Comment

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- Comment from letter
- Billone testing was performed at 400°C which is much higher than typical spent fuel cask temperatures
- Therefore temperatures will not cause significant reorientation of hydrides seen in Billone testing

“Currently available data not realistically representative” - Response

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- Acknowledge HBDRP temperatures may not cause as significant reorientation as Billone data
- 400°C temperature limit accommodates any future applications with higher heat loads
- Want to see greater operating experience and experimental data

"Currently available data not realistically representative" – Comment

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- Comment from letter
- RIS is premature and does have sufficient technical basis to be appropriately risk-informed
- Stresses are not sufficient during storage or transport to cause gross deformation of the fuel assembly
- SANDIA transportation studies indicate stresses are not sufficient to cause breakage, even with hydride reorientation
- Even if there is loss of cladding integrity, welded canisters have been certified to not leak
- Pellet-cladding bond provides additional support

"Currently available data not realistically representative" – Response

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- Plan to work more with colleagues on NUREG-1927, Rev. 1, consider all comments received, then make decision on RIS
- Staff agrees that fuel would not sufficient stresses to cause breakage during NCT or storage, possibility only during side drop transportation accident condition
- Applicant can take credit for canister provided the condition of the canister meets the CoC
- Acknowledge fuel pellets provide extra support
- Want further confirmation through operating experience

“Currently available data not realistically representative” – Comment

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- Table Comment 4
- Delete specification of “vacuum” drying process
- No indication that vacuum drying process itself leads to reorientation of hydrides
- Reorientation is a phenomena associated with higher cladding temperatures that cause hydrides to go into solution
- HBRDP is to investigate these phenomena more realistically than in the lab experiments to date.
- OK to delete the word “vacuum”
- Agree that HBRDP, and other operational experience, will provide more realistic data

“Currently available data not realistically representative” – Response

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- OK to delete the word “vacuum”
- Agree that HBRDP, and other operational experience, will provide more realistic data

“Beyond 20 years of dry storage” - Comment

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- From the letter, 2 comments
- Since the NRC has already stated its regulatory position that there is reasonable assurance of storage of high burnup fuel for the initial licensing period, RIS should be applicable only for license renewal

“Beyond 20 years of dry storage” - Response

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- RIS discusses overall HBF licensing
- Approaches emphasizes what is already done for initial 20 years term
- “Beyond 20 years” – initial license application for 40 years, or any renewal.
- Working to ensure greater harmonization with NUREG-1927, Rev 1
- Will more explicitly discuss renewal period

“Demo” - Comment

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- From the letter
- Guidance is not consistent with ISG-24, the RIS should identify the HBRDP and the guidance provided in ISG-24 as an acceptable alternative for providing reasonable assurance that spent fuel will not develop “gross ruptures” during storage or “be substantially altered” during transportation.

“Demo” - Response

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- Calling out ISG-24 was meant to include HBRDP
- Did not explicitly call out HBRDP because it is DOE/EPRI program

“Demo” cont. – Comment and Response

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- Table Comment #2, part 1
- Delete the text in red: “The data would confirm the cladding creep behavior and the reorientation of precipitated cladding hydrides resulting from vacuum drying and dry storage.”
- The RIS should not pre-judge the results to be obtained from the HBRDP
- Agree with edits

“Demo” cont. - Comment

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- Table Comment #6
- Edit statement in RIS to say, “However, if data from a demonstration cask **is unavailable and no other information is available, the applicant should confirm that the initial conditions of the HBF are as expected by confirming that no more than 1% of the HBF would have failed. The confirmation should include an assessment of the ability of stored high burnup fuel assemblies to continue to perform the intended function(s).**”
- Gas sampling data from the HBRDP will demonstrate that the initial conditions of the HBF, i.e. cladding integrity is being maintained”

“Demo” cont. - Response

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- Harmonizing NUREG-1927, Rev. 1, fuel AMP and RIS
- Taking this comment into consideration

“Containment/Confinement” - Comment

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- Table Comment #7
- Confinement analysis is not necessary if guidance in ISG-15 and ISG-18 is used.
- Include a sentence to this effect

“Containment/Confinement” cont. - Response

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- Will not incorporate comment into RIS
- ISG-18 is for the closure weld, not canister
- ISG-15 does not discuss leakage rate testing
- If non-leaktight, confinement analysis needs to be performed
- Sentence stated, “Release fraction values used as part of the confinement analysis for non-leaktight casks should be experimentally justified.”
- Proposed sentence, “If applicant is unable to justify the release fractions, the cask should be leaktight, as defined by ANSI N14.5.”

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“Containment/Confinement” cont. - Comment

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- Table Comment #8
- Remove the word ‘experimentally’ for the justification of release fractions
- Limits the avenues for providing defensible release fractions
- Will remove the word “experimentally”
- Note: currently do not know of any other acceptable methods to justify the release fractions other than through experiments

“Containment/Confinement” cont. - Response

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- Will remove the word “experimentally”
- Note: currently do not know of any other acceptable methods to justify the release fractions other than through experiments

“Transportation Flowchart” - Comment

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- Table Comment #9
- Plant fuel loading procedures ensure that the loaded fuel meets the conditions of the storage cask CoC.
- If fuel is not subjected to an unanalyzed condition, then the fuel would be in the same state as when it was put into the cask system.
- The inert environment (i.e., helium) in the cask ensures that there is no degradation of the fuel.

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“Transportation Flowchart” cont. - Response

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- During transportation, fuel experiences different loads than it does in storage
- We want to gain operating experience

“Transportation Flowchart” cont. - Comment

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- Table Comment #10
- What are the additional steps that would be necessary if fuel cladding sections are not above the DBTT for fuel being directly shipped from the pool?

“Transportation Flowchart” cont. - Response

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- If below DBTT, can follow other approaches of canning and safety analyses

"Transportation Flowchart" cont. - Comments

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- Table Comment #2, Part 2 and Table Comment #14
- Why are different paths established for fuel directly shipped from the pool and fuel that has been in dry storage?
- This should be revised based on whether the fuel temperature is above or below the DBTT at the time of shipment
- Concept of hydride reorientation and DBTT is explicitly stated in flowchart (asterisk)
- Already have application using approach from the spent fuel pool
- Keeping statement as-is

“Transportation Flowchart” cont. - Response

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- Concept of hydride reorientation and DBTT is explicitly stated in flowchart (asterisk)
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“Transportation Flowchart” cont.

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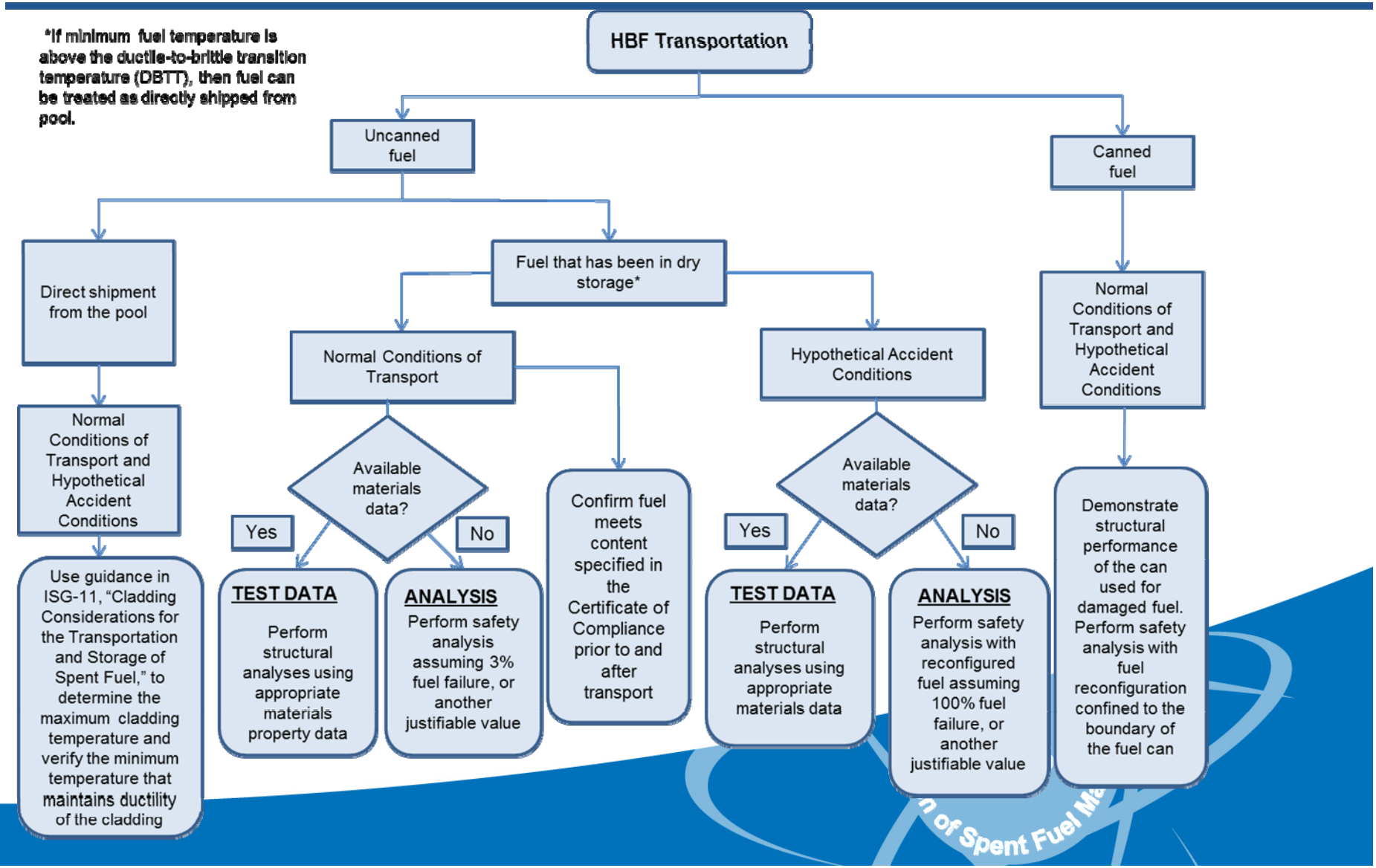

“Backfitting”

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- Table Comments #11, 12, and 13 have been sent to OGC

Conclusions

- We gained valuable public feedback through comment period
- Plan on harmonizing with NUREG-1927, Rev. 1
- Plan to further discuss “Analysis” route for both storage and transportation
- Will decide on future of RIS publishing at that point in time

Next…

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- NEI presentation is next, followed by opportunity for discussion and questions