

Summary of Baffle-Former-Bolt *Interim Inspection Guidance*

Kyle Amberge
EPRI-MRP

Mo Dinger, BFB FG Chair
Wolf Creek

EPRI BFB Focus Group
NRC Public Meeting
7/12/2017



Existing MRP-227-A Inspection Requirement

- ***Baseline volumetric (UT) examination between 25 and 35 EFPY, with subsequent examination on ten-year interval***
 - Prior to 2016, trends from BFB exams not completely clear
 - Same requirements were applied to all WEC plant configurations and designs

- Intent of interim guidance is to accelerate the initial inspections on many plants based OE
 - Add criteria to assess clustering and redefine re-inspection period determination
 - Basic goal of interim guidance is to find defective BFBs prior to a potential clustering condition and potential missing or protruding BFBs as observed in the Tier 1a plants
 - Provide plants ability to better characterize risk of outage impacts

Existing MRP-227 Inspection Requirement

- MRP-227-A also requires that a plant disposition relevant conditions detected during the required examinations via the utility corrective action program (CAP)
- This includes disposition of any baffle-former bolt degradation as well as corrective actions taken by plant
 - Any relevant conditions require a plant-specific evaluation
 - Extent of evaluation is to be commensurate with the extent of degradation discovered
 - Engineering tools exist including WCAP-17096-A acceptance criteria
- An extensive amount of BFB research, operating experience reports, generic studies, and potentially plant-specific analyses are available to assist utilities in the disposition of inspection findings

MRP-227 Results Disposition Requirement

- MRP-2017-009 NEI 03-08 Needed requirement regarding disposition of inspection findings:
 - *Examination results that do not meet the examination acceptance criteria defined in Section 5 of MRP-227 shall be recorded and entered in the owner's plant corrective action program and dispositioned.*
 - *Engineering evaluations used to disposition an examination result that does not meet the examination acceptance criteria in Section 5, shall be conducted in accordance with NRC approved evaluation methods (i.e., ASME Code Section XI, WCAP-17096-NP or equivalent method)*

Interim Guidance Inspection Requirement

- Interim guidance issued in MRP-2017-009, dated 3/15/2017
 - Technical basis in part established by probabilistic methods in Weibull/Monte-Carlo bases predictive tools developed by structural consultants (WEC, AREVA, SIA)
- Baseline volumetric (UT) examination shall be performed as follows:
 1. *NSAL-16-1 Rev.1 Tier 1 plants: per NSAL-16-1 Rev.1 and MRP-2016-021, dated 7/25/2016*
 2. *NSAL-16-1 Rev.1 Tier 2 plants: no later than 30 EFPY**
 3. *Remaining plants: no later than 35 EFPY*

** Some Tier 2 plants have already performed the baseline UT exams between 2011 and 2016; therefore, any initial baseline UT exams performed prior to 1/1/2018 are considered acceptable even if performed later than 30 EFPY*

Interim Guidance Inspection Requirement

- *Subsequent volumetric (UT) examinations shall be performed on an interval established by plant-specific evaluation, and shall not exceed 10-years*
 - *This evaluation is embedded within a plant’s CAP program*
 - *Reduced reinspection interval has been determined to be an appropriate response to atypical or accelerated BFB degradation and shall satisfy the following criteria:*

<i>WEC Plant Design Type</i>	<i>%UT Indications and Visually Failed BFBs</i>	<i>UT Re-Exam Period</i>
<i>Down-Flow WEC Plants</i>	<i><3% indications with no clustering^(a)</i>	<i>not to exceed 10-years</i>
<i>Down-Flow WEC Plants</i>	<i>≥3% indications or clustering^(a)</i>	<i>not to exceed 6-years^(b)</i>
<i>Up-Flow WEC Plants</i>	<i><5% indications with no clustering^(a)</i>	<i>not to exceed 10-years</i>
<i>Up-Flow WEC Plants</i>	<i>≥5% indications or clustering^(a)</i>	<i>not to exceed 6-years^(b)</i>
<p><i>Note:(a) Clustering defined per NSAL-16-1 Rev.1: three or more adjacent defective BFBs or more than 40% defective BFBs on the same baffle plate. Untestable bolts should be reviewed on a plant-specific basis consistent with WCAP-17096-NP-A for determination if these should be considered when evaluating clustering.</i></p> <p><i>(b) A longer reinspection interval, not to exceed 10-years, may be justified by plant-specific evaluation based on plant-specific exam findings. This evaluation may include additional justification from plant modifications and/or improvements (for example: replacements of BFBs, conversion to up-flow, replacement of lower internals, etc.).</i></p>		

- *BFB inspection response “Playbook” was developed by MRP*

Interim Guidance Allowance for Proactive Preventative Maintenance Approaches

- Latitude for PWR plants regarding planning for and implementation of BFB replacements as a method to improve and enhance the baffle-former assembly structure as *preventative maintenance* and an *asset management* tool is considered reasonable; therefore, the following guidance is provided to plants based on management decisions:
 - *As an alternative to performing UT inspections, a plant may perform proactive bolt replacements as preventative maintenance justified by plant-specific evaluation using established methodologies (for example, WCAP-15029-P-A or equivalent)*
 - *The plant-specific evaluation shall also establish and justify the UT re-examination period resulting from the bolt replacements performed*

Summary of Basis for BFB Interim Guidance

- BFB inspection findings in 2016 are closely related to design-specific and plant-specific features:
 - WEC plants assembled with internal hex 347SS BFBs
 - Down-Flow plants have highest pressure differential; highest bolt stress
 - 4-loop plants have least quantity of BFBs per total area
- Oldest US plants are judged to have the least margin due plant design as well as differences in BFB manufacturing history
- These conclusions were initially made in TB-12-5 and formalized in NSAL-16-1
- No design is immune - other plant designs are also susceptible; still the risk is lower due to plant-specific design differences
 - CE and B+W designs also manage degradation via MRP-227-A
- BFB degradation observed to date is not a safety issue; rather, it is entirely a plant asset management, utility risk and cost issue
 - Industry has put guidance in place to ensure BFB degradation does not become a safety issue for plants in the future



Together...Shaping the Future of Electricity