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Waterford 3

W3F1-2000-0078
A4.05
PR

June 1, 2000

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Technical Specification Change Request NPF-38-224
Supplemental Information Regarding Containment Cooling System

Gentlemen:

Entergy Operations, Inc. (EOI) submitted the subject change request by letter W3F1-99-0156, dated October 18, 1999. The NRC has requested additional information to support their review of this request May 23, 2000. Attached is the EOI response to those questions. This response is consistent with the discussion of these topics between EOI and the NRC Staff reviewers conducted by telephone on May 25 and 26, 2000. This information supplements both the original submittal and the additional information provided in the EOI letter W3F1-2000-0069, dated May 16, 2000.

EOI is hereby requesting the attached information be considered in your review of the Technical Specifications (TS) change request. The proposed TS change had been evaluated in accordance with 10CFR50.91(a)(1), using the criteria in 10CFR50.92(c), and it had been determined that this request involved no Significant Hazards Consideration. The information contained in this correspondence does not affect the Significant Hazards Consideration Determination conclusions.

EOI is requesting NRC Staff approval of the TS change prior to June 9, 2000 to allow the expeditious closure of Notice of Enforcement Discretion (NOED) 00-6-06. As noted in the NOED, the discretion period is in effect until either this license amendment is issued or until completion of an outage of sufficient duration to effect repairs.

A001

This letter contains no new commitments. Should you have any questions or comments concerning this submittal, please contact Jerry Burford at (601) 368-5755.

Pursuant to 28 U.S.C.A. Section 1746, I declare under penalty of perjury that the foregoing is true and correct. Executed on June 1, 2000.

Very truly yours,

C.M. Dugger
Vice President, Operations
Waterford 3

CMD/FGB/rtk

Attachment: Supplemental Information for NPF-38-224

cc: E.W. Merschoff, NRC Region IV
N. Kalyanam, NRC-NRR
J. Smith
N.S. Reynolds
NRC Resident Inspectors Office
Louisiana DEQ/Surveillance Division
American Nuclear Insurers

ATTACHMENT 1
To W3F1-2000-0078

NPF-38-224

Supplemental Information Regarding
Containment Cooling System

SUPPLEMENTAL INFORMATION REGARDING CONTAINMENT COOLING SYSTEM

Question 1.

The Section 6.2 of the FSAR for CESSAR describes methodology for calculation of LOCA mass and energy release for containment peak pressure analysis. We understand that a revised mass and energy methodology was used for the current Waterford analysis. Provide a listing of all modifications that have been made between the CESSAR FSAR and the current analysis. Provide reference of the NRC staff review and approval for each modification. For modifications that were not previously approved describe the modification in detail and justify that it is conservative for containment analysis.

Response

The LOCA mass and energy release data used in the Waterford 3 containment response analyses were provided by CE. The methodology used for the Waterford analyses is the same as the methodology described in CESSAR FSAR and approved by NRC. There are no modifications to the methods or codes between the CESSAR FSAR and the current Waterford 3 mass & energy analysis. The same methods have also been more recently approved by the NRC Staff for the Palo Verde stretch power effort. Refer to Safety Evaluation related to Amendment No. 108 to Facility Operating License No. NPF-41, Amendment No. 100 to Facility Operating License No. NPF-51, and Amendment No. 80 to Facility Operating License No. NPF-74, Arizona Public Service Company, et al, Palo Verde Nuclear Generating Station, Units Nos. 1, 2, and 3, Docket Nos. STN 50-528, STN 50-529, and STN 50-530

Question 2.

The methodology for calculation of LOCA mass and energy release for peak containment analysis has changed between the original licensing of Waterford and the current analysis. Provide a listing of all modifications and discuss their effect on the containment pressure.

Response

The differences between the original Waterford 3 FSAR mass and energy release data and the current analysis are due to code modifications and

improved input data calculations. These modifications and improvements have been followed in modern analyses, such as that for the Palo Verde stretch power effort cited in the response to Question 1. These modifications have already been approved by NRC. Some of the specific modifications are discussed below:

1. For the blowdown phase, the CEFLASH-4A computer code is used in the current analysis. The CEFLASH-4 computer code referenced in the SRPs was used in the FSAR analysis. The CEFLASH-4 code is no longer available and has been superseded by the NRC approved 1985 Evaluation Model version of the CEFLASH-4A code.

2. The FLOOD3 computer code is used for the new mass and energy. This replaces the combination of codes, FLOOD MOD2, PLATE, and FROTH that had been used in the FSAR analyses. Interfaces between these codes in the FSAR analysis resulted in overly conservative release of mass and energy during the reflood/post reflood stage of the event. Integration of these codes into one FLOOD3 code eliminates this excess conservatism. Some improvements in the implementation of the FLOOD3 code that result in a more realistic calculation of the mass and energy release are:

   - Heat transfer between the RCS and steam generators in the intact and broken loops are treated individually in the new M&E analysis. In the old FSAR mass and energy calculation, an average steam generator (SG) temperature at the end of reflood was used for both SGs. The more realistic approach used in the FLOOD3 code is to calculate the temperature in each SG individually.

   - The specific volume of the fluid in the primary loop and the containment pressure are now varied with time. In the old FSAR M&E analyses, the specific volume was assumed to be constant.

   - A more rigorous heat transfer scheme is used for treating the transfer of energy from the loop and SG walls to the exiting break fluid. In the old FSAR M&E calculation, the wall heat transfer during and after reflood was modeled one dimensionally using a constant heat transfer coefficient and a constant "cold" temperature as an infinite heat sink. The constant cold heat sink temperature is overly conservative in that a more detailed calculation would yield a higher fluid temperature and hence lower heat transfer rates. In FLOOD3 the fluid in the RCS is heated mechanistically, as opposed to assuming saturated liquid in the core.

- A more realistic secondary to primary side heat transfer coefficient is calculated and a more realistic grouping of primary and secondary side metal masses based on contact with water and steam is used. In the old FSAR M&E analysis, a very conservative constant nucleate boiling heat transfer coefficient of 10000 Btu/hr-ft^2-°F was used to model heat transfer from the SG tubes to the primary fluid. This conservative primary side value has been maintained, however, the secondary side heat transfer coefficient is now a calculated constant value, based on bounding conditions in the SG.

Question 3.

A significant contributor to the calculation of containment peak pressure for breaks at the reactor coolant pump suction is the energy removed from the steam generators. For the pump suction break producing the highest containment pressure, provide the calculated temperature in each steam generator initially, at the end of blowdown and at the end of reflood discuss how calculation of energy from the steam generators is made conservative for containment analysis during each period of the analysis including the period after reflood of the core is accomplished.

Response

The specific steam generator temperature data is not readily available at W3. The development and treatment of this data and the conservative calculation of energy from the steam generator; however, is done the same way in the current W3 analysis as was done and approved by NRC for the CESSAR FSAR. The codes and methodology used in the W3 M&E release calculations is also the same as those used and approved by NRC for the Palo Verde uprate submittal (as noted in the response to Question 1 above.)

Question 4

We understand that slot breaks have been found to be more conservative for containment analysis than double ended breaks. Provide reference to documentation where this determination was made and approved. Given the significant modifications that have made in the containment peak pressure methodology, justify that slot breaks are still bounding.

Response

LOCA analyses are typically performed for three break locations, hot leg, RCP suction leg and RCP discharge leg, for both maximum (2 HPSI and 2 LPSI) and minimum (1 HPSI and 1 LPSI) safety injection flow rates. While early analyses considered both guillotine and slot breaks, as well as different break areas, sensitivity studies performed in the mid-1970's indicated that the slot breaks with the equivalent area of a double-ended pipe break were most limiting. These sensitivity results were first documented in the preliminary safety analysis report for the System 80 CESSAR design (6/3/74). These studies showed that the individual driving pressure in the lines on each side of the guillotine break produced a less severe integrated mass & energy release (due to critical flow considerations) than that based on the higher "mixed" break pressure from a slot break. Thus, since the 1974 studies were performed, CE's methodology for containment M&E analyses has been limited to slot breaks.

Attached are tables presenting a recent informal sensitivity study of three different break locations and considering the two different break types at each location. These tables provide the M&E data for Waterford 3 for each scenario. Comparison of the data in these tables indicates that the slot break yields a higher integrated mass and energy release to the containment.

To confirm this, EOI performed an informal GOTHIC analysis using the mass and energy provided in these tables to calculate the containment pressure. The results show that for the discharge and suction leg locations, the slot break produces a peak pressure greater than 0.5 psi above that for the guillotine break. However, for the hot leg break location, the slot break gives about the same peak pressure as the guillotine break (slot break pressure is lower than the guillotine break peak pressure by less than 0.05 psi). This difference is very small and is within the accuracy of the analyses to predict the actual containment response. Also note that the peak pressure for the LOCA scenario is not the limiting case since it is well below (more than 7 psi) the peak pressure for the MSLB.

RESULTS FOR THE GUILLOTINE BREAK ARE INFORMAL

WSES UNIT 3 - COMPARISON OF M&E BETWEEN THE SLOT AND GUILLOTINE BREAKS

DOUBLE ENDED DISCHARGE LEG BREAK
MASS & ENERGY RELEASE DATA
BLOWDOWN PHASE

TIME	MASS RATE (LBM/SEC)		ENERGY RATE (BTU/SEC)	
(SEC)	SLOT	GUILLOTINE	SLOT	GUILLOTINE
0.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.50	1.1301E+05	1.0239E+05	6.1767E+07	5.5864E+07
1.00	1.0467E+05	9.3832E+04	5.7358E+07	5.1271E+07
1.50	8.8519E+04	7.7125E+04	4.9356E+07	4.2339E+07
2.00	7.4117E+04	6.6424E+04	4.1848E+07	3.6761E+07
2.50	6.2408E+04	5.7089E+04	3.5295E+07	3.1798E+07
3.00	5.6308E+04	5.2362E+04	3.1818E+07	2.9208E+07
4.00	4.9799E+04	4.9202E+04	2.8832E+07	2.7393E+07
5.00	3.3050E+04	4.4553E+04	2.2686E+07	2.5224E+07
6.00	3.1626E+04	3.4173E+04	2.1051E+07	2.1277E+07
7.00	2.7883E+04	2.2920E+04	1.8736E+07	1.6882E+07
8.00	2.1078E+04	2.0391E+04	1.5347E+07	1.5208E+07
9.00	1.1054E+04	1.6500E+04	1.0113E+07	1.3174E+07
10.00	1.1684E+04	9.0960E+03	9.7428E+06	9.5980E+06
11.00	1.3777E+04	8.1028E+03	8.2521E+06	8.3902E+06
12.00	1.3586E+04	1.0376E+04	6.2820E+06	7.8437E+06
12.10	1.3264E+04	1.0578E+04	6.0074E+06	7.7157E+06
12.20	1.2972E+04	1.0737E+04	5.7569E+06	7.5620E+06
12.30	1.2731E+04	1.1026E+04	5.5375E+06	7.4919E+06
12.40	1.2435E+04	1.1237E+04	5.3019E+06	7.3875E+06
12.50	1.2150E+04	1.1376E+04	5.0771E+06	7.2511E+06
12.60	1.1887E+04	1.1483E+04	4.8710E+06	7.1018E+06
12.70	1.1586E+04	1.1552E+04	4.6570E+06	6.9369E+06
12.80	1.1283E+04	1.1587E+04	4.4504E+06	6.7598E+06
12.90	1.0991E+04	1.1587E+04	4.2560E+06	6.5692E+06
13.00	1.0919E+04	1.1543E+04	4.1516E+06	6.3692E+06
13.10	1.0796E+04	1.1523E+04	4.0212E+06	6.1893E+06
13.20	1.0640E+04	1.1537E+04	3.8869E+06	6.0343E+06
13.30	1.0341E+04	1.1491E+04	3.7054E+06	5.8611E+06
13.40	9.9746E+03	1.1459E+04	3.5126E+06	5.6975E+06

13.50	9.5660E+03	1.1513E+04		3.3132E+06	5.5903E+06	
13.60	1.0166E+04	1.1546E+04		3.4739E+06	5.4539E+06	
13.70	4.5000E+03	1.1429E+04		1.5045E+06	5.2806E+06	
13.80	9.5649E+03	1.1154E+04		3.1722E+06	5.0535E+06	
13.90	9.8455E+03	1.0799E+04		3.2384E+06	4.8063E+06	
14.00	4.2252E+03	1.0527E+04		1.3676E+06	4.6015E+06	
14.10	4.0746E+03	1.0261E+04		1.3093E+06	4.4076E+06	
14.20	4.0714E+03	1.0009E+04		1.3025E+06	4.2253E+06	
14.30	3.9273E+03	9.7712E+03		1.2553E+06	4.0544E+06	
14.40	3.3135E+03	9.5426E+03		1.0682E+06	3.8929E+06	
14.50	2.8338E+03	9.3235E+03		9.1766E+05	3.7405E+06	
14.60	2.4178E+03	9.1205E+03		7.8485E+05	3.5992E+06	
14.70	1.9830E+03	8.9209E+03		6.4715E+05	3.4648E+06	
14.80	1.4984E+03	8.6539E+03		4.9545E+05	3.3100E+06	
14.90	9.2410E+02	8.3719E+03		3.1648E+05	3.1558E+06	
15.00	3.5544E+02	8.0545E+03		1.3836E+05	2.9945E+06	
15.10	0.0000E+00	7.7272E+03		0.0000E+00	2.8353E+06	
15.20		7.4102E+03			2.6846E+06	
15.30		7.1054E+03			2.5423E+06	
15.40		6.8159E+03			2.4092E+06	
15.50		6.5422E+03			2.2851E+06	
15.60		6.5242E+03			2.2474E+06	
15.70		2.7588E+03			1.0639E+06	
15.80		2.7327E+03			1.0363E+06	
15.90		2.7736E+03			1.0313E+06	
16.00		2.6612E+03			9.7942E+05	
16.50		1.4351E+03			5.4379E+05	
17.00		0.0000E+00			0.0000E+00	
			DIFFERENCE SLOT-GUILL			DIFFERENCE SLOT-GUILL
INTEGRAL	5.1783E+05	5.1229E+05	1.07	3.0701E+08	3.0502E+08	0.65
	LBM	LBM	%	BTU	BTU	%

RESULTS FOR THE GUILLOTINE BREAK ARE INFORMAL

WSES UNIT 3 - COMPARISON OF M&E BETWEEN THE SLOT AND GUILLOTINE BREAKS

DOUBLE ENDED SUCTION LEG BREAK
MASS & ENERGY RELEASE DATA
BLOWDOWN PHASE

TIME	MASS RATE (LBM/SEC)		ENERGY RATE (BTU/SEC)	
(SEC)	SLOT	GUILLOTINE	SLOT	GUILLOTINE
0.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.50	7.4521E+04	7.1738E+04	4.1111E+07	3.9369E+07
1.00	7.2678E+04	6.8560E+04	4.0743E+07	3.8053E+07
1.50	6.9307E+04	6.4723E+04	3.9269E+07	3.6277E+07
2.00	6.4211E+04	6.1896E+04	3.6606E+07	3.4942E+07
2.50	5.8094E+04	5.7233E+04	3.3518E+07	3.2552E+07
3.00	4.6190E+04	5.0094E+04	2.7671E+07	2.9072E+07
3.50	3.5140E+04	3.7383E+04	2.2166E+07	2.3160E+07
4.00	3.1282E+04	3.0942E+04	1.9879E+07	1.9856E+07
4.50	3.0669E+04	2.8995E+04	1.9225E+07	1.8536E+07
5.00	3.0198E+04	2.9056E+04	1.8842E+07	1.8284E+07
5.50	2.8093E+04	2.8291E+04	1.7811E+07	1.7695E+07
6.00	2.7639E+04	2.6426E+04	1.7365E+07	1.6770E+07
6.50	2.7606E+04	2.5225E+04	1.7205E+07	1.6107E+07
7.00	2.7209E+04	2.4722E+04	1.6930E+07	1.5764E+07
7.50	2.6542E+04	2.5526E+04	1.6526E+07	1.5940E+07
8.00	2.5576E+04	2.5101E+04	1.6032E+07	1.5634E+07
8.50	2.4052E+04	2.4057E+04	1.5334E+07	1.5075E+07
9.00	2.2379E+04	2.2824E+04	1.4552E+07	1.4426E+07
9.50	2.0918E+04	2.1679E+04	1.3826E+07	1.3836E+07
10.00	1.9742E+04	2.0456E+04	1.3208E+07	1.3232E+07
10.50	1.8726E+04	1.9150E+04	1.2669E+07	1.2605E+07
11.00	1.7717E+04	1.7930E+04	1.2146E+07	1.2041E+07
11.50	1.6644E+04	1.6750E+04	1.1617E+07	1.1488E+07
12.00	1.6138E+04	1.5698E+04	1.1301E+07	1.0993E+07
12.50	1.4986E+04	1.4954E+04	1.0596E+07	1.0493E+07
13.00	1.3950E+04	1.3634E+04	9.8691E+06	9.7656E+06
13.50	1.3797E+04	1.1537E+04	8.9209E+06	8.4579E+06

14.00	1.2877E+04	9.9825E+03		8.1063E+06	7.2565E+06	
14.50	1.1845E+04	9.1747E+03		7.1500E+06	6.5188E+06	
15.00	1.0909E+04	8.0083E+03		6.3640E+06	5.7720E+06	
15.50	9.1185E+03	7.0008E+03		5.3732E+06	5.1314E+06	
16.00	8.0852E+03	6.1143E+03		4.7802E+06	4.5219E+06	
16.10	8.0641E+03	6.0395E+03		4.6590E+06	4.4456E+06	
16.20	7.9292E+03	4.4397E+03		4.5034E+06	3.7473E+06	
16.30	7.7905E+03	4.2615E+03		4.3645E+06	3.6339E+06	
16.40	7.6815E+03	5.8641E+03		4.2432E+06	4.2471E+06	
16.50	7.6037E+03	4.1152E+03		4.1497E+06	3.4984E+06	
16.60	7.5475E+03	3.9376E+03		4.0840E+06	3.3911E+06	
16.70	7.6081E+03	3.8590E+03		4.0478E+06	3.3277E+06	
16.80	7.7689E+03	3.6251E+03		4.0128E+06	3.1855E+06	
16.90	7.9817E+03	3.3630E+03		3.9828E+06	3.0043E+06	
17.00	8.1460E+03	3.1717E+03		3.9450E+06	2.8993E+06	
17.10	8.0815E+03	0.0000E+00		3.8370E+06	0.0000E+00	
17.20	7.9119E+03			3.6990E+06		
17.30	8.4137E+03			3.7665E+06		
17.40	8.6219E+03			3.7454E+06		
17.50	8.5503E+03			3.6450E+06		
17.60	8.4272E+03			3.5326E+06		
17.70	8.6368E+03			3.4713E+06		
17.80	9.8004E+03			3.6948E+06		
17.90	9.5954E+03			3.5519E+06		
18.00	9.2421E+03			3.3936E+06		
18.10	8.8359E+03			3.2434E+06		
18.20	3.4998E+03			1.5351E+06		
18.30	2.4171E+03			1.4800E+06		
18.40	2.3666E+03			1.4677E+06		
18.50	2.3031E+03			1.4374E+06		
18.60	2.2391E+03			1.4035E+06		
18.70	2.1765E+03			1.3682E+06		
18.80	2.1151E+03			1.3318E+06		
18.81	0.0000E+00			0.0000E+00		
			DIFFERENCE SLOT-GUILL			DIFFERENCE SLOT-GUILL
INTEGRAL	4.9899E+05	4.7029E+05	5.75	3.0152E+08	2.8814E+08	4.44
	LBM	LBM	%	BTU	BTU	%

RESULTS FOR THE GUILLOTINE BREAK ARE INFORMAL

WSES UNIT 3 - COMPARISON OF M&E BETWEEN THE SLOT AND GUILLOTINE BREAKS

DOUBLE ENDED HOT LEG BREAK
MASS & ENERGY RELEASE DATA
BLOWDOWN PHASE

TIME	MASS RATE (LBM/SEC)		ENERGY RATE (BTU/SEC)	
(SEC)	SLOT	GUILLOTINE	SLOT	GUILLOTINE
0.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.50	1.0485E+05	1.0458E+05	6.5541E+07	6.4593E+07
1.00	7.9865E+04	8.1213E+04	5.0435E+07	5.0748E+07
1.50	7.1647E+04	6.9307E+04	4.4449E+07	4.3299E+07
2.00	7.0756E+04	6.6565E+04	4.2705E+07	4.0741E+07
2.50	6.7890E+04	6.6047E+04	4.0417E+07	3.9515E+07
3.00	6.1715E+04	6.0590E+04	3.7464E+07	3.6701E+07
4.00	5.0496E+04	4.9570E+04	3.1960E+07	3.1426E+07
5.00	4.5268E+04	4.2696E+04	2.8472E+07	2.7446E+07
6.00	3.7947E+04	3.7529E+04	2.4085E+07	2.4182E+07
7.00	2.2092E+04	2.5924E+04	1.7295E+07	1.8198E+07
8.00	1.4321E+04	1.6037E+04	1.3535E+07	1.3421E+07
9.00	9.5392E+03	9.0884E+03	9.4519E+06	9.7978E+06
10.00	8.7094E+03	8.1245E+03	8.0034E+06	8.7791E+06
11.00	4.9332E+03	6.1465E+03	5.3591E+06	6.7516E+06
12.00	2.6496E+03	2.8887E+03	3.2122E+06	3.5030E+06
12.10	2.5335E+03	2.7901E+03	3.0836E+06	3.3803E+06
12.20	2.7316E+03	2.8096E+03	3.3409E+06	3.4245E+06
12.30	3.0205E+03	2.9703E+03	3.5427E+06	3.6319E+06
12.40	3.6897E+03	3.2661E+03	3.4870E+06	3.9701E+06
12.50	4.1101E+03	3.6372E+03	3.5145E+06	4.0845E+06
12.60	4.3192E+03	4.5444E+03	3.5271E+06	4.3045E+06
12.70	4.3862E+03	4.8241E+03	3.4718E+06	4.3713E+06
12.80	4.4059E+03	4.7229E+03	3.4096E+06	4.3303E+06
12.90	4.4064E+03	4.3078E+03	3.3513E+06	4.0196E+06
13.00	4.3498E+03	3.9007E+03	3.2756E+06	3.6891E+06
13.10	4.2544E+03	3.3936E+03	3.2229E+06	3.2676E+06
13.20	4.0961E+03	2.9079E+03	3.1700E+06	2.8841E+06

13.30	3.8461E+03	2.2584E+03		3.0630E+06	2.3466E+06	
13.40	3.5864E+03	1.8593E+03		2.9593E+06	2.1462E+06	
13.50	3.3146E+03	1.6630E+03		2.9236E+06	1.9929E+06	
13.60	3.0159E+03	1.4528E+03		2.8027E+06	1.7421E+06	
13.70	2.7821E+03	1.2988E+03		2.6996E+06	1.5756E+06	
13.80	2.5554E+03	1.2633E+03		2.5992E+06	1.5432E+06	
13.90	2.3481E+03	1.2597E+03		2.4917E+06	1.5393E+06	
14.00	2.1635E+03	0.0000E+00		2.3817E+06	0.0000E+00	
14.10	1.9754E+03			2.2627E+06		
14.20	1.7387E+03			2.0853E+06		
14.30	1.5366E+03			1.8636E+06		
14.40	1.3923E+03			1.6961E+06		
14.50	1.2392E+03			1.5179E+06		
14.60	1.0659E+03			1.3097E+06		
14.70	9.2818E+02			1.1431E+06		
14.80	7.8031E+02			9.6257E+05		
14.90	6.2086E+02			7.6573E+05		
15.00	5.0223E+02			6.1841E+05		
15.10	0.0000E+00			0.0000E+00		
			DIFFERENCE SLOT - GUILL			DIFFERENCE SLOT-GUILL
INTEGRAL	4.8280E+05 LBM	4.7709E+05 LBM	1.18 %	3.2028E+08 BTU	3.1720E+08 BTU	0.96 %

Question 5.

Provide an electronic copy of the input to the GOTHIC code for the limiting reactor coolant pump suction break and the limiting hot leg break.

Response

The attached diskette provides a copy of the GOTHIC input files for hot leg break and suction leg break containment analyses.

Question 6.

Provide a summary describing the key parameter uncertainties and the impact of the uncertainties on the limiting containment pressure and temperature response. Also provide peak containment pressure results for suction leg and discharge leg breaks.

Response

The following table provides the values and their associated instrument uncertainties for key parameters used in the supplemental GOTHIC analysis to assess the impact of uncertainties. The uncertainty values, shown in Table 1 and used in this GOTHIC analysis, for initial containment temperature and CS riser level are different than the values used in the previous FSAR analyses and reflected in Table 5 of the TSCR submittal. In the FSAR analyses, an instrument uncertainty of 6 °F, corresponding to the average of three loops, was used for the initial containment temperature. Note that containment temperature at Waterford 3 is currently measured by averaging the values from three loops. The temperature uncertainty used in the GOTHIC analyses corresponds to the calculated value for an individual loop. In the FSAR analyses, a conservative CS riser level instrument uncertainty of 10 ft was used. The calculated CS riser level uncertainty is 7 ft. In addition, uncertainty for the initial containment pressure was not considered in the FSAR analyses. However, it was added to the supplemental GOTHIC uncertainty analysis.

Table 1

Parameter	w/o Uncertainty	Uncertainty	With Uncertainty
Initial Containment Temperature	120 °F	+7.5 °F	127.5 °F
CCW Temperature	115 °F	+5 °F	120 °F
CCW Flow	1200 gpm	-100 gpm	1100 gpm
Initial CS Riser Level	149.5 ft	-7 ft	142.5 ft
Initial Containment Pressure	15.7 psia	+0.11 psi	15.81 psia

Table 2 provides the containment pressure and temperature results for the limiting LOCA and MSLB scenarios both with and without the above uncertainties. The containment pressure and temperature results in Table 2 are obtained from formal GOTHIC analyses performed with input that included the instrument uncertainties provided in Table 1.

Table 2

Parameter	w/o Uncertainty	w/ Uncertainty	Difference
Limiting LOCA Peak Pressure (DEHLSB)	35.20 psig	35.34 psig	0.14 psi
Limiting LOCA P @ 24 hours (DEDLSB, min SI)	15.50 psig	15.90 psig	0.40 psi
MSLB Peak Pressure	42.68 psig	43.26 psig	0.58 psi
MSLB Peak Temperature	397.4 °F	402.60 °F	5.2 °F

Where:

DEHLSB: Double Ended Hot Leg Slot Break
DEDLSB: Double Ended Discharge Leg Slot Break

Question 7.

What is the peak containment pressure for the suction leg and discharge leg breaks.

Response

The peak pressure for the suction leg break is 32.4 psig. The peak pressure for the discharge leg break is 33.5 psig. These are both below the peak pressure for the hot leg break that is 35.2 psig and well below the containment design pressure of ***44 psig.*** The LOCA peak pressure (35.2 psig) is also well below the MSLB peak pressure of ***42.68 psig***.