To: Nuclear Regulatory Commission April 20, 2015

Re: Considerations in Licensing High Burnup Spent Fuel in Dry Storage and Transportation
Docket ID NRC-2015-0047

Please consider modifying your guidelines based on the following comments and questions.

1. The determination to use a lead cask for high burnup fuel is not adequately addressed. Given the unpredictable nature and unknowns about high burnup fuel, which you have admitted is quite different than lower burnup fuel, how can just a lead cask be adequate? Also, the demonstration project is using a thick cask rather than a thin canister/thick concrete overpack. Different fuel assemblies, drying temperatures, containers and other variables do not appear to be accounted for with a demonstration cask or a lead cask.

2. What is your rationale for knowing which cask contains fuel that might be the most embrittled or otherwise damaged?

3. And by lead canister, do you mean a lead cask at each facility or just the demonstration project cask?

4. Since it's impossible to know when a canister will crack and there is no current technology that can adequately inspect for cracks or repair cracks in canisters, it appears a more conservative approach should be taken and require canning of all high burnup fuel in damaged/failed fuel cans. I understand these cans are not sealed and have vent holes at both ends, so do not provide a true defense in depth radiation barrier. However, at minimum it provides fuel assembly retrievability and reduces other fuel storage risks.

5. What does the term "examination mean" and how could that possibly be done in other than the demonstration project? The demonstration project doesn't represent all the variations that currently exist in canisters and fuel assemblies and cladding.

6. In the flowchart, a number of decision points and action boxes assume fuel can be examined. This would require unwelding the canister lids under water or in a hot cell. Since this is not practical or possible, it doesn't appear to be a feasible action.

7. Since the NRC is now approving burnup up to 68 GWd/MTU when it even has serious unknowns for fuel in the 40+ GWd/MTU range, it seems an even more conservative approach should be taken on storage and transportation guidelines. Or was that level of burnup address in the technical data available that you used to substantiate your high burnup guidelines? Please provide references.

8. Were these guidelines informed by any seismic data or analysis that might negatively impact cladding embrittlement (e.g., cause it to shatter under high seismic events). Given the new information from the USGS (in their Fukushima Lessons Learned) that one earthquake fault can jump nine feet to another fault, it would seem this should be

considered, especially in high seismic areas such as San Onofre in San Diego county and Diablo Canyon in San Luis Obispo, California.

9. Please clarify specifically what the defense in depth is if high burnup fuel becomes damaged after dry storage. Particularly given the information in the following report.

   "…the trend of the data generated in the current work clearly indicates that failure criteria for high-burnup cladding need to include the embrittling effects of radial-hydrides for drying-storage conditions that are likely to result in significant radial-hydride precipitation...A strong correlation was found between the extent of radial hydride formation across the cladding wall and the extent of wall cracking during RCT [ring-compression test] loading."

   Ductile-to-Brittle Transition Temperature for High-Burnup Zircaloy-4 and ZIRLO™ Cladding Alloys Exposed to Simulated Drying-Storage Conditions M.C. Billone, et.al. September 28, 2012.
   http://pbadupws.nrc.gov/docs/ML1218/ML12181A238.pdf

10. Would any of the information in this report regarding the explosive characteristics of hydrides cause you to consider reevaluating your guidelines?

    Explosive Characteristics of Titanium, Zirconium, Thorium, Uranium and their Hydrides, Irving Hartmann, John Nagy, Murray Jacobsom, U.S. Dept of the Interior, Bureau of Mines, December 1951
    https://sanonofresafety.files.wordpress.com/2014/12/4410914explosivezirconiumdivofmines.pdf

    Zirconium Hydride Material Safety Data Sheet
    http://www.espimetals.com/index.php/msds/780-zirconium-hydride

    Additional references at http://sanonofresafety.org/nuclear-waste/

Thank you,

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