NRR-PMDAPEm Resource

From: Regner, Lisa
Sent: Thursday, February 04, 2016 4:08 PM
To: Wayne Harrison
Cc: Michael Murray; Sterling, Lance (lsterling@STPEGS.COM)
Subject: DRAFT RAI for Thermal-hydraulic review of STP GSI-191
Attachments: IBMgetContent.docx

Wayne,

Attached is the draft thermal-hydraulic RAI. The technical staff is implementing a pilot program where they provide a categorization scheme for each of the questions to help better describe the extent of the staff's concern and level of effort expected to resolve the issue. Details of this categorization are included in the attachment.

You will see that the staff has a number of remaining significant concerns in the T-H area and we are hopeful that the upcoming audit will assist in the efficiency of the resolution of these remaining concerns.

We will discuss these further with you at the public meeting on 2/18, and at the audit, as needed.

Thank you,
Lisa

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Priority: Standard
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To facilitate better communication, each of the requests for additional information (RAIs) has been categorized by the U.S. Nuclear Regulatory Commission (NRC) staff. The three categories considered are:

- Level of Concern (i.e., “How concerned is the NRC staff with the statements in the submittal which generated this RAI?”),
- Level of Impact (i.e., “What is the perceived level of impact of RAI to the approval of the submittal?”, and
- Level of Effort (i.e., “What is the perceived level of work which will be needed to satisfy this RAI?”)

Each RAI is assigned a level in each category (1-5) and the scores are combined to generate the following significance table. Further details on each category are provided at the end of this document. The individual levels of each RAI are provided with that RAI below.

Table 1: RAI Summary for STP STNP-RAIs

Level of Significance	Number of RAIs
High	13
Moderate	9
Low	10

ENCLOSURE

Table 2: RAI Categorization Summary for STP SNPB-RAIs

RAI	Concern	Impact	Effort		Significance
1	2	1	2		High
2	1	1	1		High
3	5	3	4		Low
4	1	1	1		High
5	2	3	3		Moderate
6	2	1	2		High
7	1	1	1		High
8	3	1	3		Low
9	3	1	3		Moderate
10	3	3	3		Low
11	3	3	2		Low
12	3	3	2		Low
13	2	1	1		High
14	3	3	3		Low
15	3	3	3		Low
16	3	1	5		Moderate
17	2	1	1		High
18	2	3	2		Moderate
19	3	3	3		Low
20	3	3	2		Low
21	3	3	3		Low
22	2	3	2		Moderate
23	1	1	1		High
24	1	2	1		High
25	3	2	2		Moderate
26	1	2	2		High
27	1	2	2		High
28	3	2	2		Moderate
29	1	2	2		High
30	3	2	2		Moderate
31	2	2	2		High
32	3	2	3		Moderate

Level of Concern	Definition	Significance Points
1	The NRC staff is very concerned as the RAI is focused upon statements which the staff understands, but the staff believes are incorrect.	1
2	The NRC staff is concerned as the RAI is focused upon statements which the staff understands, but the staff is skeptical about being correct.	1
3	The NRC staff is somewhat concerned as the RAI is focused upon statements which the staff understands and believes are correct, but considers the supporting documentation to be inadequate.	0
4	The NRC staff is unsure of their concern as the as the RAI is focused upon statements which the staff does not understand, and; therefore clarification is needed.	0
5	The NRC staff is minimally concerned.	0

Level of Impact	Definition	Significance Points
1	The RAI could have a very large impact. If it is not resolved, either the submittal will be denied or the approval would be so limited that the method described in the submittal may be unusable.	1
2	The RAI could have a large impact. If it is not resolved, the approval will be limited such that the submittal would be usable, but significantly limited.	1
3	The RAI could have somewhat of an impact. If it is not resolved, the approval will be limited such that the submittal would be usable and only slightly limited.	0
4	The impact of the RAI is unknown as it is address information in the submittal which the staff does not understand.	0
5	The RAI likely has a minimal impact. If it is not resolved, the approval would likely not be limited.	0

Level of Effort	Definition	Significance Points
1	The RAI will likely require a very significant level of effort to resolve. Such requests are typically made when important aspects of a specific assertion of the submittal are missing and likely require substantial additional analysis by the submitter or the NRC staff. **Additionally, the NRC staff believes that there is a high likelihood of having an additional RAI on the newly submitted information.** Examples: data required for independent verification, need for additional computational runs, need for additional experimental data	1
2	The RAI will likely require a significant level of effort to resolve. Such requests are typically made when important aspects of a specific assertion of the submittal are missing and likely require additional analysis by the submitter. Additionally, the NRC staff does not believe that there is a high likelihood of having an additional RAI on the newly submitted information. Examples: complete justifications of an assertion, detailed summary	0
3	The RAI will likely require some level of effort to resolve. Such requests including requesting data or information which may not be immediately available, but is likely known or understood by the submitter. Examples: further explanations or details, high level summary	0
4	The RAI will likely require a small level of effort to resolve. Such requests include requesting a data or information which is likely to be immediately available, but has not been given. Examples: a citation for a reference, a figure or a table of known data	0
5	The RAI will likely require a minimal level of effort to resolve. Such requests include requesting an affirmation of a certain position (i.e., “yes” or “no”). Examples: a confirmation that a certain procedure is being used	0

To determine an RAI’s Overall Significance, sum that RAI’s Significance Points from each attribute.

The following criteria were used for this review:

Criterion #	Title	*Criteria*	Reference
0.1	Clad Oxidation	*The thickness of the cladding oxide and the deposits of material on the fuel shall not exceed 0.050 inches in any fuel region.*	SE for WCAP-16793-NP, Revision 2
1.1	Structured Process	*The process used for accident scenario identification should be a structured process.*	SRP Section 15.0.2 Sub-Section III.3c
1.2	Accident Progression	*The description of each accident scenario should provide a complete and accurate description of the accident progression.*	SRP Section 15.0.2 Sub-Section III.3c
1.3	Phenomena Identification and Ranking	*The dominant physical phenomena influencing the outcome of the accident should be correctly identified and ranked.*	SRP Section 15.0.2 Sub-Section III.3c
1.4	Initial and Boundary Conditions	*The description of each accident scenario should provide complete and accurate description of the plant initial and boundary conditions.*	SRP Section 15.0.2 Sub-Section III.3c
2.1	Necessary Documentation	*The documentation should be reviewed to determine if (i) all documentation listed in Section II.1 above has been provided [the evaluation model, the accident scenario identification process, the code assessment, the uncertainty analysis, a theory manual, a user manual, and the quality assurance program], (ii) the evaluation model overview provides an accurate roadmap of the evaluation model documentation, (iii) all documentation is accurate, complete, and consistent and, (iv) all symbols and nomenclature have been defined and consistently used.*	SRP Section 15.0.2 Sub-Section III.3a
2.2	Theory Manual	*The theory manual should be a self-contained document that describes the field equations, closure relationships, numerical solution techniques, and simplifications and approximations (including limitations) inherent in the chosen field equations and numerical methods.*	SRP Section 15.0.2 Sub-Section III.3a
2.3	Closure Relationships	*The theory manual should identify the pedigree or origin of closure relationships used in the code and the limits of applicability for all models in the code.*	SRP Section 15.0.2 Sub-Section III.3a

2.4	User Manual	*The user manual should provide guidance for selecting or calculating all input parameters and code options.*	SRP Section 15.0.2 Sub-Section III.3a
2.5	Options for Licensing Calculations	*The guidance in the [user] manual should specify the required and acceptable code options for the specific licensing calculations.*	SRP Section 15.0.2 Sub-Section III.3a
2.6	Required Input	*The required input settings are hardwired into the input processor so that the code stops with an error message if the required input is not provided or if the input is not within an acceptable range of values or that administrative controls (an independent reviewer QA check) are in place that accomplish the same purpose.*	SRP Section 15.0.2 Sub-Section III.3a
2.7	Accident Specific Guidelines	*Computer codes that are used for multiple accidents and transients should include guidelines that are specific to each transient or accident.*	SRP Section 15.0.2 Sub-Section III.3a
3.1	Previously Reviewed and Accepted Codes and Models	*It should be determined if the mathematical modeling and computer codes used to analyze the transient or accident should be been previously reviewed and accepted.*	SRP Section 15.0.2 Sub-Section III.3b
3.2	Physical Modeling	*The physical modeling described in the theory manual and contained in the mathematical models should be adequate to calculate the physical phenomena influencing the accident scenario for which the code is used.*	SRP Section 15.0.2 Sub-Section III.3b
3.3	Field Equations	*The field equations of the evaluation model should be adequate to describe the set of physical phenomena that occur in the accident.*	SRP Section 15.0.2 Sub-Section III.3b
3.4	Validation of the Closure Relationships	*The range of validity of the closure relationships should be specified and should be adequate to cover the range of conditions encountered in the accident scenario.*	SRP Section 15.0.2 Sub-Section III.3b
3.5	Simplifying and Averaging Assumptions	*The simplifying assumptions and assumptions used in the averaging procedure should be valid for the accident scenario under consideration.*	SRP Section 15.0.2 Sub-Section III.3b
3.6	Level of Detail in the Model	*The level of detail in the model should be equivalent to or greater than the level of detail required to specify the answer to the problem of interest.*	SRP Section 15.0.2 Sub-Section III.3b
3.7	Equations and Derivations	*The equations and derivations should be correct*	SRP Section 15.0.2 Sub-Section III.3b

3.8	Similarity Criteria and Scaling Rationale	*The similarity criteria and scaling rationales should be based on the important phenomena and processes identified by the accident scenario identification process and appropriate scaling analyses.*	SRP Section 15.0.2 Sub-Section III.3b
3.9	Scaling Analysis	*Scaling analyses should be conducted to ensure that the data and the models will be applicable to the full scale analysis of the plant transient.*	SRP Section 15.0.2 Sub-Section III.3b
4.1	Single Version of the Evaluation Model	*All assessment cases should be performed with a single version of the evaluation model.*	SRP Section 15.0.2 Sub-Section III.3d
4.2	Validation of the Evaluation Model	*Integral test assessments must properly validate the predictions of the evaluation model for the full size plant accident scenarios. This validation should cover all of the important code models and the full range of conditions encountered in the accident scenarios.*	SRP Section 15.0.2 Sub-Section III.3d
4.3	Range of Assessment	*All code closure relationships based in part on experimental data or more detailed calculations should be assessed over the full range of conditions encountered in the accident scenario by means of comparison to separate effects test data.*	SRP Section 15.0.2 Sub-Section III.3d
4.4	Numerical Solution	*The numerical solution should conserve all important quantities.*	SRP Section 15.0.2 Sub-Section III.3d
4.5	Code Tuning	*All code options that are to be used in the accident simulation should be appropriate and should not be used merely for code tuning.*	SRP Section 15.0.2 Sub-Section III.3d

4.6	Compensating Errors	*The reviewers should ensure that the documentation contains comparisons of all important experimental measurements with the code predictions in order to expose possible cases of compensating errors.*	SRP Section 15.0.2 Sub-Section III.3d
4.7	Specific Test Cases	*Assessments should be performed where applicable [specific test cases for LOCA to meet the requirements of Appendix K to 10 CFR Part 50 and TMI action items for PWR small-break LOCA].* *Appropriate sensitivity studies shall be performed for each evaluation model, to evaluate the effect on the calculated results of variations in noding, phenomena assumed in the calculation to predominate, including pump operation or locking, and values of parameters over their applicable ranges. For items to which results are shown to be sensitive, the choices made shall be justified.* *A detailed analysis shall be performed of the thermal-mechanical conditions in the reactor vessel during recovery from small breaks with an extended loss of all feedwater.*	SRP Section 15.0.2 Sub-Section III.3d Appendix K to 10 CFR Part 50 *TMI action items for PWR*
4.8	Assessment Data	*Published literature should be referred to for sources of assessment data for specific phenomena, accident scenarios, and plant types.*	SRP Section 15.0.2 Sub-Section III.3d
5.1	Important Sources of Uncertainty	*The accident scenario identification process should be used in identifying the important sources of uncertainty.*	SRP Section 15.0.2 Sub-Section III.3e
5.2	Code Uncertainty	*The method for calculating uncertainty should contain all important sources of uncertainty and that a sample uncertainty calculation for a prototypical plant gives a reasonable estimate of the calculation uncertainty. The reviewers should confirm that sources of code uncertainty have been addressed.*	SRP Section 15.0.2 Sub-Section III.3e
5.3	Calculation Uncertainty	*Sources of calculation uncertainties should be addressed, including uncertainties in plant model input parameters for plant operating conditions (e.g., accident initial conditions, set points, and boundary conditions).*	SRP Section 15.0.2 Sub-Section III.3e
5.4	Experimental Uncertainty	*The uncertainties in the experimental data base should be addressed.*	SRP Section 15.0.2 Sub-Section III.3e

5.5	Calculated and Predicted Results	*For separate effects tests and integral effects tests, the differences between calculated results and experimental data for important phenomena should be quantified for bias and deviation.*	SRP Section 15.0.2 Sub-Section III.3e
5.6	Data with Large Uncertainties	*Data sets and correlations with experimental uncertainties that are too large when compared to the requirements for evaluation model assessment should not be used.*	SRP Section 15.0.2 Sub-Section III.3e
5.7	Uncertainties and Design Margin	*When the code is used in a licensing calculation, the combined code and application uncertainty should be less than the design margin for the safety parameter of interest in the calculation.*	SRP Section 15.0.2 Sub-Section III.3e
6.1	Appendix B Quality Assurance Program	*The evaluation model should be maintained under a quality assurance program that meets the requirements of Appendix B to 10 CFR Part 50.*	SRP Section 15.0.2 Sub-Section III.3f
6.2	Quality Assurance Documentation	*The quality assurance program documentation should include procedures that address all of these areas [design control, document control, software configuration control and testing, and corrective actions].*	SRP Section 15.0.2 Sub-Section III.3f
6.3	Independent Peer Review	*Independent peer reviews should be performed at key steps in the evaluation model development process.*	SRP Section 15.0.2 Sub-Section III.3f

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1. RAI-SNPB-01

Cladding Oxide					
Demonstrate that the thickness of the cladding oxide and the deposits of material on the fuel do not exceed 0.050 inches in any fuel region.					
Criterion	0.1				
Level of Concern	2	**Level of Impact**	1	**Level of Effort**	2
Overall Significance	High				

2. RAI-SNPB-02

Accident Scenario Progression					
Provide a description of the accident progression of the four accident scenarios being simulated using the LTCC EM. This description should start at the initiation of the break, define each phase, and the important phenomena occurring in that phase in the various locations of the RCS (e.g., core, reactor vessel, steam generators - both primary and secondary side, loops, pressurizer, pumps, containment).					
Criterion	1.2				
Level of Concern	1	**Level of Impact**	1	**Level of Effort**	1
Overall Significance	High				

3. RAI-SNPB-03

Clarification on Core Bypass Blockage					
During the audit, STP was considering performing the long term core cooling analysis with the core bypass open to allow flow in the axial direction. Does STP intend to make this change and allow flow axially through the bypass or will STP continue with the bypass completely blocked? If STP is crediting the use of the bypass, they should provide analysis to demonstrate that the bypass will not block during the scenarios. If they are not crediting the bypass, they should inform the NRC that they plan to continue with their current model.					
Criterion	1.3				
Level of Concern	5	**Level of Impact**	3	**Level of Effort**	4
Overall Significance	Low				

4. RAI-SNPB-04

Describe important phenomena					
Provide a description of the important phenomena being modeled in RELAP5-3D for of each of the four accident scenarios being simulated. These phenomena should include those important to obtaining the correct initial conditions for the long-term phase, and those phenomena important during the long-term phase. Additionally, this description should include the range of the system parameters over which the phenomena occur.					
Criterion	1.3				
Level of Concern	1	**Level of Impact**	1	**Level of Effort**	1
Overall Significance	High				

5. RAI-SNPB-05

Debris at grid spacers					
Describe how the LTCC EM accounts for crud and potential blockages at spacer grids.					
Criterion	1.3				
Level of Concern	2	**Level of Impact**	3	**Level of Effort**	3
Overall Significance	Moderate				

6. RAI-SNPB-06

Initial and Boundary Conditions for each Accident Scenario					
Demonstrate that the initial and boundary conditions for each accident scenario are appropriate for the given simulation. This demonstration should focus on the simulations performed under the Appendix B QAP. Provide a discussion of the confirmation of the initial and boundary conditions and describe how it was determined that these conditions reflect the conditions in the plant. Provide a discussion on the treatment of uncertainties. Additionally, provide any appropriate references. *If this demonstration relies on comparisons with results from other computer codes provide (1) a description of the code, (2) confirmation that the code has been approved by the NRC, (3) a summary of the simulations the code has been approved to analyze, and (4) an analysis addressing each boundary and initial and boundary condition and how a deviation in that condition would be reflected in the code comparison.*					
Criterion	1.4				
Level of Concern	2	**Level of Impact**	1	**Level of Effort**	2
Overall Significance	High				

7. RAI-SNPB-07

Initial and Boundary Conditions for the Long-Term Phase

Demonstrate that the initial and boundary conditions for each accident scenario at the beginning of the long-term phase are consistent with those conditions which are expected. This demonstration should analyze the RELAP5-3D calculations for the conditions at the beginning of reflood and show that those calculations are reasonable compared with known behavior. This analysis should include comparison between the conditions calculated by RELAP5-3D and the current large and small break LOCA safety analyses.

Criterion	1.4				
Level of Concern	1	**Level of Impact**	1	**Level of Effort**	1
Overall Significance	High				

8. RAI-SNPB-08

How are the phenomena modeled

Summarize how the important phenomena are being modeled in the LTCC EM. This discussion should provide the phenomena and a summary of how it is being modeled (e.g., through the field equations, by an identified closure relationship).

Criterion	2.2				
Level of Concern	3	**Level of Impact**	3	**Level of Effort**	3
Overall Significance	Low				

9. RAI-SNPB-09

Reference and limits of closure relationships

Demonstrate that each closure relationship is associated with an appropriate reference providing its limits of applicability.

Criterion	2.3				
Level of Concern	3	**Level of Impact**	1	**Level of Effort**	3
Overall Significance	Moderate				

10. RAI-SNPB-10

<table>
<tr><td colspan="6">User Manual

Provide the user manual and/or similar guidance for analysts performing simulations using the LTCC EM.</td></tr>
<tr><td>Criterion</td><td>2.4</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Level of Concern</td><td>3</td><td>Level of Impact</td><td>3</td><td>Level of Effort</td><td>3</td></tr>
<tr><td>Overall Significance</td><td colspan="5">Low</td></tr>
</table>

11. RAI-SNPB-11

<table>
<tr><td colspan="6">Modeling of Important Phenomena

Provide a summary of the important phenomena and demonstrate the LTCC EM is able to adequately model those phenomena.</td></tr>
<tr><td>Criterion</td><td>3.2</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Level of Concern</td><td>3</td><td>Level of Impact</td><td>3</td><td>Level of Effort</td><td>2</td></tr>
<tr><td>Overall Significance</td><td colspan="5">Low</td></tr>
</table>

12. RAI-SNPB-12

<table>
<tr><td colspan="6">Field Equations

Define and provide a summary of the field equations for the LTCC EM. This should include identification of the of the conservation equation (e.g., mass, momentum) and the number of dimensions of the equation. For portions of the RCS model that change in nodalization (e.g., 1-D to 3-D) a separate description may be necessary. Additionally, demonstrate that these equations are able to model the necessary phenomena.</td></tr>
<tr><td>Criterion</td><td>3.3</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Level of Concern</td><td>3</td><td>Level of Impact</td><td>3</td><td>Level of Effort</td><td>2</td></tr>
<tr><td>Overall Significance</td><td colspan="5">Low</td></tr>
</table>

13. RAI-SNPB-13

Validation of closure relationships

For the closure relationships identified, provide appropriate validation for the use of this relationship over its expected application domain. This validation should include comparisons to separate effects tests and/or integral test data and appropriately address the model's uncertainty. Where appropriate, discuss any similarity criteria, scaling rationale, assumptions, simplifications, and/or compensating errors.

Criterion	3.4, 3.8, 3.9, 4.3,4.6, 5.2, 5.4, 5.5, 5.6				
Level of Concern	2	**Level of Impact**	1	**Level of Effort**	1
Overall Significance	High				

14. RAI-SNPB-14

Simplifying and averaging

Provide a summary of the key simplifying and averaging assumptions used in the generation of the mathematical models used in the LTCC EM and demonstrate that they are appropriate for the accident scenarios being modeled.

Criterion	3.5				
Level of Concern	3	**Level of Impact**	3	**Level of Effort**	3
Overall Significance	Low				

15. RAI-SNPB-15

Level of detail

Confirm that the level of detail (e.g., phenomena modeled, initial and boundary conditions, overall assumptions) is consistent between STP's LOCA licensing basis analysis and the simulations performed using RELAP5-3D.

Criterion	3.6				
Level of Concern	3	**Level of Impact**	3	**Level of Effort**	3
Overall Significance	Low				

16. RAI-SNPB-16

Single version of the evaluation model					
Confirm that a single version of the evaluation model was used during the simulations of the given accident scenarios. This includes confirming that the code version was frozen and the manner for calculating or obtaining inputs did not change.					
Criterion	4.1				
Level of Concern	3	**Level of Impact**	1	**Level of Effort**	5
Overall Significance	Moderate				

17. RAI-SNPB-17

Validation of the evaluation model					
Provide appropriate validation demonstrating that the LTCC EM will result in a reasonable prediction of the important figures of merit for the accident scenarios considered. Demonstrate that the validation covers the range of the accident scenarios used in the LTCC EM. This validation should include comparisons to integral test data and appropriately address the model's uncertainty. Where appropriate, discuss any similarity criteria, scaling rationale, assumptions, simplifications, and/or compensating errors.					
Criterion	4.2, 3.8, 3.9, 4.3,4.6, 5.2, 5.4, 5.5, 5.6				
Level of Concern	2	**Level of Impact**	1	**Level of Effort**	1
Overall Significance	High				

18. RAI-SNPB-18

Mesh size sensitivity					
Demonstrate that the LTCC results are independent of mesh size for the accident scenarios under consideration.					
Criterion	4.7				
Level of Concern	2	**Level of Impact**	3	**Level of Effort**	2
Overall Significance	Moderate				

19. RAI-SNPB-19

Initial Test Cases					
Provide a summary of the assessment cases performed in order to demonstrate that RELAP5-3D has been installed and is being used appropriately.					
Criterion	4.7				
Level of Concern	3	**Level of Impact**	3	**Level of Effort**	3
Overall Significance	Low				

20. RAI-SNPB-20

Specific sensitivity studies					
During the audit, the NRC staff identified a number of sensitivity studies that would be important for the review of the proposed long term core cooling evaluation methodology. STP should perform the following sensitivity studies and submit plots of the relevant figures of merit and important timings for long term core cooling analysis: *a) Appendix K decay heat load with single worst failure and steam generator tube plugging* *b) Axial power shape* *c) Small break sensitivity study with appropriate break size resolution*					
Criterion	4.7				
Level of Concern	3	**Level of Impact**	3	**Level of Effort**	2
Overall Significance	Low				

21. RAI-SNPB-21

Important Sources of Uncertainty					
Demonstrate that the important sources of uncertainty are appropriately accounted for in the LTCC EM.					
Criterion	5.3, 5.2				
Level of Concern	3	**Level of Impact**	3	**Level of Effort**	3
Overall Significance	Low				

22. RAI-SNPB-22

Uncertainness and design margin					
Provide a discussion on the impact of the uncertainties considered on the important figures of merit (e.g., PCT) for each of the accident scenarios and the margin to the design limit.					
Criterion	5.7				
Level of Concern	2	**Level of Impact**	3	**Level of Effort**	2
Overall Significance	Moderate				

23. RAI-SNPB-23

Evaluation Model in an Appendix B QAP

To address GL 2004-02, STP is demonstrate its compliance with 10 CFR 50.46 (b)(5), Long term core cooling, including the impact of debris, using the following two step approach:

(1) The hot leg large break, hot leg medium break, hot leg small break, and cold leg small break will be demonstrated to be in compliance with 10 CFR 50.46 (b)(5) by ensuring that the long term core temperature does not exceed 800° F assuming a fully blocked core. This is demonstrated by using deterministic analysis performed with RELAP5-D

(2) The cold leg large break and cold leg medium break will rely on a risk informed approach.

The hot leg large break, hot leg medium break, hot leg small break, and cold leg small break analyses are used to demonstrate compliance with 10 CFR 50.46 (b)(5). Therefore certain design control measures are required, as specified in 10 CFR 50, Appendix B (III):

> *Design control measures shall be applied to items such as the following: reactor physics, stress, thermal, hydraulic, and accident analyses; compatibility of materials; accessibility for inservice inspection, maintenance, and repair; and delineation of acceptance criteria for inspections and tests.*

However, it is not apparent that the RELAP5-3D analysis was performed under a QA program satisfying the requirements of Appendix B.

Demonstrate that the RELAP5-3D analysis was performed under a QA program which satisfies the requirements of 10 CFR 50, Appendix B, or provide a similar analysis that was performed under such a program.

Criterion	6.1				
Level of Concern	1	**Level of Impact**	1	**Level of Effort**	1
Overall Significance	High				

24. RAI-SNPB-24

Input Verification					
Provide details of how STP's QAP controls over the input deck for the LTCC EM. How are the input values verified? What inputs are users given permission to change and how are such changes controlled?					
Criterion	6.1				
Level of Concern	1	**Level of Impact**	2	**Level of Effort**	1
Overall Significance	High				

25. RAI-SNPB-25

Proper Convergence					
How does the QAP ensure the code converged properly? Such indicators commonly include nonphysical state properties and excessive mass error. Demonstrate that if the code did not converge numerically, the analysts would be alerted to the error messages and act appropriately.					
Criterion	6.1				
Level of Concern	3	**Level of Impact**	2	**Level of Effort**	2
Overall Significance	Moderate				

26. RAI-SNPB-26

Non-physical results					
How does the QAP ensure non-physical results were not obtained? Such as liquid over vaper, unphysical oscillations that could be numerically induced, or any other nonphysical results that may lead to erroneous conclusions concerning the code's calculated thermal-hydraulic behavior.					
Criterion	6.1				
Level of Concern	1	**Level of Impact**	2	**Level of Effort**	2
Overall Significance	High				

27. RAI-SNPB-27

Realistic results					
How does the QAP ensure the physical results are realistic? Where the calculated flow regimes and heat transfer modes should be studied to ensure that the code is not assuming unrealistic conditions?					
Criterion	6.1				
Level of Concern	1	**Level of Impact**	2	**Level of Effort**	2
Overall Significance	High				

28. RAI-SNPB-28

Boundary conditions as prescribed					
How does the QAP ensure that the boundary conditions are occurring as prescribed? Boundary conditions and others that control the direction of the transient (e.g., valves opening, pumps beginning to coast down, or heater rod power turning off) should be checked by the user to ensure that all is happening as expected.					
Criterion	6.1				
Level of Concern	3	**Level of Impact**	2	**Level of Effort**	2
Overall Significance	Moderate				

29. RAI-SNPB-29

Thoroughly understood results					
How does the QAP ensure that every aspect of the calculation is thoroughly understood? The depressurization rate, various indications of core heatup, drain rate of the system at various locations, liquid holdup, indications of condensation or evaporation, transition from subcooled to two-phase break flow, and other conditions should all be explainable. Also, the results of the user's calculation should be understood from the perspective of previous calculations done on the same or similar facilities.					
Criterion	6.1				
Level of Concern	1	**Level of Impact**	1	**Level of Effort**	2
Overall Significance	High				

30. RAI-SNPB-30

Quality assurance program documentation *Demonstrate that the documentation for the QAP includes procedures to address all relevant areas including, but not limited to, design control, document control, software configuration control and testing, and corrective actions.*					
Criterion	6.2				
Level of Concern	3	**Level of Impact**	2	**Level of Effort**	2
Overall Significance	Moderate				

31. RAI-SNPB-31

Independent Peer Review *Demonstrate that the QAP used independent peer review in the key steps appropriately. This should include a description of the steps where independent peer review was applied and how independence was defined and obtained.*					
Criterion	6.2				
Level of Concern	2	**Level of Impact**	2	**Level of Effort**	2
Overall Significance	High				

32. RAI-SNPB-32

Important Sources of Uncertainty *Identify the important sources of uncertainty in the LTCC EM*					
Criterion	5.1				
Level of Concern	3	**Level of Impact**	2	**Level of Effort**	3
Overall Significance	Moderate				