NRC Staff Resolution of STP Comments on Draft Safety Evaluation

NRC Staff Draft Safety Evaluation (SE) Editorial Comments from STP Nuclear Operating Company (STPNOC)

No.	SE or Attachment Section and Page	STPNOC Proposed Change	STPNOC Reason for Proposed Change	NRC Staff Resolution
1	Section 3.1, pg. 6	The sumps are located at the *Elev. (- minus)* 11-foot 3-inch level of the reactor containment building.	Correction for the proper floor elevation.	Change accepted.
2	Section 4.4.1, pg. 19	~~However, the licensee stated that piping in the containment is fabricated, designed, constructed, and examined (preservice inspections) with rigorous engineering requirements including safety factors.~~ <u>However, the staff noted that the licensee described ASME code requirements for design, fabrication, construction, and examination of containment piping, and addressed associated safety factors.</u>	Although we don't disagree and did describe ASME requirements, quality requirements, and safety factors, we could not identify where we specifically made this statement.	Change accepted.
3	Section 4.4.3, pg. 21	The licensee used guidance in RG 1.82 (remove note 51 re 2012 RG).	STP's UFSAR licensing basis is identified in the LAR as RG 1.82 draft Rev. 1, 1983.	Change accepted. Added new endnote 58.

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4	Section 4.5.2.2, pg. 28, 29	In its letter dated October 20, 2016, the licensee provided estimates of the risk attributable to debris. The licensee presented risk results using the arithmetic mean ~~in one case~~ and the geometric mean to allow comparison ~~in another~~. The licensee also stated its licensing position that the geometric mean is the most appropriate method and provided its basis in its response to APLAB, Results Interpretation – Uncertainty Analysis: RAI 2. Per NUREG-1829, providing analysis results under differing assumptions helps identify the sensitivity of the results to those assumptions. The NRC staff reviewed the licensee's information and concludes that the sensitivity analysis of the risk results to the choice of aggregation method is an acceptable way to address this source of uncertainty because it is consistent with the recommendation in NUREG-1829.	The SE phrasing suggests that STPNOC used geometric mean for one configuration and arithmetic mean for a different configuration and might apply the arithmetic aggregation for some conditions. Table 9 in Section 4.5.1 of Att. 1-3 to LAR Supplement 3 (10/20/2016) includes a "head to head" comparison of delta-CDF results for geometric and arithmetic means. STPNOC stated its licensing position in the paragraph below the table that the geometric mean is the most appropriate method and referenced its basis in a RAI response.	Partially accepted; the edits to the second sentence are accepted. The addition of the new sentence is not accepted because the licensee's position is not significant to the NRC staff's review.
5	Section 4.5.2.6.2, pg. 34	For DEGBs, D is equal to the inner diameter of the pipe and a spherical jet is assumed.	Agree – contradicts the square root of 2 discussion mentioned in No. 6 below (but this – just D – is the correct interpretation).	No change, since the current SE version in ADAMS correctly states this sentence.

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6	Section 4.5.2.6.2, pg. 35	In case of a full pipe break, the licensee ~~defined an equivalent break size based on $\sqrt{2}$ times the inner pipe diameter (i.e., the DEGB size is the diameter of a circular opening twice the area of the inner cross-section of the pipe).~~ used a spherical ZOI based on the material L/D using the applicable pipe ID.	See Comment 5.	Change accepted.
7	Section 4.5.2.6.2, pg. 36	In case of a full pipe break, the licensee uses a spherical ZOI based on the material L/D using the applicable pipe ID ~~defined an equivalent break size based on $\sqrt{2}$ times the inner pipe diameter (i.e., the DEGB size is the diameter of a circular opening twice the area of the inner cross-section of the pipe)~~.	Is correctly stated in Section 4.5.2.6.2, page 34. See Comment 5.	No change, since the current SE version in ADAMS correctly states this sentence.
8	Section 4.5.2.7, pg. 46	~~Debris settling is not credited for fine debris in the debris transport analyses~~98.5% of fine debris is transported to the RCB recirculation pool.	LAR (August 20): The majority of fiber fines (98.5%) destroyed from insulation in the ZOI are transported to the containment pool. The other 1.5% of debris not transported to the RCB sump is trapped in inactive cavities during pool fill. The transport modes and their contributing fractions to the containment pool for ZOI-generated fiber fines are described below.	Change accepted.

SE Attachment 2, "Long-Term Core Cooling Methodology and Evaluation Results Assessment" Comments from STPNOC

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1	LTCC Methodology, Section A.4.1, pg. 9	The licensee provided justification … the licensee referenced responses to previous questions 31 and ~~35~~ 36	Reference should be to Question 36 (See draft SE reference 27, pg. 74 of 77).	Change accepted.
2	LTCC Methodology, Section A.4.2.1.1, pg. 11	The licensee provided a description of the structured process used to identify and define the accident scenario in response to SNPB-3-2 (Reference 24 and 25) and SNPB-3-4 (Reference 22). ~~STPNOC stated that the process for accident scenario identification focused on three areas~~: The staff review of the STPNOC process determined that it addressed the areas below.	Could not find that we specifically made this statement, although the staff might have concluded from the review of the responses that STP put appropriate focus on these areas.	Change accepted.
3	LTCC Methodology, Section A.4.2.1.4, pg. 19	~~However, the licensee cautioned that the figure of merit for determining the limiting break should not be PCT, but the core collapsed liquid level~~.	We cannot find this cautionary statement. The collapsed liquid level is important, but PCT is the accepted regulatory figure of merit.	Partially accepted; modified as: However, the licensee *recognized* that the figure of merit for determining the limiting break should not be PCT, but the core collapsed liquid level.

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4	LTCC Methodology, Section A.4.2.2.5, pg. 23	Because the LTCC EM is only used to perform the simulations described in the RAI responses provided by the licensee, the NRC staff has determined that consideration of future licensing calculations was not needed. The NRC staff has concluded that this criterion does not apply. (No change suggested)	Check for understanding: If STP needs to rerun in the future (for the same cases but for, say a different block limit, more or less, different blockage timing, and so forth, we should be able to do so provided we use the same methodology that was reviewed.	Disagree. The licensee is limited in its use of this methodology as specified in the A.4.3 Conclusions.
5	LTCC Methodology, Section A.4.2.2.7, pg. 24	While the licensee provided justification for the use of the LTCC EM for the simulation of the 16-inch hot-leg breaks (and various sensitivity studies), complete accident-specific guidelines were not provided as the approval was limited to only those simulations already submitted to the NRC. Therefore, future use of the LTCC EM beyond the methodology and application reviewed by the staff requires prior review and approval by the NRC staff. Thus, the NRC staff concludes that this criterion does not apply.	We would understand this to still allow STP to apply the STP EM for similar sensitivity studies using the same methodology reviewed by NRC.	Disagree. The licensee is limited in its use of this methodology as specified in the A.4.3 Conclusions.
6	LTCC Methodology, Section A.4.2.3.4, pg. 27	The CCFL model is applied at the upper nozzles ~~core plate, a plate containing numerous holes which separates the fuel from the upper plenum~~.	Upper nozzles are where the CCFL is of concern rather than the upper core plate, per se.	Partially accepted. Modified to state “top of the core” versus “core plate.” The NRC staff notes that CCFL is typically checked for both the top of the fuel (i.e., upper nozzles) and the upper core plate, and is applied at which ever one has the least flow area.

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7	LTCC Methodology, Section A.4.2.3.4, pg. 27	Wallis with smooth edges over-predicted the superficial velocities in data with a few number of holes, but under-predicted the superficial velocities in data with a moderate number of holes and greatly under-predicted the superficial velocities of data with a large number of holes. This was the correlation chosen by the licensee for the LTCC EM. (No change suggested)	Comment: In our understanding, CCFL is correlated by the superficial velocity of the steam (which is assumed positive), and superficial velocity of the liquid. When the liquid velocity equals the steam velocity, it is stopped (flow begins to be counter-current).	No changes made. The NRC staff notes that CCFL has to do with the velocities of the steam and the liquid, but it also has to do with the liquid/vapor interface and the friction created in each.

8	LTCC Methodology, Section A.4.2.3.4, pg. 28	Therefore, a likely SI flow path is down through the core support plate on the periphery, down the periphery fuel bundles, and then into the center of the core to make up for any loss due to boil off. Given the open lattice nature of the core, this flow path would in reality be almost unaffected by CCFL. However, due to the manner in which the core is meshed and the CCFL model is applied, this flow path is not possible in the simulation. The NRC staff finds that this is likely to be a conservatism in the licensee's analysis. (No change suggested)	This same argument should apply for cores that are not designed as "low leakage" since power sharing will always be an artifact of multi-region cores. For example, even with low leakage design, we showed that internal low power sharing regions had downflow.	Accepted and modified: Original: *In reality, while CCFL may occur in channels which have significant amounts of steam generated, such as center regions of the core, it would likely not occur near the core periphery. Therefore, a likely SI flow path is down through the core support plate on the periphery, down the periphery fuel bundles, and then into the center of the core to make up for any loss due to boil off. Given the open lattice nature of the core, this flow path seems almost unaffected by CCFL, but due to the manner in which the core is meshed and the CCFL model is applied, this flow path is not possible in the simulation. The NRC staff finds that this is likely to be a very large conservatism in the licensee analysis.* Modified: *In reality, while CCFL may occur in hotter channels which generate significant amounts of steam (e.g., those commonly found in central regions of the core), it would not be likely to occur in lower power channels (e.g., those commonly found in the core periphery). Therefore, a likely SI flow path is down through the core support plate on the periphery, down the periphery fuel bundles, and then into the center of the core to make up for any loss due to boil off. Given the open lattice nature of the core, this flow path would in reality be almost*

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				unaffected by CFL. However, due to the manner in which the core is meshed and the CCFL model is applied, this flow path is not possible in the simulation. The NRC staff finds that this is likely to be a conservatism in the licensee's analysis.
9	LTCC Methodology, Section A.4.2.4.2, pg. 32	… While CCFL was found to restrict the flow from the upper plenum into the core in the analysis, it is possible that this results from an oversensitivity to CCFL caused by modeling the core and thus the ~~upper core plate~~ *top nozzles* where CCFL occurs, as a single radial node.	CCFL will occur at the top nozzles, which were modeled in STP's LTCC EM.	Partially accepted; modified as: While CCFL was found to restrict the flow from the upper plenum into the core in the analysis, it is possible that this results from an oversensitivity to CCFL caused by modeling the core – *specifically, the top of the core where CCFL occurs* – as a single radial node.
10	LTCC Methodology Section A.4.2.4.7, pg. 35	<u>The staff believes</u> this is likely because in the two channel model, liquid can flow into the average channel and steam and liquid exit through the hot channel, but in the base case all liquid flowing into the core and all steam and liquid exiting the core must go through the same channel (i.e., the same node).	Should clarify that this is the staff's opinion. It is not included in our assessment and we have not performed analyses to support it.	Change accepted.

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11	LTCC Methodology, Section A.4.2.5, pg. 37	Safety parameters are those parameters which have limits to ensure plant safety, such as the specified acceptable fuel design limits (SAFDLs) required by General Design Criterion 10 from 10 CFR 50 Appendix A. Examples of safety parameters are PCT, cladding oxidation thickness, departure from nuclear boiling ratio (DNBR), and critical power ratio (CPR). No explicit uncertainty analysis was prescribed or performed for the LTCC EM. However, the NRC staff reviewed specific aspects of the LTCC EM to confirm that specific uncertainties would be accounted for in the analysis. (No change suggested)	Confirming the intent of the staff's statements: The uncertainties we addressed were pertaining to the debris issue in LTCC. It appears from the following paragraph that those were reviewed and found to be acceptable.	While STPNOC's comment did not request any change to the SE, they did request confirmation of the staff's intent. They clarified "that the uncertainties addressed were pertaining to the debris issues in the LTCC." While there were some uncertainties associated with the debris itself in the LTCC simulations, these were very limited. For example, the only direct uncertainty associated with debris was on the blockage time of the core inlet. This uncertainty was addressed by assuming a conservatively short blockage time. There were other uncertainties associated with the LTCC simulation which the staff considered to be the dominating uncertainties and which were addressed in the SE.
12	LTCC Methodology, Section A.4.3, pg. 46	The NRC staff's conclusions herein are specific to the South Texas Project and future uses of this LTCC EM require prior review and approval by the NRC staff for those specific details and plant design. (No changes suggested)	We understand this means other plants cannot use this without prior NRC approval; however, STP can continue to use it in accordance with the methodology we submitted.	Disagree. The licensee is limited in its use of this methodology as specified in the A.4.3 Conclusions.