STPNOC Public Meeting with NRC to Discuss STPNOC Risk-Informed GSI-191 Licensing Application

NRC Offices

Rockville, Md

July 28, 2016

Agenda

- Introduction
- Overview of changes to application
- SSIB RAIs
- ESGB RAIs (as needed)
- SCVB RAIs (as needed)
- STSB RAIs
- APLA RAIs
- SNPB RAIs (as needed)
- Follow up LAR content
- Schedule

Overview of Expected Changes to Application

- Primary changes:
  - Hot leg breaks > 16” will be added to risk-informed scope
    - Adds 8 critical weld locations at the RPV hot leg nozzles
    - No significant effect on risk quantification
  - Small cold-leg breaks will be added to scope of breaks that meet the RoverD evaluation showing there is insufficient debris to affect core cooling
    - Will not require RELAP5-3D long-term cooling analysis
  - Proposed Technical Specification change will provide justification other than a quantified risk evaluation
  - Incorporation of change control processes in UFSAR
    - Similar to what was done for STP’s Special Treatment exemptions

SSIB RAIs

- Follow-up RAI 33
- Follow-up RAI 34
- Follow-up RAI 37
- SSIB-3-4
- SSIB-3-9

SSIB Follow up RAI 33

- See discussion in previously submitted response to RAI 34 that addresses flashing; boiling does not occur
- Maximum sump temperature determined using CONTEMPT for initial submittals – conservative determination
- Change to GOTHIC (more conservatism) resulted in higher maximum sump temperature
- Other conservatisms include use of M&E release rates based on 29” LBLOCA – largest break that passes fiber debris generation limit is 16”
- Use of COBRA TRAC for M&E release rates and containment analysis would lower sump temperature by ~20 degrees
- Initial RWST temperature used was 130 degrees

SSIB RAI 33 continued

- 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.
- The analysis of available NPSH to the pumps concerns itself with the NPSH at the pump suction nozzle, located at the top of the barrel.

Follow-up RAI 34

- Degasification/gas release for SBLOCA is bounded by LBLOCA
  - Head loss smaller for SBLOCA, and pressure difference causes gas release
- Consideration of plenum loss in CSHL calculation is conservative
- Integration of degasification and comparison to ½ height assumption
- A passing calculated void fraction was defined as a “void fraction less than 2% with non-boiling conditions in the pool”.
  - Cases that used Reg. Guide 1.82 to credit overpressure but resulted in non-zero void fraction less than 2% did so to prevent failing NPSH conditions at the pump; ie if boiling is present in the pool or void >2%, a passing NPSHm cannot be achieved because of forced cavitation.
  - Vertical pump design provides margin

Follow-up RAI 34 Cont.

- P_{loss} was calculated
  - Corrected Debris HL + Corrected CSHL+ Corrected Plenum Loss
- The degasification evaluation for RAI-34 was performed considering peak sump temp and corresponding pressure from the current design basis accident analysis calculation that yields maximum sump temperature.

Follow-up RAI 37

- The sole intent of the original response to 2009 RAI-37 was to say that NPSH margin (a minimum) and calculated head loss (a maximum) are bounded by LBLOCA analysis.
- SBLOCA is bounded for the following regions
  - $NPSH_m = NPSH_A - NPSH_R$
  - NPSHR decreases with decreasing flowrate
  - NPSHA increases with SBLOCA Conditions

Essentially the same as LBLOCA for Min Conditions

Smaller Peak Temp for SBLOCA Conditions/ Smaller Vap. Pressure

$$NPSH_A = \frac{P_{Cont}}{\rho g} + H_{Elev} - H_{Piping} - \frac{P_{Vap}}{\rho g}$$

Assumed 14.7 psi for all temps below boiling,. Above boiling cancels with vapor pressure term

Piping Losses Smaller for Lower Flow SBLOCA Cases

  - Head loss will be smaller for SBLOCA because of less debris and smaller flow.

Follow-up RAI 37

- Additionally the max fiber load for a small (<2”) break is 32.65 lbm (13.6 ft^3) which includes 28.5 lbm of latent fiber and 4.15 lbm of ZOI destroyed fiber
- For all two train cases this equates to a conservatively (no compression) calculated debris bed thickness of <1/16”
- For one train cases (through a single strainer), the maximum calculated bed thickness is 0.083”

SSIB 3-4

- Maximum particulate generation was calculated for Di_small sizes at each critical weld location and for DEGB sizes at non-critical weld locations to preserve RoverD fiber evaluation calculated risk.
- Non-DEGB calculations were performed with angular sweeps of 360 degrees in one degree increments to find the maximum amount of particulate generated at each location.

SSIB-3-9

- Future submittal of UFSAR mark-ups will include:
  - definition for Total Strainer Head Loss (= debris head loss plus clean strainer head loss)
  - Examples of change in NPSH margin for different sump temperatures

STSB

- Ninety-day completion time justified using non-risk basis
  - Time is reasonable for emergent conditions that involve debris that could be generated and transported under LOCA conditions.
  - Likelihood of an initiating event in the 90-day completion time is very small (1/4 of the LOCA annual frequency).
  - Margins in the debris generation and transport analyses and in the downstream and in-core effects analyses.
  - Provides reasonable time to identify and implement mitigating or compensatory action
  - In addition to the actions directly addressing the debris just mentioned, plant system configuration can be managed by application of the CRMP to maximize availability of mitigating systems (e.g., ECCS, AFW, SDGs) and defense in depth (e.g., containment isolation, CCW, ECW) by limiting activities that remove them from service.

STSB (continued)

- Conditions such as tarps on strainers addressed
  - Do not meet the proposed TS condition of “potential effects of LOCA generated and transported debris”
  - Proposed Bases enhanced to make applicability clear

Applicability

This required action applies only for the potential effects of debris on emergency sump strainer operability or on in-core debris effects. It does not apply for effects other than those caused by debris ***for which the testing and analysis apply***. Debris effects are conditions caused by transportable debris that could impact the net positive suction head or otherwise degrade pump performance, or cause strainer structural failure by excess accumulation on one of more of the emergency sump strainers. ***Obstructions or covers on the strainers such as tarps,*** ~~Gaps~~ or other conditions that are a physical degraded or nonconforming condition of the strainer ***(e.g., gaps, deformations)*** are to be addressed by the system train-specific, non-debris TS actions a and b.

APLA

- APLA-4-2 re indirect LOCA
  - Not included in initial RAI response
  - Evaluation shows indirect LOCA has insignificant contribution
- STPNOC will meet the 48-month requirement by reviewing relevant elements of the assessment to determine if there were any significant changes that would affect the conclusions.
  - STPNOC methodology only determines a bounding delta-CDF and delta-LERF
- Change control and reporting requirements to be in UFSAR App. 6A

Follow up LAR content

- Reference to 8/20/15 LAR supplement
- Reference to exemptions in 8/20/15 LAR supplement, as clarified by letter changing section of 50.46 to be exempted
- Include Final RoverD
- Include Final Technical Specification Change
- Include Final UFSAR markups
- Reference to RAI responses

Schedule

- LAR Supplement
- SE (draft?)
- ACRS Subcommittee
- ACRS full committee
- Final SE and Amendment