NRR-PMDAPEm Resource

From: Harrison Albon <awharrison@STPEGS.COM>
Sent: Tuesday, September 13, 2016 4:09 PM
To: Regner, Lisa; Klos, John
Cc: Richards, Drew; Schulz, William
Subject: [External_Sender] STPNOC Draft Response to SSIB Follow-up to RAI 33
Attachments: 16 Sept DRAFT adder to followup RAI 33 9-13 1400.pdf

Lisa, John,

Here is STP's draft response to SSIB Follow-up to RAI 33 for discussion with Steve Smith in the public call scheduled for tomorrow.

It refers to Follow up to RAI 34, which we also expect to provide prior to the call.

Wayne Harrison
STP Licensing
(979) 292-6413

Hearing Identifier: NRR_PMDA
Email Number: 3055

Mail Envelope Properties (94960344217740aaa247b2d4e59aecb5)

Subject: [External_Sender] STPNOC Draft Response to SSIB Follow-up to RAI 33
Sent Date: 9/13/2016 4:08:39 PM
Received Date: 9/13/2016 4:08:44 PM
From: Harrison Albon

Created By: awharrison@STPEGS.COM

Recipients:
"Richards, Drew" <amrichards@STPEGS.COM>
Tracking Status: None
"Schulz, William" <weschulz@STPEGS.COM>
Tracking Status: None
"Regner, Lisa" <Lisa.Regner@nrc.gov>
Tracking Status: None
"Klos, John" <John.Klos@nrc.gov>
Tracking Status: None

Post Office: CMBXEXCH03.CORP.STPEGS.NET

Files	Size	Date & Time
MESSAGE	289	9/13/2016 4:08:44 PM
16 Sept DRAFT adder to followup RAI 33 9-13 1400.pdf	208756	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Follow-up RAI 33 – In the December 23, 2009 RAIs, the NRC staff asked the licensee to provide the margin to flashing and the assumptions for the calculation. The licensee provided a calculation for the margin to flashing for large break loss of coolant accidents (LOCAs) at the start of recirculation as (in pounds per square inch [psi]):

Containment pressure + submergence – total strainer head loss – vapor pressure
= 43.1 + 0.3 - 1.5 - 39
= 2.9 psi

The licensee stated that post LOCA containment over pressure credit is needed to eliminate the potential for flashing. The licensee stated that the minimum strainer submergence was conservatively determined to be 0.5 inch for small break LOCA (SBLOCA), sump temperature and containment pressure would be lower for a SBLOCA than a large break LOCA (LBLOCA), strainer flow rate would also be lower, and debris transported to strainers would be much less such that there would be open strainer areas. Therefore, flashing is not expected to be an issue for SBLOCAs. The NRC guidance[1] is that sump temperature should be calculated conservatively high and containment pressure conservatively low to ensure no flashing will occur. It is acceptable to perform a time based calculation taking viscosity, chemical timing, and strainer submergence into account. Most design basis calculations maximize containment pressure, which is non conservative from a flashing perspective. Please explain in detail how sump temperature and containment pressure were calculated.

1 "Revised Content Guide for Generic Letter 2004-02 Supplemental Responses, November 2007" (ADAMS Accession No. ML073110278), and Regulatory Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident."

Response

The response to the December 23, 2009 RAI included a sump temperature and containment pressure that were calculated as part of the LOCA containment pressure and temperature response analysis. This was performed using the CONTEMPT computer code. The most recent LOCA containment pressure/temperature analysis was performed using the computer code GOTHIC. This resulted in a higher maximum sump temperature which was evaluated not to significantly impact the NPSH evaluation. An alternate analysis to change the design basis to maximize the sump temperature using COBRA/TRAC is an option but has not been fully evaluated to implement.

Addition to Response (Sept 2016)

Also see discussion in response to Follow-Up RAI 34 that addresses flashing and states that sump pool boiling does not occur. The maximum sump temperature determined for the initial submittals used the CONTEMPT code which was a

conservative determination. The change to GOTHIC (with more conservatism) resulted in a higher maximum sump temperature. The maximum sump temperature resulted from a case that was different from the case that yielded the maximum peak containment pressure. Other conservatisms include use of mass and energy (M&E) release rates based on a 29" LBLOCA which is greater in size than the largest break of 16" that passes the insulation fiber debris generation limit. Another conservatism used in the analysis was that the initial Refueling Water Storage Tank (RWST) temperature used was 130 degrees. As discussed in the response to Follow-Up RAI #34, a best estimate case shows that the peak sump temperature is much lower than the value of 273.6°F determined using GOTHIC.

Based on a sensitivity study for a large dry containment similar to STP, the use of COBRA/TRAC for M&E release rates would lower the maximum sump temperature by ~20 degrees. This is because the code provides a two-fluid, three-field representation of two-phase flow. It features extremely flexible noding for both the hydrodynamic mesh and the heat transfer solution. The previous vessel component of the code was somewhat restrictive in the geometries that could be modeled and also could not treat the entrainment of liquid drops from the continuous liquid phase directly. COBRA/TRAC has a more realistic model for stored energy in the primary and secondary systems. This treatment results in a longer time for stored energy to be released and also in a longer time to start recirculation.

Another consideration is that there is adequate margin to flashing due to the pump design. The Westinghouse CS and SI pump design provides for the NPSH requirement to be met by the inherent design of the pump. The pumps are vertical motor-driven pumps, each sitting in an individual barrel. The design calls for a distance of 15 ft. in this barrel between the suction nozzle centerline and the pump first-stage impeller. The 15-ft liquid-head in the pump barrel is thus expected to inherently satisfy the 15-ft NPSH requirement.