GE Nuclear Energy

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August 28, 1995

MFN 126-95
Docket STN 52-004

Document Control Desk
U. S. Nuclear Regulatory Commission

Attention: Theodore E. Quay, Director
Standardization Project Directorate

Subject: **SBWR - Revised Schedule for TRACG RAIs Q901.75 - Q901.158**

Reference: 1. Letter from J. H. Wilson (NRC) to J. E. Quinn (GE), REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE SIMPLIFIED BOILING WATER REACTOR (SBWR) DESIGN (Q901.75 - Q901.158), dated May 25, 1995.

We are in receipt of the reference letter requesting additional information on the material presented in GE Licensing Topical Report (LTR) NED-32177, TRACG Computer Code Qualification, dated January 1993. We propose to respond to these RAIs in two groups; the first group of responses will be provided the end of October, 1995, and the remainder will be provided by the end of the year, 1995. This schedule reflects the urgency of completing Revision C to the SBWR Test and Analysis Program Description (NED-32391), by August 31, 1995 such that the Staff can issue the DSER this fall. The 901-RAI response schedule also provides reasonable time to incorporate appropriate changes into the update of NED-32177, scheduled to be provided to the Staff in April, 1996. The RAI responses will also reflect the discussions held with NRC and BNL to clarify some of the RAIs.

If you have any questions regarding TRACG please contact Bharat Shiralkar of our staff on 408-925-6889.

Sincerely,

James E. Quinn

D040 1/1

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Attachment: Status of Responses to RAIs 901.75 - 901.158

cc:	P. A. Boehnert	(NRC/ACRS)	(2 paper copies w/att plus E-Mail w/att)
	I. Catton	(ACRS)	(1 paper copy w/att plus E-Mail w/att)
	S. Q. Ninh	(NRC)	(2 paper copies w/att plus E-Mail w/att)
	J. H. Wilson	(NRC)	(1 paper copy w/att plus E-Mail w/att)

Attachment to MFN 126-95

Status of Responses to RAIs 901.75 - 901.158

Revised Due Date	ID or RAI No.	Source or Date Rec'd	NRC Comments
10/31/95	901.75	5/25/95	The word "Qualification" is used throughout the report without ever being defined. "Validation" and "Verification" are well defined words. It would appear that "Qualification" is used in place of "Validation." ....
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10/31/95	901.88	5/25/95	Section 3.2.1) The film boiling evaluations of Section 3.2.1 state that THTF pressures are significantly higher than those of BWR transients. What are the THTF pressures and how much are the correlations affected by the differences between ....
12/31/95	901.89	5/25/95	(Section 3.2.1) These high pressure data cannot be applied for code validation of film boiling after depressurization (i.e. in the range of about 2 bar), as would be required if the core were ever uncovered. Provide a justification for ....
10/31/95	901.90	5/25/95	(Section 3.2.1) What is the sensitivity of the film boiling heat transfer to the given rod temperature data (i.e., what error in film heat transfer rates would induce what error in rod temperatures), which clearly lag in response due to ....
12/31/95	901.91	5/25/95	(Section 3.3) The comparison of TRACG code predictions against test data from the CSHT facility is specific to ECCS liquid coolant entering the fuel bundles, which is not of interest in SBWRs. However, ...
10/31/95	901.92	5/25/95	(Section 3.3) The descriptions of the tests and the model are inadequate. In particular, a detailed description of Figures 3.3-3 and 3.3-4 is required to permit a reader to follow the results. Provide additional explanation and description of ....
12/31/95	901.93	5/25/95	(Section 3.4.1.3) Evaluate the effect of using heat slabs over the time period of 50 to 60 s. Was this effect quantitatively evaluated, or is the last sentence of this section conjecture?
12/31/95	901.94	5/25/95	(Section 3.5) This section assesses TRACG's capability to predict tube bundle pressure drops in the range of operating conditions (mass flow range of test data - 140 to 2,040 kg/m2s; average full power mass flux ~1,020 kg/m2s). However, ...
10/31/95	901.95	5/25/95	(Section 3.6.1) This section refers to "five rod groups" and to the rod that first showed BT being treated as a separate group. This description is unclear. Is a sub-channel analysis being applied here, with a separation into five groups? ....
10/31/95	901.96	5/25/95	(Section 3.6.1) Describe the relative location of thermocouples 2 through 6 in Figure 3.6-1. They are apparently all in the upper section of the bundle, but the response of Tc 4 is flat, while Tc 2 shows the largest oscillation amplitude. ....
12/31/95	901.97	5/25/95	(Section 3.6.[illegible]) Fig 3.6-2 is presented as TRACG results for comparison with the experimental results of Figure 3.6-1. However, this figure does not really present a validation of the test data, except ....

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10/31/95	901.98	5/25/95	(Section 3.6.2) How was the pressure increased in these tests? Figure 3.6-3 implies that this was achieved through an increase in inlet flow. If so, why was a prescribed pressure vs. time imposed on the simulation, ...
10/31/95	901.99	5/25/95	(Section 3.6.2) The report stated that the TRACG model used here is the "same" as for the oscillation tests. However, a different tube bundle was used here (GE9 vs. GE11). Provide clarification of this discrepancy.
12/31/95	901.100	5/25/95	(Section 3.6.2) A plot of CPR with a scale truncated at 1.0 does not provide a validation for the comparison of the experiment and the TRACG simulation. Provide justification why parameters equivalent to those of Figure 3.6-3 were not used.
10/31/95	901.101	5/25/95	(Section 3.7) Identify the FRIGG test that was selected.
10/31/95	901.102	5/25/95	(Section 3.7) FRIGG experiments that used a pseudo random binary signal are available. Provide justification for not using one of those experiments for validation.
10/31/95	901.103	5/25/95	(Section 4.2) Provide an explanation for why carryover and carry-under are only reported as functions of inlet quality. Mass flow rates or a related parameter, such as stagnation pressure, should be considered as a separate, independent parameter.
10/31/95	901.104	5/25/95	(Section 4.2) The validation presented is in the range of normal operating data only. Consideration of LOCA conditions is missing. In particular during an MSLB scenario and during ADS operation, carryover could ....
12/31/95	901.105	5/25/95	(Section 4.4.3) One purpose of the steady state heat transfer test was to evaluate "the effect of varying nitrogen concentration and steam flow rates on the PCC heat transfer characteristics". The comparison given does not ....
10/31/95	901.106	5/25/95	(Section 4.4.5) The methodology describing how this degradation parameter was established in the experiments is unclear. The text states that it was "calculated by measuring the condensate flow rate", which is in itself contradictory. ....
10/31/95	901.107	5/25/95	(Section 5.1.1) The "mixture level" mentioned here is a two-phase level and not a collapsed level. Its progression downward during the test run is estimated based on the differential pressure measurements, using the taps indicated in Figure 5.1-2. ....
10/31/95	901.108	5/25/95	(Section 5.1.1) For the TRACG model, Figure 5.1-13 of Section 5.1.2 shows a bundle nodalization using 26 nodes. However, the test data of Figures 5.1-3 to 6 are for "Data Nodes" 28 to 31. The results section (Section 5.1.1.3) implies ....

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10/31/95	901.109	5/25/95	(Section 5.1.1) Since this is a natural convection loop, the mass flows through the tube bundle, the bypass region and through the downcomer should be determined. Are any data for these available, and if so, how do the ....
10/31/95	901.110	5/25/95	(Section 5.1.1) The reported void fraction distributions and the average rod temperature data generally show satisfactory agreement between experiment and simulation. However, two anomalies should be addressed: Why do the TRACG predictions ....
12/31/95	901.111	5/25/95	(Section 5.1.2) This section gives a partial justification of the nodalization. Under "further subdivisions" ... "for more accurate representation," the nodalization of the lower plenum region is discussed. Two axial levels are used, ...
12/31/95	901.112	5/25/95	(Section 5.1.2) The early disagreement between TRACG break flow predictions and test data in Figure 5.1-19 is well discussed. However, a rationale for the significant underprediction of the break flow between 50 and 150 s should be provided.
12/31/95	901.113	5/25/95	(Section 5.1.2) For CCFL breakdown times between 90 and 130 s, "noticeable changes" in upper plenum pressure drop are mentioned on Page 5-17. In particular for the measured data, no such changes can be readily identified in Figure 5.1-23. ....
12/31/95	901.114	5/25/95	(Section 5.1.2) Clarify the description and discussion of rod heat-up on Page 5-18. "Little or no heat-up" at the top elevation applies for the test data (when referred to the initial operating temperature) and for the ....
10/31/95	901.115	5/25/95	(Section 5.1.2.3, page 5-17) A TRACG "hot rod" model is introduced and described. However, the staff could not find any reference to this "hot rod" model in the Model Report. A description of this model should be included in the revised Model Report.
12/31/95	901.116	5/25/95	(Section 5.1.3, Figure 5.1-33) Provide an explanation for the test data bypass pressure drop spike at about 17 s.
10/31/95	901.117	5/25/95	(Section 5.1.4) All references to other sections of this report and to references should be reviewed and corrected.
10/31/95	901.118	5/25/95	(Section 5.1.4) Various ECC flow rates are here given as fractions of those in previous tests, but the absolute values are not given in either place. A table with the relevant flow rates and temperatures should be provided.
10/31/95	901.119	5/25/95	(Section 5.1.4) The text of Section 5.1.4.3, describing Figure 5.1-40 (core inlet flow), refers to unreliable core inlet flow data and states that dynamic effects affected the accuracy of the density determination. How is the test core inlet flow ....
10/31/95	901.120	5/25/95	(Section 5.1.4) Figure 5.1-45 shows two separate test data traces, differing from most other figures with rod temperatures. What is the second (lower) trace? (See also Figures 5.2-20 and 21.)

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10/31/95	901.121	5/25/95	(Section 5.1.4) Although no void fraction data were presented with the results of this section, the conclusions of Section ..4.4 claim good performance of the void distribution models. F..ther, ...
10/31/95	901.122	5/25/95	(Section 5.2) This report should be free-standi..n and should demonstrate qualification of the TRACG code. This section contains insufficient detail in the description of the test facility and of the TRACG model. No rationale for the selected TRACG ....
12/31/95	901.123	5/25/95	(Section 5.2.2) The discussion of Figure 5.2-3 states that an attenuation of the depressurization rate at 11.5 s was observed. A slightly lower depressurization rate was observed at about 18 s, but not at 11.5 s. Provide a basis substantiating the ....
12/31/95	901.124	5/25/95	(Section 5.2.2) Figures 5.2-6 and 7 are claimed to show a "faster reduction" of the bypass and bundle inventories for the time period of 40 to 64 s. If DP is accepted as a measure of inventory, then ....
10/31/95	901.125	5/25/95	(Section 5.3.2) Table 5.3-1 lists the tests to be modeled by TRACG, along with the rationale for why these tests were selected. Tests B01 and B07 are both main steam line breaks, however, there is no description of what the difference between ....
10/31/95	901.126	5/25/95	(Section 5.3.2) Aside from the arrangement of cooling water inventories, there are additional differences between the SBWR design for which GIST was built, and the current design. In particular, the reference to ADS components, ...
10/31/95	901.127	5/25/95	(Sectiom 5.3.4) Table 5.3-1 states that Test B07 (core uncovery and subsequent heat-up) would be the only SBWR-related test where these phenomena were observed. However, this was not discussed in the text and ....
10/31/95	901.128	5/25/95	(Section 5.3.4, Page 5-76) The report states that Figure 5.3-12 shows that test and calculation show onset of GDCS flow within 12 s of each other. However, the figure shows at least 70 s (less than 450 s vs. more than 520 s). Explain this discrepancy.
12/31/95	901.129	5/25/95	(Section 5.3.4) Figure 5.3-13 shows some disagreement for the annulus pressure drop between test and predictions during depressurization (~50 to 200 s) and, in Figure 5.3-14, the core pressure drop disagrees after GDCS onset. However, ...
12/31/95	901.130	5/25/95	(Section 5.3.4) Provide an explantion for why a GDCS flow over-prediction after calibration against test data can be justified by a test data uncertainty of 10%. Since the test data were used as a basis, ...
12/31/95	901.131	5/25/95	(Section 5.3.4) There are some disagreements in the annulus pressure drop data, in particular in the 50 to 150 s range, and some in the post-300 s range. These should be discussed and quantified to substantiate the subjective conclusion that ....

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12/31/95	901.132	5/25/95	(Section 5.4.3) The detailed qualitative description of the accident scenario points to the importance of keeping the lower plenum two-phase level below the side entry orifices (SEO). However, the results section stated that this was the case, ...
12/31/95	901.133	5/25/95	(Section 5.4.3) The discussion of Figure 5.4-7 is not clear. The figure shows vapor velocities, which turn negative at about 13 s for the peripheral bundles. It is not clear how this indicates transition to liquid downflow at about 10 s, and ....
12/31/95	901.134	5/25/95	(Section 5.4.3) Apparently the SEO pressure drop is not an orifice DP, but a measurement across taps 0.567 m apart. The text description and data for Figure 5.4-8 differ. Only at close to 20 s (not 10 s) does the measured pressure difference ....
12/31/95	901.135	5/25/95	(Section 5.4.3) The calculated pressure drop data of Figures 5.4-8 to 14 show oscillations of differing frequencies, which are not observed in the test data. Provide a rationale explaining this behavior.
10/31/95	901.136	5/25/95	(Sections 5.5.1 & 5.5.2) The description of the facility, the test procedure (and also of the TRACG model in Section 5.5.3.1) are adequate, but, the test itself is never identified. It is initially referred to as "a system response test". ....
12/31/95	901.137	5/25/95	(Section 5.5.3) Nine almost straight lines are presented on nine graphs and, at the selected scales, agreement between test and experiment appears excellent. Since the test was run to demonstrate the operation of the PCCS, ...
12/31/95	901.138	5/25/95	(Section 5.5.3, Figure 5.5-5) The report states that the initial peak pressure in the drywell is well-predicted, however, the figure does not support this conclusion. The report should provide a blow-up of that region and should explain ....
10/31/95	901.139	5/25/95	(Section 5.5.3) Explain the differences between Figures 5.5-7 and 8 (same title, same straight lines).
12/31/95	901.140	5/25/95	(Section 5.5.3) Using the pool level as an indicator of heat removal is a relatively inaccurate integral reading, telling little about the actual heat removal conditions. Also, over the time period of 17 hr the predicted pool level drop is ....
12/31/95	901.141	5/25/95	(Section 5.5.3) TRACG apparently over-predicts the PCCS heat removal rate. This should reduce the drywell pressure. Explain why the drywell pressure agreement is good, with an over-prediction in PCCS heat removal.
10/31/95	901.142	5/25/95	(Section 5.6) Provide a discussion explaining why the reference natural circulation experiment was not simulated, since it is much more relevant to SBWR applications than the forced flow experiment. Apparently, the information ....

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10/31/95	901.143	5/25/95	(Section 7.2) The data shown in Figures 7.2-2 and 3 appear to apply during recirculation pump coast-down time. Only the transition to a natural circulation mode and the flow under those conditions are of interest for SBWR applications. ....
12/31/95	901.144	5/25/95	(Sections 7.2 & 7.3) Provide a detailed description of the test conditions and the data measured during the plant tests and for the different time periods.
12/31/95	901.145	5/25/95	(Section 7.3) During the Hatch MSIV Closure Test, the quenching of steam by incoming feedwater played an essential role. What actually happened to the feedwater flow during this test? Was it generally set to match steamline flow; had it been tripped?
10/31/95	901.146	5/25/95	In Section 3.2.12, the Model Report points out need for a quenching heat transfer model during reflood, which apparently is available as an option in TRACG. However, the Qualification does not mention this model. Has it been validated ....
10/31/95	901.147	5/25/95	(Figures 3.1-10 and 11) Provide the units of vapor flux on the abscissa scale..
10/31/95	901.148	5/25/95	(Section 3.1.5) Table 3.1-5 lists four tests with top break and two with bottom break. Why are only the first two of the top break tests simulated with the TRACG model? Was there a problem with the other two top break tests (5801-19 and 5702-16)?
10/31/95	901.149	5/25/95	(Section 3.3) Provide the name of the "CSHT" facility.
10/31/95	901.150	5/25/95	(Equation 3.3-1) No notation is provided for this equation. The staff notes that the corresponding equation in the Model Report (Equation 3.2-54) differs slightly and is only partly defined there. Provide notation for the equation and define ....
12/31/95	901.151	5/25/95	(Section 3.4) This section should be enhanced by including figures of the vessel pressure vs. time.
10/31/95	901.152	5/25/95	(Page 3-99) Apparently the figure titles on this page are reversed. Figure 3.9-3 shows "Energy Release", which is more commonly referred to in the text as "integrated power". For clarity, also indicate that it is integrated power ....
10/31/95	901.153	5/25/95	(Figures 4.2-2 & 5) Provide revised figure titles. Both figure titles are mislabeled; carryover is shown.
10/31/95	901.154	5/25/95	(Page 5-3) The mixture level of 0.254 m (top of Page 5-3) appears to be in error. Confirm that level is 2.54 m (100 in.), which would roughly correspond to the elevation shown in Figure 5.1-6.
10/31/95	901.155	5/25/95	(Section 5.1.3.3) Confirm that the reference to a figure in the next-to-last line in Section 5.1.3.3 should be to Figure 5.1-35 (not 5.3.1.9).
10/31/95	901.156	5/25/95	(Section 5.1.4, Page 5-43) The reference to Figures 5.1-44 and 45 in the text appears wrong. Confirm that figure numbers and discussion refer to mid plane and upper elevation (not 0.89 m elevation).

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10/31/95	901.157	5/25/95	(Section 5.3.1) Is the reference to recirculation line breaks in the second paragraph of this section an error, since GIST was established for SBWR-related tests. If not, provide an explanation.
10/31/95	901.158	5/25/95	(Page 5-130, first line) In a TRACG model, how does one fill the system with water?

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J. E. Quinn, Projects Manager
LMR and SBWR Programs

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12/31/95	901.87	5/25/95	(Section 3.2) This section only considers film boiling and core spray heat transfer. In the Model Report, Sections 3.2.9 and 10 consider interfacial and wall heat transfer with many more heat transfer regimes. For interfacial heat transfer, ...
10/31/95	901.88	5/25/95	Section 3.2.1) The film boiling evaluations of Section 3.2.1 state that THTF pressures are significantly higher than those of BWR transients. What are the THTF pressures and how much are the correlations affected by the differences between ....
12/31/95	901.89	5/25/95	(Section 3.2.1) These high pressure data cannot be applied for code validation of film boiling after depressurization (i.e. in the range of about 2 bar), as would be required if the core were ever uncovered. Provide a justification for ....
10/31/95	901.90	5/25/95	(Section 3.2.1) What is the sensitivity of the film boiling heat transfer to the given rod temperature data (i.e., what error in film heat transfer rates would induce what error in rod temperatures), which clearly lag in response due to ....
12/31/95	901.91	5/25/95	(Section 3.3) The comparison of TRACG code predictions against test data from the CSHT facility is specific to ECCS liquid coolant entering the fuel bundles, which is not of interest in SBWRs. However, ...
10/31/95	901.92	5/25/95	(Section 3.3) The descriptions of the tests and the model are inadequate. In particular, a detailed description of Figures 3.3-3 and 3.3-4 is required to permit a reader to follow the results. Provide additional explanation and description of ....
12/31/95	901.93	5/25/95	(Section 3.4.1.3) Evaluate the effect of using heat slabs over the time period of 50 to 60 s. Was this effect quantitatively evaluated, or is the last sentence of this section conjecture?
12/31/95	901.94	5/25/95	(Section 3.5) This section assesses TRACG's capability to predict tube bundle pressure drops in the range of operating conditions (mass flow range of test data - 140 to 2,040 kg/m2s; average full power mass flux ~1,020 kg/m2s). However, ...
10/31/95	901.95	5/25/95	(Section 3.6.1) This section refers to "five rod groups" and to the rod that first showed BT being treated as a separate group. This description is unclear. Is a sub-channel analysis being applied here, with a separation into five groups? ....
10/31/95	901.96	5/25/95	(Section 3.6.1) Describe the relative location of thermocouples 2 through 6 in Figure 3.6-1. They are apparently all in the upper section of the bundle, but the response of Tc 4 is flat, while Tc 2 shows the largest oscillation amplitude. ....
12/31/95	901.97	5/25/95	(Section 3.6.1) Fig 3.6-2 is presented as TRACG results for comparison with the experimental results of Figure 3.6-1. However, this figure does not really present a validation of the test data, except ....

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10/31/95	901.98	5/25/95	(Section 3.6.2) How was the pressure increased in these tests? Figure 3.6-3 implies that this was achieved through an increase in inlet flow. If so, why was a prescribed pressure vs. time imposed on the simulation, ...
10/31/95	901.99	5/25/95	(Section 3.6.2) The report stated that the TRACG model used here is the "same" as for the oscillation tests. However, a different tube bundle was used here (GE9 vs. GE11). Provide clarification of this discrepancy.
12/31/95	901.100	5/25/95	(Section 3.6.2) A plot of CPR with a scale truncated at 1.0 does not provide a validation for the comparison of the experiment and the TRACG simulation. Provide justification why parameters equivalent to those of Figure 3.6-3 were not used.
10/31/95	901.101	5/25/95	(Section 3.7) Identify the FRIGG test that was selected.
10/31/95	901.102	5/25/95	(Section 3.7) FRIGG experiments that used a pseudo random binary signal are available. Provide justification for not using one of those experiments for validation.
10/31/95	901.103	5/25/95	(Section 4.2) Provide an explanation for why carryover and carry-under are only reported as functions of inlet quality. Mass flow rates or a related parameter, such as stagnation pressure, should be considered as a separate, independent parameter.
10/31/95	901.104	5/25/95	(Section 4.2) The validation presented is in the range of normal operating data only. Consideration of LOCA conditions is missing. In particular during an MSLB scenario and during ADS operation, carryover could ....
12/31/95	901.105	5/25/95	(Section 4.4.3) One purpose of the steady state heat transfer test was to evaluate "the effect of varying nitrogen concentration and steam flow rates on the PCC heat transfer characteristics". The comparison given does not ....
10/31/95	901.106	5/25/95	(Section 4.4.5) The methodology describing how this degradation parameter was established in the experiments is unclear. The text states that it was "calculated by measuring the condensate flow rate", which is in itself contradictory. ....
10/31/95	901.107	5/25/95	(Section 5.1.1) The "mixture level" mentioned here is a two-phase level and not a collapsed level. Its progression downward during the test run is estimated based on the differential pressure measurements, using the taps indicated in Figure 5.1-2. ....
10/31/95	901.108	5/25/95	(Section 5.1.1) For the TRACG model, Figure 5.1-13 of Section 5.1.2 shows a bundle nodalization using 26 nodes. However, the test data of Figures 5.1-3 to 6 are for "Data Nodes" 28 to 31. The results section (Section 5.1.1.3) implies ....

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10/31/95	901.109	5/25/95	(Section 5.1.1) Since this is a natural convection loop, the mass flows through the tube bundle, the bypass region and through the downcomer should be determined. Are any data for these available, and if so, how do the ....
10/31/95	901.110	5/25/95	(Section 5.1.1) The reported void fraction distributions and the average rod temperature data generally show satisfactory agreement between experiment and simulation. However, two anomalies should be addressed: Why do the TRACG predictions ....
12/31/95	901.111	5/25/95	(Section 5.1.2) This section gives a partial justification of the nodalization. Under "further subdivisions" ... "for more accurate representation," the nodalization of the lower plenum region is discussed. Two axial levels are used, ...
12/31/95	901.112	5/25/95	(Section 5.1.2) The early disagreement between TRACG break flow predictions and test data in Figure 5.1-19 is well discussed. However, a rationale for the significant underprediction of the break flow between 50 and 150 s should be provided.
12/31/95	901.113	5/25/95	(Section 5.1.2) For CCFL breakdown times between 90 and 130 s, "noticeable changes" in upper plenum pressure drop are mentioned on Page 5-17. In particular for the measured data, no such changes can be readily identified in Figure 5.1-23. ....
12/31/95	901.114	5/25/95	(Section 5.1.2) Clarify the description and discussion of rod heat-up on Page 5-18. "Little or no heat-up" at the top elevation applies for the test data (when referred to the initial operating temperature) and for the ....
10/31/95	901.115	5/25/95	(Section 5.1.2.3, page 5-17) A TRACG "hot rod" model is introduced and described. However, the staff could not find any reference to this "hot rod" model in the Model Report. A description of this model should be included in the revised Model Report.
12/31/95	901.116	5/25/95	(Section 5.1.3, Figure 5.1-33) Provide an explanation for the test data bypass pressure drop spike at about 17 s.
10/31/95	901.117	5/25/95	(Section 5.1.4) All references to other sections of this report and to references should be reviewed and corrected.
10/31/95	901.118	5/25/95	(Section 5.1.4) Various ECC flow rates are here given as fractions of those in previous tests, but the absolute values are not given in either place. A table with the relevant flow rates and temperatures should be provided.
10/31/95	901.119	5/25/95	(Section 5.1.4) The text of Section 5.1.4.3, describing Figure 5.1-40 (core inlet flow), refers to unreliable core inlet flow data and states that dynamic effects affected the accuracy of the density determination. How is the test core inlet flow ....
10/31/95	901.120	5/25/95	(Section 5.1.4) Figure 5.1-45 shows two separate test data traces, differing from most other figures with rod temperatures. What is the second (lower) trace? (See also Figures 5.2-20 and 21.)

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10/31/95	901.121	5/25/95	(Section 5.1.4) Although no void fraction data were presented with the results of this section, the conclusions of Section 5.1.4.4 claim good performance of the void distribution models. Further, ...
10/31/95	901.122	5/25/95	(Section 5.2) This report should be free-standing and should demonstrate qualification of the TRACG code. This section contains insufficient detail in the description of the test facility and of the TRACG model. No rationale for the selected TRACG ....
12/31/95	901.123	5/25/95	(Section 5.2.2) The discussion of Figure 5.2-3 states that an attenuation of the depressurization rate at 11.5 s was observed. A slightly lower depressurization rate was observed at about 18 s, but not at 11.5 s. Provide a basis substantiating the ....
12/31/95	901.124	5/25/95	(Section 5.2.2) Figures 5.2-6 and 7 are claimed to show a "faster reduction" of the bypass and bundle inventories for the time period of 40 to 64 s. If DP is accepted as a measure of inventory, then ....
10/31/95	901.125	5/25/95	(Section 5.3.2) Table 5.3-1 lists the tests to be modeled by TRACG, along with the rationale for why these tests were selected. Tests B01 and B07 are both main steam line breaks, however, there is no description of what the difference between ....
10/31/95	901.126	5/25/95	(Section 5.3.2) Aside from the arrangement of cooling water inventories, there are additional differences between the SBWR design for which GIST was built, and the current design. In particular, the reference to ADS components, ...
10/31/95	901.127	5/25/95	(Sectiom 5.3.4) Table 5.3-1 states that Test B07 (core uncovery and subsequent heat-up) would be the only SBWR-related test where these phenomena were observed. However, this was not discussed in the text and ....
10/31/95	901.128	5/25/95	(Section 5.3.4, Page 5-76) The report states that Figure 5.3-12 shows that test and calculation show onset of GDCS flow within 12 s of each other. However, the figure shows at least 70 s (less than 450 s vs. more than 520 s). Explain this discrepancy.
12/31/95	901.129	5/25/95	(Section 5.3.4) Figure 5.3-13 shows some disagreement for the annulus pressure drop between test and predictions during depressurization (~50 to 200 s) and, in Figure 5.3-14, the core pressure drop disagrees after GDCS onset. However, ...
12/31/95	901.130	5/25/95	(Section 5.3.4) Provide an explantion for why a GDCS flow over-prediction after calibration against test data can be justified by a test data uncertainty of 10%. Since the test data were used as a basis, ...
12/31/95	901.131	5/25/95	(Section 5.3.4) There are some disagreements in the annulus pressure drop data, in particular in the 50 to 150 s range, and some in the post-300 s range. These should be discussed and quantified to substantiate the subjective conclusion that ....

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12/31/95	901.132	5/25/95	(Section 5.4.3) The detailed qualitative description of the accident scenario points to the importance of keeping the lower plenum two-phase level below the side entry orifices (SEO). However, the results section stated that this was the case, ...
12/31/95	901.133	5/25/95	(Section 5.4.3) The discussion of Figure 5.4-7 is not clear. The figure shows vapor velocities, which turn negative at about 13 s for the peripheral bundles. It is not clear how this indicates transition to liquid downflow at about 10 s, and ....
12/31/95	901.134	5/25/95	(Section 5.4.3) Apparently the SEO pressure drop is not an orifice DP, but a measurement across taps 0.567 m apart. The text description and data for Figure 5.4-8 differ. Only at close to 20 s (not 10 s) does the measured pressure difference ....
12/31/95	901.135	5/25/95	(Section 5.4.3) The calculated pressure drop data of Figures 5.4-8 to 14 show oscillations of differing frequencies, which are not observed in the test data. Provide a rationale explaining this behavior.
10/31/95	901.136	5/25/95	(Sections 5.5.1 & 5.5.2) The description of the facility, the test procedure (and also of the TRACG model in Section 5.5.3.1) are adequate, but, the test itself is never identified. It is initially referred to as "a system response test". ....
12/31/95	901.137	5/25/95	(Section 5.5.3) Nine almost straight lines are presented on nine graphs and, at the selected scales, agreement between test and experiment appears excellent. Since the test was run to demonstrate the operation of the PCCS, ...
12/31/95	901.138	5/25/95	(Section 5.5.3, Figure 5.5-5) The report states that the initial peak pressure in the drywell is well-predicted, however, the figure does not support this conclusion. The report should provide a blow-up of that region and should explain ....
10/31/95	901.139	5/25/95	(Section 5.5.3) Explain the differences between Figures 5.5-7 and 8 (same title, same straight lines).
12/31/95	901.140	5/25/95	(Section 5.5.3) Using the pool level as an indicator of heat removal is a relatively inaccurate integral reading, telling little about the actual heat removal conditions. Also, over the time period of 17 hr the predicted pool level drop is ....
12/31/95	901.141	5/25/95	(Section 5.5.3) TRACG apparently over-predicts the PCCS heat removal rate. This should reduce the drywell pressure. Explain why the drywell pressure agreement is good, with an over-prediction in PCCS heat removal.
10/31/95	901.142	5/25/95	(Section 5.6) Provide a discussion explaining why the reference natural circulation experiment was not simulated, since it is much more relevant to SBWR applications than the forced flow experiment. Apparently, the information ....

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Revised Due Date	ID or RAI No.	Source or Date Rec'd	NRC Comments
10/31/95	901.143	5/25/95	(Section 7.2) The data shown in Figures 7.2-2 and 3 appear to apply during recirculation pump coast-down time. Only the transition to a natural circulation mode and the flow under those conditions are of interest for SBWR applications. ....
12/31/95	901.144	5/25/95	(Sections 7.2 & 7.3) Provide a detailed description of the test conditions and the data measured during the plant tests and for the different time periods.
12/31/95	901.145	5/25/95	(Section 7.3) During the Hatch MSIV Closure Test, the quenching of steam by incoming feedwater played an essential role. What actually happened to the feedwater flow during this test? Was it generally set to match steamline flow; had it been tripped?
10/31/95	901.146	5/25/95	In Section 3.2.12, the Model Report points out need for a quenching heat transfer model during reflood, which apparently is available as an option in TRACG. However, the Qualification does not mention this model. Has it been validated ....
10/31/95	901.147	5/25/95	(Figures 3.1-10 and 11) Provide the units of vapor flux on the abscissa scale..
10/31/95	901.148	5/25/95	(Section 3.1.5) Table 3.1-5 lists four tests with top break and two with bottom break. Why are only the first two of the top break tests simulated with the TRACG model? Was there a problem with the other two top break tests (5801-19 and 5702-16)?
10/31/95	901.149	5/25/95	(Section 3.3) Provide the name of the "CSHT" facility.
10/31/95	901.150	5/25/95	(Equation 3.3-1) No notation is provided for this equation. The staff notes that the corresponding equation in the Model Report (Equation 3.2-54) differs slightly and is only partly defined there. Provide notation for the equation and define ....
12/31/95	901.151	5/25/95	(Section 3.4) This section should be enhanced by including figures of the vessel pressure vs. time.
10/31/95	901.152	5/25/95	(Page 3-99) Apparently the figure titles on this page are reversed. Figure 3.9-3 shows "Energy Release", which is more commonly referred to in the text as "integrated power". For clarity, also indicate that it is integrated power ....
10/31/95	901.153	5/25/95	(Figures 4.2-2 & 5) Provide revised figure titles. Both figure titles are mislabeled; carryover is shown.
10/31/95	901.154	5/25/95	(Page 5-3) The mixture level of 0.254 m (top of Page 5-3) appears to be in error. Confirm that level is 2.54 m (100 in.), which would roughly correspond to the elevation shown in Figure 5.1-6.
10/31/95	901.155	5/25/95	(Section 5.1.3.3) Confirm that the reference to a figure in the next-to-last line in Section 5.1.3.3 should be to Figure 5.1-35 (not 5.3.1.9).
10/31/95	901.156	5/25/95	(Section 5.1.4, Page 5-43) The reference to Figures 5.1-44 and 45 in the text appears wrong. Confirm that figure numbers and discussion refer to mid plane and upper elevation (not 0.89 m elevation).

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10/31/95	901.157	5/25/95	(Section 5.3.1) Is the reference to recirculation line breaks in the second paragraph of this section an error, since GIST was established for SBWR-related tests. If not, provide an explanation.
10/31/95	901.158	5/25/95	(Page 5-130, first line) In a TRACG model, how does one fill the system with water?