

September 7, 2016

MEMORANDUM TO: Kevin Hsueh, Chief  
Licensing Processes Branch  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

FROM: Joseph J. Holonich, Senior Project Manager /RA/  
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SUBJECT: SUMMARY OF JULY 19, 2016, MEETING WITH THE ELECTRIC  
POWER RESEARCH INSTITUTE ON MATERIALS RELIABILITY  
PROGRAM-227-A, "PRESSURIZED WATER REACTOR  
INTERNALS INSPECTION AND EVALUATION GUIDELINES"

On July 19, 2016, the U.S. Nuclear Regulatory Commission (NRC) staff met with representatives from the industry. The purpose of the meeting was to discuss recent inspection/operating experience with baffle-to-former bolts (BFB) and MRP-227-A, "Pressurized Water Reactor [(PWR)] Internals Inspection and Evaluation Guidelines." Information related to the meeting including the presentations can be found in the Agencywide Documents Access and Management System (ADAMS) package for the meeting at Accession No. ML16208A001.

Representatives from the Pressurized Water Reactor Owner's Group (PWROG) Materials Committee Electric Power Research Institute (EPRI) Materials Reliability Program (MRP), PWR suppliers and operators presented information on the experience from international and domestic PWR reactor vessel (RV) internals, specifically regarding internals fasteners known as baffle-to-former bolts (BFB). Not all PWR designs have these type of bolts in the vessel internals and there are a number of different specific vessel internals design configurations for the BFB bolting. BFB examination is a subset of the PWR RV Internals Aging Management Program under NUREG-1801, generic aging lessons learned, and the Nuclear Energy Institute (NEI) 03-08 guidelines for the management of material issues inspection and evaluation guidance is prescribed MRP-227-A. Recently, at two PWRs, a larger percentage of BFBs failed examination than had typically been experienced in the past. Although there is margin in the number of bolts required, and these findings did not trigger a substantial safety hazard status under Title 10 of the *Code of Federal Regulations* Part 21, the large percentage did not meet the PWROG WCAP-17096/MRP-227 acceptance criteria and in these cases the distribution of failures have caused further attention to this topic. In response to this experience, Westinghouse has issued a Nuclear Safety Advisory Letter (NSAL) and AREVA Inc. has issued

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a Customer Service Bulletin (CSB 16-02). The PWROG and EPRI MRP formed a BFB Focus Group and have initiated NEI 03-08 Interim Guidance for PWR Materials Management Program (PMMP) executive committee approval. Additional interim guidance beyond this is anticipated later this year following the completion of broader work already underway in the focus group.

The first industry presentation by the PWROG summarized domestic and international operating experience related to baffle-former bolt inspections. The NRC staff asked what size loss-of-coolant accident (LOCA) was considered in the safety case performed by Electricité de France (EdF). The industry was unaware of the LOCA size which was considered by EdF. The NRC staff also asked if there had been any inspections of replacement baffle-former bolts. The industry replied that replacement bolts had been ultrasonically inspected in 2011 at Ginna, finding no indications of failures. During the EPRI presentations on recent experience, the NRC staff asked if Japanese experience was also included. The EPRI representative responded that Japanese experience was not yet available but committed to request that information and to report the findings to the NRC staff if permitted. This was an action from the meeting.

The second industry presentation covered the Westinghouse NSAL 16-1 on the baffle-former bolt issue, which contains recommended changes to the baseline inspection schedules for the susceptible group of plants. The NSAL categorizes the most susceptible group of plants as Tier 1a plants, those with 4-loop, downflow configuration, and Type 347 stainless steel bolts. The NSAL recommends these plants perform ultrasonic inspection of all baffle-former bolts by the next refueling outage. The NRC staff asked if there are any NEI 03-08 requirements associated with the NSAL. The industry reply was there are no NEI 03-08 requirements in the NSAL but such requirements would be included in the first MRP interim guidance (pending PMMP approval), with broader additional interim guidance expected before the end of the year.

Westinghouse's analysis in development of NSAL 16-1 used an extended LBB analysis to estimate dynamic loads on the baffle assembly during LOCA conditions. The NRC staff asked what site-specific analysis was performed to justify use of extended LBB for plants that do not have extended LBB in the current licensing basis. Westinghouse replied that the typical metrics for LBB were examined in assessing feasibility.

The third industry presentation covered AREVA CSB 16-02, which addresses recommendations for the Babcock & Wilcox (B&W) design PWRs. The service bulletin does not recommend any changes to inspection schedules for B&W designs, but does recommend enhanced awareness by the plants for potential indicators of bolt degradation during routine plant activities, such as coolant radioactivity level monitoring, loose parts monitoring, and foreign-object search and retrieval activities during refueling outages. During the meeting it was noted that the B&W design reactor vessel internals have very low differential pressure across the baffle plates, which may be a reason for the lack of observed baffle-former bolt failures in these plants.

The fourth industry presentation addressed the baffle-former bolt focus group charter and objectives. The fifth industry presentation discussed the activities of the industry baffle-former bolt focus group. Significant activities of the focus group include developing both interim and long-term guidance for baffle-former bolt inspection and aging management, coordinating outage schedules, tooling for repair and replacement, and replacement bolt manufacturing, improving non-destructive examination techniques for the bolts, and short and long-term test programs for bolts removed from plants to improve understanding of the bolt failure mechanism and the susceptibility of bolt materials to cracking. The fifth presentation also listed the dates of

the planned baffle-former bolt inspections in the next few years. The staff noted that the industry slide says that 2 of 3 inspections during the fall 2016 outages are Tier 1a plants, when in actuality only one of the three inspections is a Tier 1a plant.

The sixth presentation during the meeting was the NRC Perspectives on Baffle-Former Bolt Degradation. The NRC discussed its actions with regard to this issue, including its initial conclusions on the safety significance of the issue, and inspections underway at affected plants.

EPRI indicated that short term interim guidance for baffle-former bolt inspections in the most susceptible group of plants was expected to be issued the week of July 25, while longer term interim guidance covering the whole fleet was planned to be issued later in 2016.

Once the discussions between the NRC staff and EPRI were done, an opportunity was given for stakeholders to interact with the NRC staff. A representative from the State of New Jersey asked what actions plants would have to take in the next 18 months. In response, the NRC staff said plants would be following the MRP guidance (including any interim guidance), and the NRC would provide oversight through the inspection process. The NRC staff also stated that expansion components under MRP-227-A would be inspected per established protocols based on the degradation found.

A representative from the State of New York asked about the LIC-504, "Integrated Risk-Informed Decision-Making Process for Emergent Issues" (ADAMS Accession No. ML14035A143) process. The NRC staff responded the evaluation was near completion and should be issued soon.

In closing, an EPRI representative stated that under MRP-227-A an aging management group had been established to focus attention on aging management and that the aging management approach in MRP-227-A is working. He also noted that inspections need to be done but the message from the meeting today was that there was not a safety challenge.

The single meeting action was that EPRI will request and provide (as permissible) Japanese international experience with BFB when it is available.

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