From: Elwood, Thomas B [TElwood@ameren.com]
Sent: Monday, April 09, 2012 6:02 PM
To: Thadani, Mohan; Singal, Balwant
Cc: Oguejiofor, Benjamin N; Pae, Brian A; Ferguson, Christine M; Maglio, Scott A; Pitts, Jesse C; Billerbeck, John; McMurtray, Anthony; Billerbeck, John; Gardocki, Stanley; Casto, Greg; Wang, Alan
Subject: FW: responses to NRC RAIs
Attachments: Attachment 1.pdf; Attachment 2.pdf; Attachment 3.pdf; Attachment 4.pdf; Attachment X.JPG

Mohan/Balwant –

Responses to the NRC's RAI questions/requests are provided as follows. I have "cc"-ed everyone that you did on your e-mail to us, but feel free to forward this on to anyone else you feel needs to see it. If you need anything else ahead of the phone call scheduled for 1 PM our time (2 PM your time), please let me or Scott know.

- Tom Elwood

From: Oguejiofor, Benjamin N
Sent: Monday, April 09, 2012 2:39 PM
To: Elwood, Thomas B
Cc: Maglio, Scott A; Pae, Brian A; Ferguson, Christine M
Subject: responses to NRC RAIs

1) *Can Callaway supply a sketch of the MSIV/actuator showing the rupture disk and describing its function?*

Attachment 1 shows a layout of one MSIV/actuator and its attendant valves including rupture disk ABPSE0001.
Attachment 2, 1st drawing, is the normal open position of the valve (top and bottom of the valve is under a vacuum).
Attachment 2, 2nd drawing, shows the closing of the valve (fluid is ported to the top of the valve piston driving the valve closed).
Attachment 2, 3rd drawing, shows the lineup after the valve has been closed for 2 minutes (bottom port is filled with fluid to prevent continuous leakage pass the piston seals)

The safety function of the rupture discs is to open to allow the lower piston chamber (LPC) of the MSIV actuators to vent and close the MSIV within the required time frame. To close an MSIV, the LPC must be open or vented. Two vent lines are provided for each MSIV actuator. The normal, non-safety vent line is routed from the actuator through a locked open manual valve and back to the condenser. The backup vent line is routed from the MSIV actuator through a locked open manual isolation valve and is safety-related up to the rupture disk set at 150 psig to an equipment floor drain

2) Please discuss the credible rupture disk failure modes (e.g., leakage, burst early, fail to burst) and their effect on MSIV functionality and the transients / events/ analyzed accidents for which the MSIVs are either credited or which MSIV may cause.

See Attachment 3 for a description of the failure modes, their causes and effects, how they may be detected, etc. With regard to the failure mode(s) in which a rupture disk bursts at a higher or lower than rated pressure, see the response to Question 5 below.

3) *Are there any spare rupture disks from the same lot number available for testing? Or old rupture disks that were previously removed available for testing? Can a visual exam be performed on the installed rupture disks?*

Currently, there are four rupture disks installed on ABPSE0001/2/3/4. The rupture disks for ABPSE0001/4 have **lot # 8042513A.** The rupture disks for ABPSE0002/3 have **lot # 8038119A.**

Although there are spare rupture disks for lot # 8038119A in the storeroom, the rupture disk are not available for testing since they are still new and have not been used in the plant. In addition, the rupture disks that are currently in the MISVs in the plant were first installed around April 2007 timeframe (RF15), and there are no old rupture disks that were previously removed that are available for testing. Based on the 5-year replacement interval, this will be the first performance of the surveillance for replacing the rupture disks. The rupture discs as currently installed cannot be visually examined due to the companion flanges that hold the rupture disk/holder assembly together. (See attachment X.)

(4) Has the rupture disk material, service conditions and environment, stress history (pressure and temperature cycles), visible condition (corrosion, leakage, e.t.c) been determined and considered?

Yes. The rupture disks are made of 316SS stainless steel. The rupture discs are rated 150 psig @ 450 F. While the plant is online (primarily at mode 1), the nominal temperature of the rupture disc is 142 F with a corresponding pressure of 3.04 psia. No pressure and temperature cycles are expected on the rupture disks while the plant is online. The only time pressure and temperature cycles are expected is when the MSIVs are actuated, i.e. when shutting down for an outage. When the rupture disks were first installed, a leakage check was performed as a post-maintenance test, and no leakage was identified. There are no corrosion concerns associated with the rupture disks since the disks are made of stainless steel and the medium (steam) is clean water.

(*5) What rupture disk vendor information or data is available concerning expected service life. And expected failure rate.*

Based on discussions with the vendor, the vendor will not predict the expected service life on the rupture disks because operating conditions vary from plant to plant. However, the pressure and temperature cycling that the rupture discs experience over time will only weaken them (not strengthen them), causing them to burst at a lower pressure. This may cause a rupture disc to prematurely burst when closing the MSIV, but the safety function of the MSIV would not be affected.

(6) *Describe rupture disk storage and handling controls and work controls during installation (e.g. torque, thread lubrication, gasketing)*

See Attachment 4 which is the Callaway procedure that provides the detailed instructions used during replacement/installation of the rupture disks.

(*7) What are the design requirements for the rupture discs installation?*

- *Is it, in fact, an overpressure protection device?*

NO - The rupture disk is not an overpressure protection device. The rupture disks are considered "valves" with a specific safety function to open and vent the lower piston chamber of the MSIV actuator so that the MSIV can close within the specified timeframe. ASME OM Code ISTC-5250 states that "other valves" such as rupture disks shall meet the requirements for non-reclosing pressure relief devices of Mandatory Appendix I. Part of this requirement is the 5-year replacement frequency stipulated in Section I-1360 of Mandatory Appendix I.

- *Is it required to be there by BPV Section III?*

NO – it is not required to be there by Section III.

- *Is the rupture disk code stamped per Section III?*

NO, the rupture discs are not stamped parts, but the materials are Section III.

- *Is it protecting a code vessel? Which code? What are the code's test/inspection/replacement requirements?*

NO – the rupture disk is not protecting a code vessel.

- *Is it properly scoped in the IST Program? Does it meet the applicability requirements of 50.55a, ISTA-1100, ISTC-1100, Mandatory Appendix I-1100?*

Yes, the rupture disks are properly scoped in the IST Program for the following reasons:

a. The rupture disks have a specified safety-related function to open to provide a vent path needed to close the MSIV within the required timeframe. This satisfies the requirements of ISTA-1100(a), *Scope.*
b. Based on item (1) above, ISTC-1100, *Applicability*, applies to the rupture disks in accordance with the In-service Testing Program.
c. The rupture disks are considered "valves" in the In-service Testing Program, and per ISTC-5250, rupture disks shall meet the requirements for non-reclosing pressure relief devices of Mandatory Appendix I.
d. For non-reclosing pressure relief devices, Mandatory Appendix I, Section I-1360 requires a 5-year replacement frequency unless historical data indicates a requirement for a more frequent replacement.

e. 10CFR50.55(a)(f)(4) states…… "*Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, pumps and valves which are classified as ASME OM Code Class 1, Class 2, and Class 3 must meet in-service test requirements…"* The rupture disks are ASME Code Class 2.

(8) Why were the rupture disks not replaced at the last outage?

The work was removed from the scope of the last refueling outage based on an initial determination that the work could be done with the plant on-line subsequent to the outage. However, when the work was evaluated by Operations management for on-line performance and scheduling after the outage, it was determined that the plant risk was too high, particularly in light of the estimated time for completing the work relative to the allowed outage time (Completion Time) specified in the Technical Specifications for an inoperable MSIV.

(9) *Has the ANII been consulted on this issue? Does he have an opinion?*

The rupture disks are exempted from involvement in replacement/repair activities by IWA-4131.2(b).