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Mr. Mark Lombard
Director
Division of Spent Fuel Storage and Transportation
Office of Nuclear Materials Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Industry Analysis and Confirmatory Information Gathering Program to Support the Long-Term Storage of High Burnup Fuel (HBF)

References:

1. Memorandum from Steve Ruffin to Anthony Hsia, *Summary of December 18, 2012 Public Meeting with the Nuclear Energy Institute and Industry to Discuss 72.48 Draft Guidance, Update on High Burnup Fuel, and Chloride-Induced Stress Corrosion Cracking*, January 18, 2013, ML13022A256
2. Letter from John Goshen to George H. Gellrich, *Third Request for Additional Information for Renewal Application to Special Nuclear Materials License No. 2505 for the Calvert Cliffs Site Specific Independent Spent Fuel Storage Installation (TAC No. L24475)*, October 12, 2012, ML12306A588
3. Letter from Kevin Hsueh to Mark A. Schimmel, *Request for Additional Information to Support Environmental Review of the Proposed License Renewal for the Prairie Island Independent Spent Fuel Storage Installation (Docket 072-00010)*, February 5, 2013, ML13017A295

Project Code: 689

Dear Mr. Lombard:

NEI has, with great interest, followed the recent dialogue with NRC staff on the subject of storage of high burnup fuel (HBF)[1] for periods beyond 20 years. This dialogue has focused on questions raised by the NRC staff regarding long-term HBF storage. This issue was most recently discussed in a December 18, 2012, public meeting between the NRC and industry (Reference 1) and the staff's questions on long-term storage of HBF are reflected in requests for additional information issued to two current applicants for dry storage license renewal (References 2 and 3).

[1] HBF is defined as fuel having discharge burnup of > 45 gigawatt-day per ton burnu, which is typically the result of 4-6 years of use in a power reactor.

This letter describes existing industry research and analyses, as well as planned research activities that are relevant to answering the staff's questions. It is the industry's position that current data and practices support the conclusion that there is reasonable assurance that HBF can be stored safely and in compliance with the regulations for at least 80 years—as provided for by the NRC's regulatory framework.[2] This 80-year period would consist of a 40-year initial dry storage license term, with the option for a license renewal term of up to an additional 40 years.

The industry recognizes that, to date, there has been relatively little experience with dry storage of HBF, and no HBF has been placed in dry storage for extended time periods. The majority of HBU fuel in dry storage has been loaded in the past six years, with only a small amount having been loaded earlier. Thus far, approximately 6% of the fuel loaded into dry storage is HBF with approximately 18% of the loaded dry storage systems containing any HBF. In the future, however, the placement of HBF into dry storage is likely to become much more common as most used fuel currently being discharged from reactors is now HBF.

To prepare for the increasing prevalence of HBF in dry storage, the industry, largely under the auspices of the Electric Power Research Institute (EPRI), has conducted a significant amount of scientific analysis examining the long term performance of HBF in dry storage. We believe that this work provides a sound foundation for the technical basis for extended dry storage of HBF fuel. This work has been published in a number of EPRI scientific and technical reports—a listing of which is provided in the attachment to this letter along with web links to provide direct access. We recommend that NRC give these reports full consideration in its ongoing and future licensing reviews of dry storage license renewal applications involving HBF. We believe that the information contained in these reports will be very useful to the staff when making licensing decisions involving long-term storage of HBF.

The industry also recognizes that scientific analysis is not a complete substitute for confirmatory experience with the actual storage of HBF under real-world conditions. A substantial portion of the technical basis for the extended storage of lower burnup fuels was provided by the Dry Storage Characterization Project completed in August of 2001. This project involved opening the CASTOR V/21 cask at the Idaho National Laboratory, which had been stored from 1985 to 1999. The project confirmed that "long-term storage has not caused detectable degradation of the spent fuel cladding or the release of gaseous fission products."[3]

The industry is working with the U.S. Department of Energy (DOE) to obtain data on HBF in storage that is equivalent to, or better than, that provided by the previous Dry Storage Characterization project for lower burnup fuels.[4] Specifically, EPRI has begun work towards a HBF Dry Cask Storage Demonstration Project to gather prototypic data from HBF in dry storage. This project is intended to provide the "surrogate confirmatory information" being called for by the NRC in its review of the two ongoing license renewal

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[2] 10 CFR Parts 72.122(h)(1), 72.112(l) and 72.124 as well as ISG-11 and NUREG-1927
[3] Dry Cask Storage Characterization Project – Phase 1:CASTOR V/21 Cask Opening And Examination, W.C. Bare and L.D. Turgeon, August 2001, INEEL/EXT-01-00183, Revision 1
[4] Fuel in the Castor V/21 cask that was opened had burnup of less than 30 gigawatt-day per ton

applications (References 2 and 3) by informing aging management plans. The DOE has initiated procurement activities (DOE Solicitation #DE-SOL-00056019 – High Burnup Fuel Cask Research and Development) in support of a HBF demonstration project. The DOE has requested bids from the industry, which were due on March 5, 2013. The outcome of the DOE solicitation is unknown at this point, but the industry intends that cooperative test programs will be carried out with the goal of loading a demonstration cask in the first half of 2017.

We anticipate that the demonstration project will be similar to the previously discussed Dry Storage Characterization project, except that this demonstration cask will be specially instrumented in advance so that data collection can begin as soon as the cask is loaded. The data collected over the first few years of the project should be valuable in establishing a realistic assessment of the conditions that will govern the subsequent aging of the fuel. After a period in storage, plans call for opening the demonstration cask and examining the HBF. The proposed project is expected to consist of the following elements:

- Develop a detailed program plan/design and obtain necessary NRC approvals
- Load well characterized used HBF of multiple cladding types into an existing bolted[5] storage cask at a reactor site
- Use a specially instrumented lid, to begin collecting data on temperature, moisture content, and internal gas composition immediately
- Perform hot cell examinations of "sister" rods, taken from the same HBF but not placed in dry storage, for baseline comparison
- After ten years or longer in storage, open the cask to perform visual and physical tests on the stored HBF.

This demonstration project is timely because it is anticipated to yield significant relevant data prior to the point at which significant quantities of HBF have been in storage longer than 20 years. The data obtained in just the first few years after loading the instrumented cask should be very useful in validating existing scientific models and informing aging management plans. The eventual unloading of the demonstration cask, examination of HBF, and comparison to sister rod data should provide the most extensive database on the performance of used fuel of any type under dry storage conditions.

In addition to the demonstration project described above, there are a number of entities across the industry capable of making valuable contributions to this effort, which we believe should become a major mission focus for the DOE now that the opening of a repository has been postponed to 2048. Whatever projects they choose to pursue, we will continue to work with the DOE to assure that the collection of data on HBF fuel in storage and transportation continues to have the same high priority for the federal Used Fuel Disposition program as it does for the industry.

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[5] A bolted cask dry storage system is preferable to a welded canister dry storage system because it will be much easier to retrieve the stored fuel for examination with a bolted system.

We believe that the scientific analysis conducted to date, along with the industry's plans to obtain confirmatory data via a HBF demonstration project, are sufficient to address the questions being raised by the staff about the extended storage of HBF in current licensing reviews. It is the industry's position that the long-term storage of HBF fuel does not currently pose a safety concern, and if any such concern is identified in the future, it would be best addressed generically (e.g., through the NRC's Generic Issue Program), not through individual licensing actions.

We understand that the NRC has formed an internal HBF task force to further address this topic. We look forward to interacting with this task force to further the dialogue on the existing technical basis for extended HBF dry storage and the planned confirmatory activities. As the industry's efforts in this area move forward, we will keep the NRC apprised of its progress and provide opportunities for NRC review and feedback.

Sincerely,

Rodney McCullum

Attachment

c: Mr. Kevin Hsueh, FSME/DWMEP/EPPAD/ER, NRC
Mr. John M. Goshen, NMSS/DSFST/LB, NRC
Mr. William J. Boyle, DOE
Mr. Christopher T. Hanson, DOE