

## Holonich, Joseph

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**From:** Boardman, Jay D. <boardmjd@westinghouse.com>  
**Sent:** Wednesday, August 15, 2018 12:28 PM  
**To:** Holonich, Joseph  
**Cc:** 'PIMENTEL, Frances'; Schrader, Kenneth; Benesole, Stephen; MIKSA, JAMES P; Swantner, Stephen R.; Andrachek, James D; Holderbaum, Chad M.; Nowinowski, W Anthony; Boardman, Jay D.  
**Subject:** [External\_Sender] PWROG-15060 DSE Feedback and Meeting Request  
**Attachments:** Summary of DSE for PWROG-15060 for NRC review.docx

Joe,

As you know, the PWROG has reviewed the NRC draft SE on PWROG-15060 and has some concerns. We would like to have a meeting with the NRC at the end of August (29 or 30). Please see the attached document for further details.

Thanks,

Jay

### Jay Boardman

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## **1 INTRODUCTION / BACKGROUND**

Technical Report (TR) PWROG-15060-P, "Pump Suction Gas Accumulation Operability Criteria Guidance," was prepared as a result of discussions between the NRC, NEI, BWROG, PWROG, and Westinghouse in January, 2015. The issue was associated with an unresolved issue (URI) that Farley received from an NRC inspection of their pump suction gas accumulation surveillance acceptance criteria basis. In addition, V. C. Summer Unit 1 also received questions from the NRC regarding justifying the technical basis that was used to establish their pump suction allowable gas void acceptance criteria. During the January 2015 meeting, the industry (Jack Stringfellow (PWROG Chairman) and Jim Riley (NEI)) stressed that the PWROG had spent considerable time and effort to perform the testing at Purdue University to develop a basis for allowable pump suction gas accumulation acceptance criteria, which was based on the Purdue test data. This basis was documented in WCAP-17271 and WCAP-17276 which had been reviewed by the NRC during their review of NEI 09-10. At the meeting, the NRC stated they accepted the use of WCAP-17271 and WCAP-17276 as operability criteria, but they thought that the industry needed additional guidance regarding the implementation of these documents. In particular, specific guidance was needed on how to address the limitations that the NRC included in the Final Safety Evaluation (FSE) on NEI 09-10. The PWROG agreed to develop this guidance and submit it for NRC review and approval. The NRC also stated they would not question licensees regarding their pump suction acceptance criteria as long as it was consistent with the subsequent NRC approved guidance.

PWROG-15060-P was submitted to the NRC on May 9, 2016 by OG-16-120. On July 1, 2016 the NRC issued 8 RAIs. The PWROG met with the NRC on July 14, 2016 to discuss the RAIs. On August 17, 2016 the NRC issued an audit plan that contained 16 questions. The intent of the audit was to perform a detailed review of the technical documents which supported PWROG-15060-P. The audit was held at the Westinghouse office in Rockville, MD on August 31, 2016 and September 1, 2016. During the audit, it was conveyed to the NRC that the PWROG wanted to fully address any issues the NRC had regarding PWROG-15060, as it would defeat the purpose of the TR if the NRC Final Safety Evaluation imposed unacceptable limitations on its use. At the audit closure, the NRC stated that the technical basis of PWROG-15060-P was acceptable, and that they did not anticipate, however could not confirm, that there would not be any limitations regarding implementing the TR.

The NRC issued the Draft Safety Evaluation (DSE) for PWROG-15060 in June, 2018.

## **2 REVIEW OF THE NRC DSE**

The purpose of PWROG-15060-P was to provide implementation guidance for developing operability criteria for pump suction gas intrusion surveillances that would be straightforward for licensees to implement. In addition, since it would be approved by the NRC, it would not be questioned by the NRC during site inspections. The DSE as written does not serve this intended purpose. The PWROG believes that gaps between the TR and the DSE exist in the following areas.

- The DSE limits the applicability of the TR to past operability. The objective of the TR is to support operability determinations following surveillance testing, which would also support past operability.
- The DSE states that the TR must be revised to address the impact of RCS chemical effects on gas transport. The impact of RCS chemical effects is a new issue that should be addressed by a revision to the TR, as opposed to a limitation in the SE inspection.
- The DSE concludes that the TR does not clearly establish the kinematic shock behavior and that "justified judgements" may be used. The intent of the TR was to preclude individual plants from defending the technical basis for the TR. The DSE limits the implementation of TR Equation 6-6 to a Froude number range of  $1.25 \leq N_{FR} \leq 1.75$ . Many pumps with horizontal inlets operate at a flow rate where  $N_{FR} > 2$ . As a result, TR Equation 6-6 cannot be used to address the NEI 09-10 FSE limitation regarding pumps with horizontal inlets.
- The DSE correlation regarding the formation of a kinematic shock as shown in DSE Figure 17 and DSE Equation (5) predicts that the required gas flux to form a kinematic shock starts to decrease with increasing Froude number for an  $N_{FR} > 1.75$ . TR Figure 6-23 depicts a flow regime map for horizontal pipes; which demonstrates that as the liquid flow rate increases it becomes more difficult to form stratified flow. In addition, Westinghouse has performed additional testing which demonstrates that the amount of gas required to form a kinematic shock increases sharply at Froude numbers above 2.
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- The DSE indicates that the shock forms when the elbow can accumulate no additional air and gas is expelled into the horizontal header. The TR indicates a shock is formed by gas accumulation at the elbow.
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- The DSE states that the gas flow rate near the elbow (in the shock) is greater than the gas flow rate downstream of the shock. The TR states that gas immediately downstream of the elbow is not flowing; it is a stagnant layer of gas that is being entrained by the water flow..
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- The DSE states that use of average fluid properties must be further justified. This is a new issue that should be addressed by a revision to the TR, as opposed to a limitation in the SE in order to provide consistent additional justification that can be implemented, that is approved by the NRC in the SE.

### 3 PWROG RECOMMENDATIONS

The PWROG would like to have a meeting with the NRC staff on either August 29, 2018 or August 30, 2018 to discuss the resolution of these comments on the DSE. Prior to the meeting, the PWROG will send a marked-up version of the DSE to the staff which includes our comments. We would like to discuss these comments at the August meeting. Following the August meeting, the PWROG proposes to provide the NRC with a DSE which is revised to meet

our intended usage. We will provide a basis for all of the revisions, and request that the NRC review and concur with the revised DSE..