Entergy

Entergy Operations, Inc.
Waterloo Road
P.O. Box 756
Port Gibson, MS 39150
Tel 601 437 6470

Jerry C. Roberts
Director
Nuclear Safety Assurance

GNRO-2003/00059

October 29, 2003

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Supplement to Amendment Request for a One-time Extension of the Integrated Leak Rate Test and Drywell Bypass Test Interval
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

REFERENCE: Letter to USNRC from Charles H. Cruse, Constellation Nuclear, "Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated Leakage Rate Test Extension," dated March 27, 2002

Dear Sir or Madam:

By letter dated May 12, 2003, Entergy Operations, Inc. (Entergy) proposed a change to the Grand Gulf Nuclear Station, Unit 1 (GGNS) Technical Specifications (TS) to change administrative TS 5.5.12 regarding Containment Integrated Leak Rate Testing (ILRT) and TS 3.6.5.1.1 regarding drywell bypass leakage. The change would allow for an extended interval (15 years) for performance of the next ILRT and drywell bypass leakage test. In accordance with recent practice for similar submittals, this request was made for a one-time extension of the interval.

Entergy and members of the NRC staff have held several calls to discuss the drywell bypass tests. As a result of the calls, 5 questions were determined to need formal response. Entergy's response is contained in Attachment 1.

There are no technical changes proposed. The original no significant hazards consideration included in the original submittal is not affected by any information contained in the supplemental letter. There are no new commitments contained in this letter.

If you have any questions or require additional information, please contact Bill Brice at 601-368-5076.

A017

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 29, 2003 .

Sincerely,

JCR/WBB/amt

Attachment: Response to Request For Additional Information Related to One-time Extension of the Integrated Leak Rate Test and Drywell Bypass Test Interval

cc: Mr. Bruce S. Mallett
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-4005

U. S. Nuclear Regulatory Commission
Attn: Mr. Bhalchandra Vaidya, NRR/DLPM
ATTN: ADDRESSEE ONLY
Mail Stop OWFN/7-D1
Washington, DC 20555-0001

Mr. Brian W. Amy, MD, MHA, MPH
Mississippi Department of Health
P. O. Box 1700
Jackson, MS 39215-1700

Mr. T. L. Hoeg, GGNS Senior Resident
Mr. D. E. Levanway (Wise Carter)
Mr. L. J. Smith (Wise Carter)
Mr. N. S. Reynolds
Mr. H. L. Thomas

Attachment 1

To

GNRO-2003/00059

Response to Request for Additional Information Related to One-time Extension of the Integrated Leak Rate Test and Drywell Bypass Test Interval

Response to Request for Additional Information Related to One-time Extension of the Integrated Leak Rate Test and Drywell Bypass Test Interval

1. Inspections of some reinforced concrete and steel containments (e.g., North Anna, Brunswick, D. C. Cook, and Oyster Creek) have indicated degradation from the uninspectable (embedded) side of the steel shell and liner of primary containments. Please describe the uninspectable areas of the Grand Gulf containment, and the programs used to monitor their condition. Provide a quantitative assessment of the impact on LERF due to age-related degradation in these areas, in support of the requested ILRT interval extension from 10 to 15 years.

A description of the uninspectable areas of the Grand Gulf containment and the programs used to monitor their condition was provided in the original license amendment request in Section 9.0 of Attachment 1 to Entergy letter dated May 12, 2003.

An analysis was done to assess the impact on Large Early Release Frequency (LERF) due to age-related degradation of the uninspectable areas of the containment. The analysis is consistent with and uses the assumptions of the referenced Calvert Cliffs assessment (except where GGNS specific data is used). The analysis estimated the likelihood and risk-implication of degradation-induced leakage occurring and not being detected by visual examinations during the extended test interval.

The following approach is used to determine the change in likelihood of detecting liner corrosion due to extending the ILRT interval. This likelihood was then used in conjunction with the alternate ILRT methodology developed in support of the original submittal (baseline analysis) to determine the resulting change in risk. The following issues were addressed:

- Differences between the containment basemat and the containment cylinder and dome;
- The historical liner flaw likelihood due to concealed corrosion;
- The impact of aging;
- The liner corrosion leakage dependency on containment pressure; and
- The likelihood that visual inspections will be effective at detecting a flaw.

The major steps of the analysis are documented in Table 1-1 below.

Table 1-1
Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome	Containment Basemat
1	**Historical Liner Flaw Likelihood** Failure Data: Containment location specific Success Data: Based on 70 steel-lined Containments and 5.5 years since the 10 CFR 50.55a requirement for periodic visual inspections of containment surfaces.	Events: 2 (Brunswick 2 and North Anna 2) 2/(70*5.5) = **5.2E-3**	Events: 0 Assume half a failure 0.5/(70 * 5.5) = **1.3E-3**
2	**Aged Adjusted Liner Flaw Likelihood** During 15-year interval, assumed failure rate doubles every five years (14.9% increase per year). The average for the 5th to 10th year was set to the historical failure rate.	Year — Failure Rate 1 — 2.1E-3 average 5-10 — 5.2E-3 15 — 1.4E-2 **15 year avg = 6.43E-3**	Year — Failure Rate 1 — 5.0E-4 average 5-10 — 1.3E-3 15 — 3.5E-3 **15 year avg = 1.57E-3**
3	**Increase in Flaw Likelihood at 3, 10 and 15 years** Uses aged adjusted liner flaw likelihood (Step2), assuming failure rate doubles every five years.	— / Flaw Likelihood / Delta 3 yrs / **0.71%** / 10 yrs / **4.06%** / **3.35%** 15 yrs / **9.24%** / **8.53%**	— / Flaw Likelihood / Delta 3 yrs / **0.17%** / 10 yrs / **1.01%** / **0.83%** 15 yrs / **2.33%** / **2.16%**
4	**Likelihood of Breach in Containment Given Liner Flaw** The upper end pressure is from Engineering Report GGNS-01-0015. It is the pressure associated with a 0.99 probability of failure (69 psig). 0.1% is assumed for the lower end pressure which is assumed to be 3 psig. Intermediate failure likelihoods are determined through logarithmic interpolation. The basemat breach likelihood is assumed to be 1/10 of the cylinder/dome analysis.	Pressure (psia) — Likelihood of Breach 17.7 — 0.1% **26.2 (ILRT)** — **0.24%** 50 — 2.94% 80 — 67.89% 83.7 — 100%	Pressure (psia) — Likelihood of Breach 17.7 — 0.01% **26.2 (ILRT)** — **0.024%** 50 — 0.294% 80 — 6.79% 83.7 — 10%

Step	Description	Containment Cylinder and Dome	Containment Basemat
5	**Visual Inspection Detection Failure Likelihood**	10% 5% failure to identify visual flaws plus 5% likelihood that the flaw is not visible (not through-cylinder but could be detected by ILRT). All events have been detected through visual inspection. 5% visible failure detection is a conservative assumption.	100%
6	**Likelihood of Non-Detected Containment Leakage** (Steps 3 * 4 * 5)	**1.7E-06 at 3 years** 0.71% * 0.24% * 10% **9.7E-06 at 10 years** 4.06% * 0.24% * 10% **2.2E-05 at 15 years** 9.24% * 0.24% * 10%	**4.2E-08 at 3 years** 0.17% * 0.024% * 100% **2.4E-07 at 10 years** 1.01% * 0.024% * 100% **5.6E-07 at 15 years** 2.33% * 0.024% * 100%

The total likelihood of the corrosion-induced, non-detected containment leakage is the sum of Step 6 for the containment cylinder and dome and the containment basemat.

<u>Total Likelihood of Non-Detected Containment Leakage</u>
At 3 years: 1.7E-06 + 4.2E-08 = 1.7E-06 or 0.00017%
At 10 years: 9.7E-06 + 2.4E-07 = 1.0E-05 or 0.001%
At 15 years: 2.2E-05 + 5.6E-07 = 2.3E-05 or 0.0023%

The total GGNS Core Damage Frequency (CDF) is 4.27E-6/year. If all of the non-detected containment leakage is assumed to be LERF, the estimated increase in LERF can be conservatively calculated using the total GGNS CDF and the total likelihood of non-detected containment leakage. The increase in LERF associated with liner corrosion is:

LERF due to corrosion (ILRT at 3 years) = 0.00017% * 4.27E-6/yr = 7.4E-12/year
LERF due to corrosion (ILRT at 10 years) = 0.001% * 4.27E-6/yr = 4.3E-11/year
LERF due to corrosion (ILRT at 15 years) = 0.0023% * 4.27E-6/yr = 9.8E-11/year

ΔLERF due to corrosion = $LERF_{ILRT\ at\ 15} - LERF_{ILRT\ at\ 3}$
= 9.8E-11/yr – 7.4E-12/yr
= 9.1E-11/yr

The resulting increase in LERF is insignificant. When the above LERF frequencies are added to the 3b frequencies used in the Containment ILRT evaluation there is no discernible change in total risk or Conditional Containment Failure Probability (CCFP). The change in LERF is on the order of 1E-10/yr. See the comparison below.

Table 1-2
Comparison of Results

	ILRT Alternate Methodology			ILRT Alternate Methodology (With Corrosion)		
	3 in 10yr	**1 in 10yr**	**1 in 15yr**	**3 in 10yr**	**1 in 10yr**	**1 in 15yr**
Total Risk	1.838E+01	1.859E+01	1.874E+01	1.838E+01	1.859E+01	1.874E+01
ILRT Risk Contribution (%)	0.53%	1.73%	2.58%	0.53%	1.74%	2.58%
Increase from Base		1.13%	1.93%		1.13%	1.93%
Increase from Current			0.80%			0.80%
LERF value due to ILRT	1.15E-08	3.84E-08	5.76E-08	1.15E-08	3.85E-08	5.77E-08
Increase from Base		2.69E-08	4.61E-08		2.69E-08	4.62E-08
Increase from Current			1.92E-08			1.93E-08
CCFP	6.89E-01	6.95E-01	7.00E-01	6.89E-01	6.95E-01	7.00E-01
Increase from Base		0.63%	1.08%		0.63%	1.08%
Increase from Current			0.45%			0.45%

Based on the results in Table 1-2, it can be seen that including corrosion effects in the ILRT assessment would not alter the conclusions of the original analysis. The change in LERF from extending the interval to 15 years from the current 10 year requirement including corrosion is 1.93E-08 which is well below the Regulatory Guide 1.174 definition for a very small change of 1.0E-07. Additionally, the dose increase from 3a and 3b is 0.80% and the CCFP increase is estimated to be 0.45%. Both of these increases are considered to be small. As such, the ILRT interval extension is judged to have minimal impact on plant risk (including age-adjusted corrosion impacts), and is therefore acceptable.

Additional sensitivity cases were also investigated to gain an understanding of the sensitivity of this analysis to the various key parameters. These results are summarized in Table 1-3. None of the results of the sensitivities would alter the above conclusions.

Table 1-3
Liner Corrosion Sensitivity Cases

Age (Step 2)	Containment Breach Step 4	Visual Inspection & Non-Visual Flaws (Step 5)	Likelihood Flaw Is LERF	LERF Increase From Corrosion
Base Case Doubles every 5 years	**Base Case** 0.24%/0.024%	**Base Case** 10%	**Base Case** 100%	**Base Case** 9E-11
Doubles every 2 years	Base	Base	Base	2E-10
Doubles every 10 years	Base	Base	Base	4E-10
Base	Base point 10 times lower (0.03%/0.003%)	Base	Base	1E-11
Base	Base point 10 times higher (1.81%/0.181%)	Base	Base	7E-10
Base	Base	5%	Base	5E-11
Base	Base	15%	Base	1E-10
Lower Bound				
Doubles every 10 years	Base point 10 times lower (0.03%/0.003%)	5%	10%	3E-12
Upper Bound				
Doubles every 2 years	Base point 10 times higher (1.81%/0.181%)	15%	100%	2E-09

In summary, this analysis provides a sensitivity evaluation of considering potential corrosion impacts within the framework of the ILRT interval extension risk assessment. The analysis confirms that the ILRT interval extension has a minimal impact on plant risk. Additionally, a series of parametric sensitivity studies regarding the potential age related corrosion effects on the containment liner also indicate that even with very conservative assumptions, the conclusions from the original analysis would not change. That is, the ILRT interval extension is judged to have a minimal impact on plant risk and is therefore acceptable.

2. **The baseline drywell bypass (DWB) leakage rate for Category 1 sequences (DWL_b) is based on a limited set of data (results from 2 leakage tests), and the multipliers used to characterize more severe leakage (10 x DWL_b for Category 3a and 35 x DWL_b for Category 3b sequences) are arbitrarily taken from the ILRT methodology. Please provide a more complete set of DWB leakage rate data that includes all available DWB test results for the entire fleet of Mark III plants over their full operating history, and DWB test results for other BWR containment types that may be applicable. Justify that the DWB leakage rates ascribed to Category 1, 3a, and 3b sequences are representative of the full range of leakage rates that have been found. These comparisons should support a conclusion that the a maximum leakage rates observed are within the value assigned to Category 3b, and that the majority of the leakage rate results are well represented by the value assigned to Category 1.**

A limited set of data is available for Mark III plants. In addition, data from other BWR containment types (e.g., Mark II) is not considered applicable because of the differences in drywell configuration and free volume. A summary of the applicable Mark III drywell bypass leakage test results, categorized in accordance with the GGNS DWBT evaluations leakage assumptions, is provided in the following table.

Table 2-1

Plant	DWBT Leakages		Total Tests
	Small	Large	
Plant 1	0	0	6
Plant 2	5	0	7
Plant 3	1	0	6
Plant 4	0	0	5
Total	6	0	24

The test results were classified as "Small" if the leakage was greater than the base DWB leakage (DWL_b) assumed in the GGNS DWBT evaluation (900 scfm) but less than 10 x DWL_b. Results would have been classified as "Large" if the test leakage had been greater than 10 x DWL_b (9000 scfm). It should be noted that none of the above test results were considered failures of the drywell bypass test as there was considerable margin in each of the tests. The above is a categorization of the test results in relation to the assumed base leakage and the 3a and 3b drywell leakage categories.

A review of all the DWBT results for the domestic Mark III plants demonstrates that the maximum observed leakage rate (2599 scfm), is well within the leakage rate assigned for Category 3b leakage (31,500 scfm) and that the majority of the leakage rate results (18 of 24) are represented by the value assigned to Category 1.

3. **The probability values assigned to small (Category 3a) or large (Category 3b) DWB leakage are arbitrarily taken from the ILRT methodology. These values were derived from data from the containment ILRT program, which is fundamentally different than and not directly applicable to DWB testing. Using the expanded set of data developed in response to RAI 2, please develop DWB-specific probability values for these leakage categories. Describe and justify the probability distribution used to fit the data (e.g., Chi-squared) and the confidence level associated with the probability values (e.g., 95th percentile). Update the risk-informed analysis, as appropriate, based on this information.**

Because the data available is limited, we believe that the Alternative 3 evaluation presented in the original submittal is more appropriate. However, even though the data is sparse, an estimate of the Category 3a and 3b probabilities can be calculated using the data. Using a Chi Squared upper bound (95% confidence) value was not considered to be appropriate since it will give a bounding value rather than a realistic value. The use of the mean for the 3a Category (6/24 = 0.25) is considered more appropriate for a realistic evaluation. Since there have been no Category 3b occurrences, the Jeffreys non-informative approach is more appropriate for the 3b Category. Use of the Jeffreys non-informative is based on the following justification from the NEI Interim Guidance.

"Application of the Jeffreys non-informative prior is one of a number of statistical analysis approaches to estimating probabilities when no failures have been experienced. The approach was used in NUREG-1150 and more recently in NUREG/CR-5750. NUREG/CR-5750 is now the preferred source of initiating event data, which also involves rare event approximations. The selected approach is more conservative than many of the referenced approaches. (See for example Lipow, M. and Welker, E. "Estimating the Exponential Failure Rate From Data With No Failure Events", Proceedings of the 1974 Annual Reliability and Maintainability Symposium, Low Angeles CA January 29-31, 1974.) The principle exception being the Chebychev upper bound. However, the Chebychev upper bound is specifically selected when a 95% confidence interval is desired. Regulatory Guide 1.174 decision criteria are designed for use with mean values rather than upper bound estimates. We believe, given the information available at this time, that the Jeffreys non-informative prior provides a reasonable balance between conservatism in light of uncertainty and yet meets the intent of Regulatory Guide 1.174. Further, application of the Jeffreys non-informative prior is consistent with NUREG-1150, a reference applied in this interim guide and previous ILRT documents related to this question, namely EPRI TR-104285 and NUREG-1493."

The Category 3b probability is calculated below using the Jeffreys non-informative prior.

$$category\ 3b\ leak\ probability = \frac{number\ of\ occurrences(0) + \frac{1}{2}}{number\ of\ tests + 1}$$

$$= \frac{(0) + \frac{1}{2}}{24 + 1} = 2.0E-02$$

To summarize, the base Category 3a leak probability is estimated as 2.5E-01 and the Category 3b leak probability is estimated as 2.0E-02. These values are considered conservative but are used along with the Alternate Methodology (NEI Interim Guidance) to perform a sensitivity analysis.

DWBT Sensitivity with Industry Data (Case 1)

This sensitivity analysis is performed using the alternate methodology based on NEI Interim Guidance. Since the leak probability values developed above are considered conservative, several of the assumptions of the baseline analysis have been modified to make the results more realistic. These include use of more realistic accident dose estimates and method of calculating the Class 3a and 3b frequencies. The details of the sensitivity case are discussed below.

DWBT Data Sensitivity Case 1 - Frequency Calculations

The method of combining the probability of DWBT leakage and the probability of containment leakage was developed in the baseline analysis. For this sensitivity, the conditional probabilities of the different combinations of DWBT and ILRT leakage are calculated using different probabilities than the baseline analysis. The small leak probability is 2.5E-01 for the DWBT (as calculated above) and 2.7E-02 for the ILRT (from baseline analysis). The large leak probability is 2E-02 for the DWBT (as calculated above) and 2.7E-03 (from baseline analysis) for the ILRT. Since the sum of the small and large leak DWBT probabilities is relatively large, the baseline

DWBT probability is adjusted (from 1.0) to ensure that the overall probability of DWB leakage is not greater than one. This adjustment is also made for the baseline ILRT probabilities for consistency. The following table lists the potential base (3 in 10) combinations.

Table 3-1 Conditional Probability of Combined Leakage for Baseline Testing (DWBT Data Case 1)

Leakage Combinations	DW Bypass Leakage	CTMT Leakage	DW Leakage Prob	Prob of CS	CTMT Leakage Prob	Combined Prob	EPRI Class Assign-ment
AA'	1 DWL_B	1 La	0.730	NA	0.97	0.71	1
AB'	1 DWL_B	10 La	0.730	NA	2.7E-02	1.97E-02	3a
AC'	1 DWL_B	35 La	0.730	NA	2.7E-03	1.97E-03	3b
BA'1 CS Available	10 DWL_B	1 La	2.50E-01	6.18E-01	0.97	1.50E-01	1
BA'2 CS Not Available			2.50E-01	3.82E-01	0.97	9.27E-02	7
BB'1 CS Available	10 DWL_B	10 La	2.50E-01	6.18E-01	2.7E-02	4.17E-03	3a
BB'2 CS Not Available			2.50E-01	3.82E-01	2.7E-02	2.58E-03	7
BC'1 CS Available	10 DWL_B	35 La	2.50E-01	6.18E-01	2.7E-03	4.17E-04	3b
BC'2 CS Not Available			2.50E-01	3.82E-01	2.7E-03	2.58E-04	7
CA'1 CS Available	35 DWL_B	1 La	2.0E-02	6.18E-01	0.97	1.20E-02	1
CA'2 CS Not Available			2.0E-02	3.82E-01	0.97	7.41E-03	7
CB'1 CS Available	35 DWL_B	10 La	2.0E-02	6.18E-01	2.7E-02	3.34E-04	3a
CB'2 CS Not Available			2.0E-02	3.82E-01	2.7E-02	2.06E-04	7
CC'1 CS Available	35 DWL_B	35 La	2.0E-02	6.18E-01	2.7E-03	3.34E-05	3b
CC'2 CS Not Available			2.0E-02	3.82E-01	2.7E-03	2.06E-05	7

The overall conditional probability of Class 3a and Class 3b is the summation of the combined probabilities for each combination that is categorized as Class 3a or 3b. The increased probability of Class 7 due to DWBT is also calculated in a similar manner.

Class 3a probability = 1.97E-02 + 4.17E-03 + 3.34E-04 = 2.42E-02
Class 3b probability = 1.97E-03 + 4.17E-04 + 3.34E-05 = 2.42E-03
Class 7 $\text{probability}_{DWBT}$ = 9.27E-02 + 2.58E-03 + 2.58E-04 + 7.41E-03 + 2.06E-04 + 2.06E-05 = 1.03E-01

The baseline frequencies of Class 3a and 3b are then found by multiplying their probabilities by the portion of GGNS core damage frequency that is not Class 7. This is more realistic since these frequencies are then based on the portions of CDF with no containment failure (1.34E-6/year). This is also done for the increased probability of Class 7. This increase in Class 7 frequency is added to the original Class 7 frequency to obtain the total.

Class 3a frequency = 2.42E-02 X 1.34E-06/yr = 3.25E-08/yr
Class 3b frequency = 2.42E-03 X 1.34E-06/yr = 3.25E-09/yr
Class 7 frequency_{DWBT} = 1.03E-01 X 1.34E-06/yr = 1.38E-07/yr

Frequencies for 10 year Test Interval

As in the baseline analysis, the increase factor for the Class 3a, 3b and delta Class 7 probabilities is 3.333 for the 10 year test interval. The following table lists the 1 in 10 year combinations of DWBT and ILRT leakage.

Table 3-2 Conditional Probability of Combined Leakage for 1 in 10 years (DWBT Data Case 1)

Leakage Combinations	DW Bypass Leakage	CTMT Leakage	DW Leakage Prob	Prob of CS	CTMT Leakage Prob	Combined Prob	EPRI Class Assign-ment
AA'	1 DWL_B	1 La	0.100	NA	0.90	0.09	1
AB'	1 DWL_B	10 La	0.100	NA	9.0E-02	9.00E-03	3a
AC'	1 DWL_B	35 La	0.100	NA	9.0E-03	9.00E-04	3b
BA'1 CS Available	10 DWL_B	1 La	8.33E-01	6.18E-01	0.90	4.64E-01	1
BA'2 CS Not Available			8.33E-01	3.82E-01	0.90	2.87E-01	7
BB'1 CS Available	10 DWL_B	10 La	8.33E-01	6.18E-01	9.0E-02	4.64E-02	3a
BB'2 CS Not Available			8.33E-01	3.82E-01	9.0E-02	2.87E-02	7
BC'1 CS Available	10 DWL_B	35 La	8.33E-01	6.18E-01	9.0E-03	4.64E-03	3b
BC'2 CS Not Available			8.33E-01	3.82E-01	9.0E-03	2.87E-03	7
CA'1 CS Available	35 DWL_B	1 La	6.67E-02	6.18E-01	0.90	3.71E-02	1
CA'2 CS Not Available			6.67E-02	3.82E-01	0.90	2.29E-02	7
CB'1 CS Available	35 DWL_B	10 La	6.67E-02	6.18E-01	9.0E-02	3.71E-03	3a
CB'2 CS Not Available			6.67E-02	3.82E-01	9.0E-02	2.29E-03	7
CC'1 CS Available	35 DWL_B	35 La	6.67E-02	6.18E-01	9.0E-03	3.71E-04	3b
CC'2 CS Not Available			6.67E-02	3.82E-01	9.0E-03	2.29E-04	7

The class probabilities and frequency for the 1 in 10 year test interval are calculated below.

Class 3a probability = 9.0E-03 + 4.64E-02 + 3.71E-03 = 5.91E-02
Class 3b probability = 9.0E-04 + 4.64E-03 + 3.71E-04 = 5.91E-03
Class 7 $\text{probability}_{DWBT}$ = 2.87E-01 + 2.87E-02 + 2.87E-03 + 2.29E-02 + 2.29E-03 + 2.29E-04 = 3.44E-01

Class 3a frequency = 5.91E-02 X 1.34E-06/yr = 7.93E-08/yr
Class 3b frequency = 5.91E-03 X 1.34E-06/yr = 7.93E-09/yr
Class 7 frequency_{DWBT} = 3.44E-01 X 1.34E-06/yr = 4.62E-07/yr

Frequencies for 15 Year Test Interval

In the baseline analysis, the increase factor for the Class 3a, 3b and delta Class 7 probabilities is 5 for the 15 year test interval. This factor is applied to the ILRT probabilities; however, it is not reasonable to apply this factor to the DWBT probabilities since it yields a leakage probability in excess of 1.0 (100%). In order to force the maximum DWBT probability to 1.0, a factor of 3.704 was used. This is the maximum that they can be increased without exceeding 1.0 for the total DWBT probability. The following table lists the 1 in 15 year combinations of DWBT and ILRT leakage.

Table 3-3 Conditional Probability of Combined Leakage for 1 in 15 years (DWBT Data Sensitivity 1)

Leakage Combinations	DW Bypass Leakage	CTMT Leakage	DW Leakage Prob	Prob of CS	CTMT Leakage Prob	Combined Prob	EPRI Class Assignment
AA'	1 DWL_B	1 La	0.000	NA	0.85	0.00	1
AB'	1 DWL_B	10 La	0.000	NA	1.35E-01	0.00	3a
AC'	1 DWL_B	35 La	0.000	NA	1.35E-02	0.00	3b
BA'1 CS Available	10 DWL_B	1 La	9.26E-01	6.18E-01	0.85	4.87E-01	1
BA'2 CS Not Available			9.26E-01	3.82E-01	0.85	3.01E-01	7
BB'1 CS Available	10 DWL_B	10 La	9.26E-01	6.18E-01	1.35E-01	7.73E-02	3a
BB'2 CS Not Available			9.26E-01	3.82E-01	1.35E-01	4.78E-02	7
BC'1 CS Available	10 DWL_B	35 La	9.26E-01	6.18E-01	1.35E-02	7.73E-03	3b
BC'2 CS Not Available			9.26E-01	3.82E-01	1.35E-02	4.78E-03	7
CA'1 CS Available	35 DWL_B	1 La	7.41E-02	6.18E-01	0.85	3.90E-02	1
CA'2 CS Not Available			7.41E-02	3.82E-01	0.85	2.41E-02	7
CB'1 CS Available	35 DWL_B	10 La	7.41E-02	6.18E-01	1.35E-01	6.18E-03	3a
CB'2 CS Not Available			7.41E-02	3.82E-01	1.35E-01	3.82E-03	7
CC'1 CS Available	35 DWL_B	35 La	7.41E-02	6.18E-01	1.35E-02	6.18E-04	3b
CC'2 CS Not Available			7.41E-02	3.82E-01	1.35E-02	3.82E-04	7

The class probabilities and frequency for the 1 in 15 year test interval are calculated below.

Class 3a probability = 0 + 7.73E-02 + 6.18E-03 = 8.34E-02
Class 3b probability = 0 + 7.73E-03 + 6.18E-04 = 8.34E-03
Class 7 $\text{probability}_{DWBT}$ = 3.01E-01 + 4.78E-02 + 4.78E-03
+ 2.41E-02 + 3.82E-03 + 3.82E-04 = 3.82E-01

Class 3a frequency = 8.34E-02 X 1.34E-06/yr = 1.12E-07/yr
Class 3b frequency = 8.34E-03 X 1.34E-06/yr = 1.12E-08/yr
Class 7 frequency_{DWBT} = 3.82E-01 X 1.34E-06/yr = 5.13E-07/yr

The class frequencies for the different DWBT intervals are summarized in table 3-4 below.

Table 3-4 DWBT Sensitivity Class Frequencies for Different DWBT Intervals (DWBT Data Case 1)

Class	Description	Base	1 in 10	1 in 15
1	No Containment Failure	1.17E-06	7.92E-07	7.04E-07
2	Failure of isolation system -- Not analyzed	N/A	N/A	N/A
3a	Small pre-existing leak in containment structure or liner	3.25E-08	7.93E-08	1.12E-07
3b	Large pre-existing leak in containment structure or liner	3.25E-09	7.93E-09	1.12E-08
4	Type B -- Not analyzed	N/A	N/A	N/A
5	Type C -- Not analyzed	N/A	N/A	N/A
6	Other isolation failures -- Not analyzed	N/A	N/A	N/A
7	Failure induced by severe accident phenomena (Early and Late Failures, also MSIV venting)	3.07E-06	3.39E-06	3.44E-06
8	Containment Bypass --Not analyzed	N/A	N/A	N/A
	Total Frequency	4.27E-06	4.27E-06	4.27E-06

DWBT Data Sensitivity Accident Dose Rates

The original evaluation of the DWBT extension used conservative accident dose estimates (based on the design basis LOCA dose analysis) from the evaluation of the ILRT extension that were developed in the baseline analysis. Because the leakage probabilities that were developed from limited data are considered conservative, the sensitivity analysis will use more realistic dose rates. The NEI Interim Guidance recommends the use of plant-specific dose calculations or NUREG-1150 dose calculations for calculating population dose for the EPRI categories. Since GGNS does not have a Level 3 PRA, the NUREG-1150 dose results will be used. Grand Gulf was one of the reference plants for NUREG-1150, so there is no need to adjust the results for plant specific differences. The GGNS NUREG-1150 results as documented in NUREG/CR-4551, Volume 6, were used to calculate the dose risk for the different accident progression bins (APB) identified in the report and to assign doses to the EPRI classes.

The dose for the no containment failure category (EPRI Class 1) is based on NUREG/CR-4551 APB 7. This is closest to the definition of an intact containment. This results in a Class 1 dose of 7.63E+02 man-rem.

The doses for Classes 3a and 3b were determined (per the NEI Interim Guidance) by multiplying the Class 1 dose by a factor of 10 for Class 3a and a factor of 35 for Class 3b. The resulting Class 3a dose is 7.63E+03 man-rem and the Class 3b dose is 2.67E+04 man-rem.

As in the baseline calculations Class 2, 4, 5, and 6 are not impacted by the DWBT extension and are not evaluated.

The dose for Class 7 is based on NUREG/CR-4551 APB 1 which is the APB with the largest dose. Therefore, the Class 7 dose is 2.16E+05 man-rem/yr.

The impact of the extended DWBT frequencies on risk can be determined using the above doses and the information in Table 3-4. The risk results for the different test frequencies are included in Table 3-5.

Table 3-5 DWBT Sensitivity Dose Risk Results
(DWBT Data Case 1)

Class	Description	Base	1 in 10	1 in 15
1	No Containment Failure	8.90E-04	6.04E-04	5.37E-04
2	Failure of isolation system -- Not analyzed	N/A	N/A	N/A
3a	Small pre-existing leak in containment structure or liner	2.48E-04	6.05E-04	8.55E-04
3b	Large pre-existing leak in containment structure or liner	8.68E-05	2.12E-04	2.99E-04
4	Type B -- Not analyzed	N/A	N/A	N/A
5	Type C -- Not analyzed	N/A	N/A	N/A
6	Other isolation failures -- Not analyzed	N/A	N/A	N/A
7	Failure induced by severe accident phenomena (Early and Late Failures, also MSIV venting)*	6.63E-01	7.33E-01	7.44E-01
8	Containment Bypass --Not analyzed	N/A	N/A	N/A
	TOTAL MANREM/Yr:	6.64E-01	7.34E-01	7.45E-01
	*DWBT Contribution to Class 7	2.99E-02	9.97E-02	1.11E-01
	Change from BaseLine Man-Rem/yr		7.00E-02	8.13E-02
	ILRT/DWBT Contribution	4.56%	13.70%	15.02%
	% increase from Base:		10.54%	12.25%
	Change from 1 in 10 to 1 in 15:			1.13E-02
	% Change from 1 in 10 to 1 in 15:			1.55%

DWBT Sensitivity Case 1 Change in LERF and CCFP

The change in LERF for the DWBT Sensitivity is the increase due to the change in large pre-existing leak class, Class 3b, and the increase in the frequency of Class 7 due to DWBT. This is documented below.

The change in LERF is represented by the change in Classes 3b and 7 frequencies

	Base	1 in 10	1 in 15
3b Frequency	3.25E-09	7.93E-09	1.12E-08
Class 7 due to DWBT	1.38E-07	4.62E-07	5.13E-07
Total LERF	1.42E-07	4.70E-07	5.24E-07
Delta LERF from Base		3.28E-07	3.82E-07
Delta LERF from 1 in 10 to 1 in 15			5.46E-08

The change in CCFP is considered to be the change in containment failure probability given an accident. This can be calculated as was done in the baseline analysis. The calculations for each DWBT option are summarized below.

	Class1 Freq	Class 3a Freq	Sum	CDF	CCFP	Delta from base	Delta from Current
BaseLine	1.17E-06	3.25E-08	1.20E-06	4.27E-06	7.19E-01		
1 in 10	7.92E-07	7.93E-08	8.71E-07	4.27E-06	7.96E-01	7.68%	
1 in 15	7.04E-07	1.12E-07	8.16E-07	4.27E-06	8.09E-01	8.96%	1.28%

Summary of DWBT Sensitivity Case 1 Results

Table 3-6 provides a summary of the results for the extension of the DWBT frequency (in conjunction with the ILRT extension) using industry data.

Table 3-6 Summary of DWBT Sensitivity Results
(DWBT Data Case 1 using industry data)

	3 in 10yr	**1 in 10yr**	**1 in 15yr**
Total Risk	6.639E-01	7.339E-01	7.453E-01
DWBT Risk Contribution (%)	4.56%	13.70%	15.02%
Increase from Base		7.00E-02	8.13E-02
Increase from Base (%)		10.54%	12.25%
Increase from Current			1.55%
LERF value due to ILRT	1.42E-07	4.70E-07	5.24E-07
Increase from Base		3.28E-07	3.82E-07
Increase from Current			5.46E-08
CCFP	7.19E-01	7.96E-01	8.09E-01
Increase from Base		7.68%	8.96%
Increase from Current			1.28%

DWBT Sensitivity with Industry Data and Credit for Depressurization (DWBT Data Case 2)

The above evaluation results in a delta LERF of 3.82E-07/yr for the difference between the base case and the proposed 1 in 15 year surveillance frequency. This change would fall into Region II (small change) of the Regulatory Guide 1.174 Acceptance Guidelines for LERF. As such, additional information (e.g., total LERF, external events LERF) may be required if this measure were to be used for final decision making. The above results are considered to be conservative because of the use of the limited industry DWBT data. Therefore, the assumptions of the evaluation were reviewed to identify areas where conservatism could be removed to obtain a more realistic analysis. It was determined that in addition to crediting containment sprays for mitigating the impact of increased DWB leakage, depressurization could be credited for preventing drywell bypass leakage.

Drywell Bypass and Vessel Depressurization

As discussed in the GGNS FSAR, the design drywell bypass capacity is based on a small primary system rupture in conjunction with an orderly depressurization for approximately 6 hours. The event is terminated when break flow ends due to reactor depressurization. Allowable drywell leakage increases if the depressurization time is shortened. The FSAR also notes that there is larger allowable bypass leakage with large breaks because the large primary breaks rapidly depressurize the reactor and terminate the blowdown. Also, drywell bypass is not a concern for transient initiated events as there is no steam release into the drywell. Therefore, for severe accident scenarios initiated by transient events, depressurization of the vessel and the subsequent release of steam to the suppression pool effectively removes the potential for significant drywell bypass following vessel failure. Since the GGNS core damage frequency is dominated by transient initiated events (approximately 99.5%), not taking credit for the ability to depressurize is a significant conservative element of the GGNS DWBT evaluation. As discussed in the baseline analysis, containment sprays effectively control drywell bypass and were credited in the initial DWBT calculations. This sensitivity takes credit for depressurization, in addition to the availability of containment sprays, to mitigate the impact of increased drywell bypass. Credit is taken by evaluating those cutsets that involve the availability of containment spray, depressurization, or both.

Availability of Containment Sprays or Depressurization

The availability of containment sprays or the ability to depressurize was determined in a similar manner as was used to determine containment spray availability in the baseline analysis. A gate for the failure of containment sprays and depressurization was developed using the GGNS master fault tree. This gate was solved with the appropriate flag files and the resultant cutset files were merged together, subsumed and saved. This cutset file was then delete-termed from the overall Revision 2 PRA results cutset file to obtain a cutset file representing GGNS core damage frequency with either containment spray or depressurization available.

Either containment spray or depressurization would be available for each of these remaining cutsets. The probability that containment spray or depressurization is available is determined as follows:

$P_{CSorDep\ Avail}$ = Frequency of cutsets with CS or Dep available/Overall CDF
= 4.24E-6/4.27E-6 = 0.99

DWBT Data Sensitivity Case 2 Frequency Calculations

The conditional probabilities of the different combinations of DWBT and ILRT leakage are calculated using the DWBT data developed earlier and the above split fractions for the availability of containment sprays and depressurization. The following table lists the potential baseline (3 in 10 years) combinations.

Table 3-6 Conditional Probability of Combined Leakage for Baseline Testing (DWBT Data Case 2)

Leakage Combinations	DW Bypass Leakage	CTMT Leakage	DW Leakage Prob	Prob of CS and Depress.	CTMT Leakage Prob	Combined Prob	EPRI Class Assign-ment
AA'	1 DWL_B	1 La	0.730	NA	0.97	0.71	1
AB'	1 DWL_B	10 La	0.730	NA	2.7E-02	1.97E-02	3a
AC'	1 DWL_B	35 La	0.730	NA	2.7E-03	1.97E-03	3b
BA'1 CS or Dep Available	10 DWL_B	1 La	2.50E-01	9.90E-01	0.97	2.40E-01	1
BA'2 CS & Dep Not Available			2.50E-01	1.00E-02	0.97	2.43E-03	7
BB'1 CS or Dep Available	10 DWL_B	10 La	2.50E-01	9.90E-01	2.7E-02	6.68E-03	3a
BB'2 CS & Dep Not Available			2.50E-01	1.00E-02	2.7E-02	6.75E-05	7
BC'1 CS or Dep Available	10 DWL_B	35 La	2.50E-01	9.90E-01	2.7E-03	6.68E-04	3b
BC'2 CS & Dep Not Available			2.50E-01	1.00E-02	2.7E-03	6.75E-06	7
CA'1 CS or Dep Available	35 DWL_B	1 La	2.0E-02	9.90E-01	0.97	1.92E-02	1
CA'2 CS & Dep Not Available			2.0E-02	1.00E-02	0.97	1.94E-04	7
CB'1 CS or Dep Available	35 DWL_B	10 La	2.0E-02	9.90E-01	2.7E-02	5.35E-04	3a
CB'2 CS & Dep Not Available			2.0E-02	1.00E-02	2.7E-02	5.40E-06	7
CC'1 CS or Dep Available	35 DWL_B	35 La	2.0E-02	9.90E-01	2.7E-03	5.35E-05	3b
CC'2 CS & Dep Not Available			2.0E-02	1.00E-02	2.7E-03	5.40E-07	7

The baseline frequencies of Class 3a, 3b and increased Class 7 are found using the same method as was used in baseline analysis.

Class 3a frequency = 2.69E-02 X 1.34E-06/yr = 3.62E-08/yr
Class 3b frequency = 2.69E-03 X 1.34E-06/yr = 3.62E-09/yr
Class 7 frequency_{DWBT} = 2.70E-03 X 1.34E-06/yr = 3.63E-09/yr

Frequencies for 10 year Test Interval

As in the baseline analysis, the increase factor for the Class 3a, 3b and delta Class 7 probabilities is a 3.333 multiplier for the 10 year test interval. The following table lists the 1 in 10 year combinations of DWBT and ILRT leakage.

Table 3-7 Conditional Probability of Combined Leakage for 1 in 10 years (DWBT Data Case 2)

Leakage Combinations	DW Bypass Leakage	CTMT Leakage	DW Leakage Prob	Prob of CS and Depress.	CTMT Leakage Prob	Combined Prob	EPRI Class Assign-ment
AA'	1 DWL_B	1 La	0.100	NA	0.90	0.09	1
AB'	1 DWL_B	10 La	0.100	NA	9.0E-02	9.00E-03	3a
AC'	1 DWL_B	35 La	0.100	NA	9.0E-03	9.00E-04	3b
BA'1 CS or Dep Available	10 DWL_B	1 La	8.33E-01	9.90E-01	0.90	7.43E-01	1
BA'2 CS & Dep Not Available			8.33E-01	1.00E-02	0.90	7.51E-03	7
BB'1 CS or Dep Available	10 DWL_B	10 La	8.33E-01	9.90E-01	9.0E-02	7.43E-02	3a
BB'2 CS & Dep Not Available			8.33E-01	1.00E-02	9.0E-02	7.50E-04	7
BC'1 CS or Dep Available	10 DWL_B	35 La	8.33E-01	9.90E-01	9.0E-03	7.43E-03	3b
BC'2 CS & Dep Not Available			8.33E-01	1.00E-02	9.0E-03	7.50E-05	7
CA'1 CS or Dep Available	10 DWL_B	1 La	6.67E-02	9.90E-01	0.90	5.95E-02	1
CA'2 CS & Dep Not Available			6.67E-02	1.00E-02	0.90	6.01E-04	7
CB'1 CS or Dep Available	10 DWL_B	10 La	6.67E-02	9.90E-01	9.0E-02	5.94E-03	3a
CB'2 CS & Dep Not Available			6.67E-02	1.00E-02	9.0E-02	6.00E-05	7
CC'1 CS or Dep Available	10 DWL_B	35 La	6.67E-02	9.90E-01	9.0E-03	5.94E-04	3b
CC'2 CS & Dep Not Available			6.67E-02	1.00E-02	9.0E-03	6.00E-06	7

The frequencies of Class 3a, 3b and increased Class 7 are determined using the same method as before.

Class 3a frequency = 8.92E-02 X 1.34E-06/yr = 1.2E-07/yr
Class 3b frequency = 8.92E-03 X 1.34E-06/yr = 1.2E-08/yr
Class 7 frequency_{DWBT} = 9.00E-03 X 1.34E-06/yr = 1.21E-08/yr

Frequencies for 15 year Test Interval

As in the DWBT sensitivity with industry data, the DWBT leakage probabilities are increased by a factor of 3.704. This is the maximum that they can be increased without exceeding 1.0 for the total DWBT probability. The following table lists the 1 in 15 year combinations of DWBT and ILRT leakage.

Table 3-8 Conditional Probability of Combined Leakage for 1 in 15 years (DWBT Data Case 2)

Leakage Combinations	DW Bypass Leakage	CTMT Leakage	DW Leakage Prob	Prob of CS and Depress.	CTMT Leakage Prob	Combined Prob	EPRI Class Assign-ment
AA'	1 DWL_B	1 La	0.000	NA	0.85	0.00	1
AB'	1 DWL_B	10 La	0.000	NA	1.35E-01	0.00	3a
AC'	1 DWL_B	35 La	0.000	NA	1.35E-02	0.00	3b
BA'1 CS or Dep Available	10 DWL_B	1 La	9.26E-01	9.90E-01	0.85	7.81E-01	1
BA'2 CS & Dep Not Available			9.26E-01	1.00E-02	0.85	7.88E-03	7
BB'1 CS or Dep Available	10 DWL_B	10 La	9.26E-01	9.90E-01	1.35E-01	1.24E-01	3a
BB'2 CS & Dep Not Available			9.26E-01	1.00E-02	1.35E-01	1.25E-03	7
BC'1 CS or Dep Available	10 DWL_B	35 La	9.26E-01	9.90E-01	1.35E-02	1.24E-02	3b
BC'2 CS & Dep Not Available			9.26E-01	1.00E-02	1.35E-02	1.25E-04	7
CA'1 CS or Dep Available	35 DWL_B	1 La	7.41E-02	9.90E-01	0.85	6.24E-02	1
CA'2 CS & Dep Not Available			7.41E-02	1.00E-02	0.85	6.31E-04	7
CB'1 CS or Dep Available	35 DWL_B	10 La	7.41E-02	9.90E-01	1.35E-01	9.90E-03	3a
CB'2 CS & Dep Not Available			7.41E-02	1.00E-02	1.35E-01	1.00E-04	7
CC'1 CS or Dep Available	35 DWL_B	35 La	7.41E-02	9.90E-01	1.35E-02	9.90E-04	3b
CC'2 CS & Dep Not Available			7.41E-02	1.00E-02	1.35E-02	1.00E-05	7

The class frequencies for Class 3a, 3b and increased Class 7 are determined below.

Class 3a frequency = 1.34E-01 X 1.34E-06/yr = 1.79E-07/yr
Class 3b frequency = 1.34E-02 X 1.34E-06/yr = 1.79E-08/yr
Class 7 $frequency_{DWBT}$ = 1.00E-02 X 1.34E-06/yr = 1.34E-08/yr

The class frequencies for the different DWBT intervals for this sensitivity are summarized in Table 3-9 below.

Table 3-9 Class Frequencies for Different DWBT Intervals (DWBT Data Case 2)

Class	Description	Base	1 in 10	1 in 15
1	No Containment Failure	1.30E-06	1.20E-06	1.13E-06
2	Failure of isolation system -- Not analyzed	N/A	N/A	N/A
3a	Small pre-existing leak in containment structure or liner	3.62E-08	1.20E-07	1.79E-07
3b	Large pre-existing leak in containment structure or liner	3.62E-09	1.20E-08	1.79E-08
4	Type B -- Not analyzed	N/A	N/A	N/A
5	Type C -- Not analyzed	N/A	N/A	N/A
6	Other isolation failures -- Not analyzed	N/A	N/A	N/A
7	Failure induced by severe accident phenomena (Early and Late Failures, also MSIV venting)	2.93E-06	2.94E-06	2.94E-06
8	Containment Bypass --Not analyzed	N/A	N/A	N/A
	Total Frequencies	4.27E-06	4.27E-06	4.27E-06

The dose risk for this sensitivity is calculated using the realistic dose estimates developed from NUREG/CR-4551, Volume 6. Table 3-10 provides a summary of the risk for the different DWBT intervals.

Table 3-10 DWBT Data Sensitivity Case 2 Dose Risk Results

Class	Description	Base	1 in 10	1 in 15
1	No Containment Failure	9.90E-04	9.13E-04	8.62E-04
2	Failure of isolation system -- Not analyzed	N/A	N/A	N/A
3a	Small pre-existing leak in containment structure or liner	2.76E-04	9.14E-04	1.37E-03
3b	Large pre-existing leak in containment structure or liner	9.66E-05	3.20E-04	4.79E-04
4	Type B -- Not analyzed	N/A	N/A	N/A
5	Type C -- Not analyzed	N/A	N/A	N/A
6	Other isolation failures -- Not analyzed	N/A	N/A	N/A
7	Failure induced by severe accident phenomena (Early and Late Failures, also MSIV venting)*	6.34E-01	6.35E-01	6.36E-01
8	Containment Bypass --Not analyzed	N/A	N/A	N/A
	TOTAL MANREM/Yr:	6.35E-01	6.38E-01	6.38E-01
	*DWBT Contribution to Class 7	7.83E-04	2.61E-03	2.90E-03
	Change from BaseLine Man-Rem/yr		2.61E-03	3.47E-03
	ILRT/DWBT Contribution	0.18%	0.60%	0.74%
	% increase from Base:		0.41%	0.55%
	Change from 1 in 10 to 1 in 15:			8.54E-04
	% Change from 1 in 10 to 1 in 15:			0.13%

DWBT Data Sensitivity Case 2 Change in LERF and CCFP

The change in LERF for this sensitivity is the increase due to the change in large pre-existing leak class, Class 3b, and the increase in the frequency of Class 7 due to DWBT. This is documented below.

Change in LERF is represented by the change in Classes 3b and 7 frequencies

	Base	1 in 10	1 in 15
3b Frequency	3.62E-09	1.20E-08	1.79E-08
Class 7 due to DWBT	3.63E-09	1.21E-08	1.34E-08
Total LERF	7.24E-09	2.41E-08	3.14E-08
Delta LERF from Base		1.68E-08	2.41E-08
Delta LERF from 1 in 10 to 1 in 15			7.31E-09

The change in CCFP is calculated in the same manner as is done in the baseline analysis and is summarized below.

	Class1 Freq	Class 3a Freq	Sum	CDF	CCFP	Delta from base	Delta from Current
BaseLine	1.30E-06	3.62E-08	1.33E-06	4.27E-06	6.88E-01		
1 in 10	1.20E-06	1.20E-07	1.32E-06	4.27E-06	6.92E-01	0.39%	
1 in 15	1.13E-06	1.79E-07	1.31E-06	4.27E-06	6.93E-01	0.57%	0.17%

Summary of DWBT Data Sensitivity Case 2 Results

Table 3-11 provides a summary of the results of the DWBT Data Sensitivity Case 2 results.

Table 3-11 Summary of DWBT Sensitivity Results (DWBT Case 2)

	3 in 10yr	1 in 10yr	1 in 15yr
Total Risk	6.349E-01	6.376E-01	6.384E-01
DWBT Risk Contribution (%)	0.18%	0.60%	0.74%
Increase from Base		2.61E-03	3.47E-03
Increase from Base (%)		0.41%	0.55%
Increase from Current			0.13%
LERF value due to ILRT	7.24E-09	2.41E-08	3.14E-08
Increase from Base		1.68E-08	2.41E-08
Increase from Current			7.31E-09
CCFP	6.88E-01	6.92E-01	6.93E-01
Increase from Base		0.39%	0.57%
Increase from Current			0.17%

Summary of Sensitivity Results

Table 3-12 provides a summary of the two DWBT data sensitivities. While the dose risk increase from the base case to a test interval of 1 in 15 years for Case 1 is a relatively high percentage, the total increase is less than 0.08 man-rem/year which is very low. The dose risk percentage increase for Case 2 is less than 1% and the total increase is less than that for Case 1. The change in CCFP for Case 1 from the baseline interval to the 1 in 15 year interval is 8.96% but with the more realistic Case 2 the change is only 0.57%. The delta LERF between the baseline interval and the 1 in 15 year interval for Case 1 is 3.8E-07/year. This is considered small per the guidance of Regulatory Guide 1.174. However, when more realistic assumptions are included (Case 2), the delta LERF is 2.4E-08/year. This estimate is very small based on the guidance of Regulatory Guide 1.174.

Table 3-12 DWBT Data Sensitivity and Base Analysis Results

	DWBT Data Case 1			DWBT Data Case 2			DWBT Base Analysis - Alternate 3		
	3 in 10yr	**1 in 10yr**	**1 in 15yr**	**3 in 10yr**	**1 in 10yr**	**1 in 15yr**	**3 in 10yr**	**1 in 10yr**	**1 in 15yr**
Total Risk	6.639E-01	7.339E-01	7.453E-01	6.349E-01	6.376E-01	6.384E-01	1.842E+01	1.871E+01	1.892E+01
DWBT Risk Contribution (%)	4.56%	13.70%	15.02%	0.18%	0.60%	0.74%	0.70%	2.29%	3.39%
Increase from Base		7.00E-02	8.13E-02		2.61E-03	3.47E-03		2.91E-01	4.99E-01
Increase from Base (%)		10.54%	12.25%		0.41%	0.55%		1.58%	2.71%
Increase from Current			1.55%			0.13%			1.11%
LERF value due to ILRT	1.42E-07	4.70E-07	5.24E-07	7.24E-09	2.41E-08	3.14E-08	1.93E-08	6.45E-08	9.67E-08
Increase from Base		3.28E-07	3.82E-07		1.68E-08	2.41E-08		4.51E-08	7.74E-08
Increase from Current			5.46E-08			7.31E-09			3.22E-08
CCFP	7.19E-01	7.96E-01	8.09E-01	6.88E-01	6.92E-01	6.93E-01	6.91E-01	7.01E-01	7.09E-01
Increase from Base		7.68%	8.96%		0.39%	0.57%		1.06%	1.81%
Increase from Current			1.28%			0.17%			0.76%

4. **The frequency-dominant core damage sequences (e.g., station blackout, and transients) could be adversely impacted if the DWB leakage is sufficient large. (increased DWB leakage, even within the Technical Specification limits, could result in fission products bypassing the suppression pool during the later phases of the accident.) Please provide deterministic evaluations of the impact of increased DWB leakage on containment response and fission product releases to the environment for the frequency-dominant core damage sequences at Grand Gulf. Based on these results, justify that the frequency dominant accident sequences/accident classes are appropriately treated within the DWB risk assessment methodology, i.e., the dominant sequences, in conjunction with small or large DWB leakage, are properly classified as LERF or non-LERF, and assigned appropriate population dose values.**

The GGNS FSAR documents that the containment sprays effectively control drywell bypass leakage up to a value of 35,000 scfm and limit the containment pressurization to less than the design pressure. This amount of leakage bounds the leakage values for both Class 3a and Class 3b. The GGNS DWBT risk assessment methodology conservatively assumes that the containment fails if there is any increase in drywell bypass leakage (either Class 3a or 3b) and containment sprays are not available. These containment failures are considered as Class 7 for purposes of evaluating the increases in risk, LERF, and containment failure probability. Therefore, with this assumption, the type of core damage sequence is not relevant and there is no need to provide any deterministic evaluations of the impact of increased DWB leakage on containment response and fission product releases to the environment.

5. **On page 38 of attachment 1 of the submittal, in Table 7.1-1, "Summary of ILRT Test Results," there is an apparent contradiction or error. The last line of the table is for the ILRT performed on November 21, 1993. It states that the measured leakage rate, using the Mass Point method, was 0.228, and that the 95% UCL (upper confidence limit) was 0.155. However, in this methodology, the 95% UCL must be higher than the measured leakage rate. Please explain this inconsistency.**

The data contained in Table 7.1-1 did contain errors. The corrected table is provided below. The corrections do not affect the conclusions of the original submittal.

Table 7.1-1 Summary of ILRT Test Results

		Measured Leakage Rate (wt%/day) with corrections		95% UCL (wt%/day) with corrections	
Outage	**Mo/Day/Year**	**Mass Pt.**	**Total Time**	**Mass Pt**	**Total Time**
Pre-Op	1/5/1982	0.076	0.072	0.083	0.143
Init-Op	11/4/1985	0.141	0.133	0.145	0.187
RF03	4/16/1989	0.129	0.131	0.133	0.182
RF06	11/21/1993	0.137	0.127	0.148	0.210