

May 8, 2013

MEMORANDUM TO: Anthony J. Mendiola, Chief
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Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

FROM: Joseph J. Holonich, Sr. Project Manager /RA/
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SUBJECT: SUMMARY OF THE MARCH 27, 2013, MEETING WITH THE BOILING
WATER REACTOR VESSEL AND INTERNALS PROJECT (BWRVIP)
ON THE STAFF REVIEW OF BWRVIP-194, "METHODOLOGY FOR
DEMONSTRATING STEAM DRYER INTEGRITY FOR POWER
UPRATE"

On March 27, 2013, the U.S. Nuclear Regulatory Commission (NRC) staff met with representatives from the BWRVIP. The purpose of the meeting was to discuss the NRC staff's approach to reviewing BWRVIP-194, "Methodology for Demonstrating Steam Dryer Integrity for Power Uprate."

Proprietary information was discussed at the meeting; therefore, it was closed to members of the public. Enclosure 1 is a list of meeting attendees.

The meeting began with introductory remarks from the NRC staff. In particular, the NRC staff discussed the history of its work on the BWRVIP-194 topical report (TR) and noted that the NRC staff was focused on a path forward for the BWRVIP-194 review. The two questions that the NRC staff was looking to answer in the meeting were: 1) where are we in the review of the TR and 2) how do we see the review continuing.

In addition, the NRC staff discussed its ongoing review of Extended Power Upgrades (EPUs). It was emphasized that these EPU reviews require the same types of technical disciplines as those needed to evaluate BWRVIP-194. The NRC staff informed the BWRVIP representatives that based on its current review work of the EPUs, there was a window of opportunity to review BWRVIP-194 starting in the fall 2013.

As background on the status of the review, the NRC staff provided its perspective on the history of the BWRVIP-194 submission. The NRC staff told the attendees that the TR was submitted in 2008. Following the TR submission, the NRC staff issued its acceptance review with over 20 request for additional information (RAI) questions.

The responses to the RAI questions were received in September 2011. However, to date the NRC staff had not started a detailed technical review of the TR itself or the RAIs. The NRC staff informed the meeting participants that the contractors conducting the review of BWRVIP-194 would also be the same contractors working on EPU's. Thus, the NRC staff would have to effectively manage the workload of these contracts to ensure that the higher-priority EPU's were completed while still providing support for the BWRVIP-194 review.

In addition, the NRC staff indicated that it had questions that arose as a result of experience from operating plants such as the Grand Gulf Nuclear Station and the Nine Mile Point plant. The NRC staff wanted the BWRVIP to provide information on how this experience impacted the information in BWRVIP-194 which was submitted 5 years ago.

The NRC staff acknowledged that the information provided by the BWRVIP showed the plants planning for EPU's and what steam dryers they were planning to use. This information helped the NRC staff understand how many units could be using the methodology presented in BWRVIP-194.

In their opening remarks, the BWRVIP representatives emphasized that the methodology in the TR was still worth pursuing. The representatives also noted that the methodology could be applicable to several different steam dryer geometries and vendor designs. One BWRVIP representative asked if there were any impacts on the staff review as a result of the recent sequester.

The NRC staff responded that the recent sequester was not an issue. There were other things that could impact the schedule. These included the limited availability of experts to review EPU's and the TR, as discussed earlier, and the impact from Fukushima order responses. The NRC staff felt the latter two items could have more of an impact on the review than the recent sequester.

Next, John Hosler from the Electric Power Research Institute made a presentation on the review of BWRVIP-194. The presentation covered the history of the TR, its scope, the chronology of the NRC review, the need for the TR to support EPU applications, and the applicability of the methodology to other steam dryer designs. A copy of the presentation is in the Agencywide Documents Access and Management System as Accession No. ML13092A030.

During the presentation, the NRC staff asked about the availability of data from instrumented steam dryers. The BWRVIP representatives responded that there was a chapter in BWRVIP-194 covering instrumented dryer tests that could be responsive to the NRC question. It was also noted that not all steam dryers would be instrumented but that BWRVIP-194 did address how to instrument a dryer if an owner were to pursue this option.

As part of the chronology topic, there were discussions about how the Peach Bottom EPU currently under review by NRC staff could be a parallel review to BWRVIP-194. It was noted that when the NRC staff issues RAI questions on the Peach Bottom EPU, it could also issue those RAI questions on BWRVIP-194.

The NRC staff agreed that this was a possible approach. The BWRVIP representatives noted that the responses would be different because the RAI answers for BWRVIP-194 would be broader due to the fact they would have to be more generic in their application.

In the discussion regarding model applicability, the BWRVIP representatives reported that the model should work for different types of General Electric (GE) geometries. The model was benchmarked against a square hood dryer. However, it could be used with curved and slanted hood dryers.

Plus, Peach Bottom would be using steam dryers manufactured by Westinghouse Electric Company (Westinghouse). Data benchmarking the applicability of the model to the Westinghouse steam dryers would be available in the fall 2014.

Given the data available from benchmarking, the BWRVIP representatives felt there was enough information for the NRC staff to prepare its safety evaluation (SE). In addition, the BWRVIP attendees believed that the SE could be prepared for the square, the slanted, and the curved GE dryers that could be used in EPUs.

The NRC staff agreed that it had enough information to conduct its detailed safety review. It also stated that it would still have RAI questions on the information. It was emphasized by the NRC staff that it was collecting data in support of its review but that it did not yet have a full enough picture to know what RAIs would be asked.

However, the NRC staff indicated that it could have general and WEC-specific RAI questions as early as May or June. Responses to these RAI questions would be submitted in the early fall. Having the RAI responses would then give the NRC staff a better idea of what plant-specific action items it might have related to the Westinghouse steam dryers.

The BWRVIP representatives did wonder why RAI questions were needed given the acceptance of the methodology for Nine Mile Point and the lessons learned from Nine Mile Point and the Grand Gulf Nuclear Station. They felt that the bar kept getting raised on what it would take to find the methodology acceptable.

The NRC staff responded that as long as the review was active, it would need to include any lessons learned in its evaluation. As new issues arise, the NRC staff needs to consider whether to consider it in the TR review or as an issue separate from the BWRVIP-194 review.

The final topic covered at the meeting was the BWRVIP responses to NRC staff RAI questions that had been sent prior to the meeting. Enclosure 2 contains the questions and responses.

Action items resulting from the meeting are:

- 1) The NRC staff will issue RAI questions for both Peach Bottom and BWRVIP-194 in parallel.
- 2) Question 8 in Enclosure 2 will be revised to clarify it and it will be asked as an RAI question.
- 3) BWRVIP will provide benchmarking data on the Westinghouse steam dryer design in the fall 2014

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- 4) As documented in the response to Question 4 in Enclosure 2, given the many sections of the report that need to be revised or totally replaced, the BWRVIP committed to revise and consolidate the report when it issues it as BWRVIP-194-A.

Project No. 704

Enclosures:
As stated

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- 4) As documented in the response to Question 4 in Enclosure 2, given the many sections of the report that need to be revised or totally replaced, the BWRVIP committed to revise and consolidate the report when it issues it as BWRVIP-194-A.

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Enclosures:
As stated

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**Attendees At The March 27, 2013, Meeting
With The Boiling Water Reactor Vessel And Internals Project
On The Staff Review Of BWRVIP-194, "Methodology For
Demonstrating Steam Dryer Integrity For Power Uprate."**

Name	Organization
Joseph Holonich	U.S. Nuclear Regulatory Commission (NRC)
Tony McMurtray	NRC
Chakrapani Basavaraju	NRC
William Jessup	NRC
Thomas Scarbrough	NRC
Larry Steinert	Electric Power Research Institute (EPRI)
Andy McGehee	EPRI
Robin Dyle	EPRI
Chuck Wertz	EPRI
John Hosler	EPRI
David Forsyth	Westinghouse Electric Company
Mohammad Molaei	Exelon
Ron DiSabatino	Exelon
Mark Unrah	Nebraska Public Power District

ENCLOSURE 1

**Background Questions for March 27, 2013. Meeting on
BWRVIP-194, "Methodology for Demonstrating Steam Dryer Integrity for Power Uprate"**

1. The current report is about five years old. How has operating experience from Extended Power Uprate (EPU) units been considered in BWRVIP-194, "Methodology for Demonstrating Steam Dryer Integrity for Power Uprate," and what changes, if any, need to be made to the current version of BWRVIP-194?

The submitted response for additional information in 2011 updated the methodology.

2. The benchmarking of the Acoustic Circuit Model (ACM) (Rev. 4.1) is based on Quad Cities (QC), Unit 2 data. Now, there are operating plants using and/or planning to use steam dryers of Westinghouse Electric Company (Westinghouse) Nordic design significantly different design banks with a quite different geometry and flow paths compared to the General Electric (GE) Design that consists of parallel vane banks. Additional benchmarking to address other dryer designs (Nordic design) or new GE steam dryers is not provided in the current version of BWRVIP-194. Does the Boiling Water Reactor Vessel Internals Project (BWRVIP) plan to address other dryer designs? If so, what are the plans for submitting a revision to the BWRVIP-194?

The best data available is the Quad Cities data. However, the model's applicability to the Westinghouse Nordic design will be benchmarked using the Peach Bottom data. That data will be available in the fall 2014.

3. Westinghouse has made several significant changes in ACM and developed Acoustic Circuit Enhanced model. This enhanced version is used in Monticello dryer analysis. What impact, if any, does this have on BWRVIP-194?

The ACM 4.1 in BWRVIP-194 is still a valuable and appropriate technique.

4. BWRVIP-194 as submitted originally in 2008 is focused on GE Hitachi (GEH) parallel vane bank type steam dryers with main steam line (MSL) based strain gage data using ACM 4.0. The request for additional information (RAI) responses received in September 2011 are based on ACM 4.1. Are there plans to revise BWRVIP-194 to reflect ACM 4.1? If so, when will be revision be submitted?

The responses to the RAIs are an exact rewrite of various sections of BWRVIP-194. The RAI responses can replace sections in BWRVIP-194 that are based on ACM 4.0. Because many sections of the report need to be revised, and some totally replaced, the BWRVIP committed to revise and consolidate the report when it issues it as BWRVIP-194-A.

5. How are data from instrumented Westinghouse or GEH parallel vane bank steam dryers considered in BWRVIP-194?

It is still believed that the best data is the QC data with high acoustics. This will be confirmed by the Peach Bottom data in the fall 2014.

6. The currently submitted version of the TR is based on the bias errors and uncertainties (B&Us) for ACM based on QC2 instrumented dryer data based benchmark, but does not address B&Us for steam dryers of Nordic design. The B&Us from benchmark based on GE parallel vane bank dryers may not be applicable to other dryer designs.

See the response to Question 2.

In addition, the currently submitted version of the TR needs to address the uncertainties for Finite Element Analysis (FEA) to account for dynamic behavior of dryers of Nordic Design. The uncertainty from benchmark based on GE parallel vane bank dryers based on Hope Creek spare shaker tests may not be applicable to other dryer designs.

The currently submitted version of the TR needs to address the Bias errors for FEA discrete mesh and discrete frequency errors for Nordic dryer design. The B&Us from GE parallel vane bank dryers may not be applicable to other dryer designs.

The study of changes in the analytical techniques showed an uncertainty of 21 percent is conservative. The Monticello technique uncertainty showed that the uncertainty was much, much less than 21 percent which is very conservative.

Are there any plans to revise BWRVIP-194 to include other dryer designs?

It is believed that the methodology is applicable to other dryers. That will be confirmed with the Peach Bottom data in the fall 2014.

7. The recent table provided by BWRVIP shows that LaSalle and Peach Bottom will be using ACM 4.1 and Nordic steam dryers as part of their EPU. However, BWRVIP-194 does not address the Nordic steam dryers. Given this, should these units still be identified as using BWRVIP-194 if the methodology has not been demonstrated as applicable to the steam dryers for these units?

The applicability of the methodology to other designs has already been answered.

8. Any additional issues from the Monticello EPU review should be folded into BWRVIP-194. Issues that came to light after the Nine Mile Point, Unit 2 steam dryer review, such as those from Monticello and Grand Gulf that need to be addressed in BWRVIP-194 include: (1) the safety evaluation limitation on ACM4.1 regarding its use for plants with safety relief valve resonances; (2) consideration for vane passing frequency effects; (3) the treatment of partial penetration welds in dryer analysis; (4) the impact of regulator setting & small variations in steam dome pressure, and core flow on steam dryer stresses; and (5) MSL strain gage under-prediction.

The staff agreed clarification was needed for this question. It will be refined and included as an RAI in the BWRVIP-194 review.