Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

L-2011-516
10 CFR 50.90

December 1, 2011

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

Re: St. Lucie Plant Unit 1
Docket No. 50-335
Renewed Facility Operating License No. DPR-67

Impact of Containment Spray System Modification on Extended Power Uprate License Amendment Request

Reference:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2010-259), "License Amendment Request for Extended Power Uprate," November 22, 2010, Accession No. ML103560419.

By letter L-2010-259 dated November 22, 2010 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. DPR-67 and revise the St. Lucie Unit 1 Technical Specifications (TS). The proposed amendment will increase the unit's licensed core thermal power level from 2700 megawatts thermal (MWt) to 3020 MWt and revise the Renewed Facility Operating License and TS to support operation at this increased core thermal power level. This represents an approximate increase of 11.85% and is therefore considered an Extended Power Uprate (EPU).

Subsequent to the submittal of the License Amendment Request (LAR) presented in Reference 1, FPL determined that the containment spray (CS) system must be modified to address excess CS pump discharge flow. This excess CS system flow condition is a current plant condition that was discovered and evaluated as part of the St. Lucie Unit 1 corrective action program. The corrective action to address this condition involves the addition of a flow restricting orifice in each of the CS pump discharge lines. The installation of the flow restricting orifices prior to operation at EPU conditions will reduce the minimum CS system flow assumed in the associated EPU analyses. This change will be implemented in accordance with 10 CFR 50.59 and FPL's modification process.

The attached information supplements the EPU LAR submittal [Reference 1] relative to the impact of the proposed CS system modification upon analyses performed for the design basis Loss of Coolant Accident (LOCA) and Main Steam Line Break (MSLB) containment analyses. The attachment also contains the results of calculations and evaluations performed for EPU analyses impacted by the proposed CS system modification, including the revised emergency core cooling system (ECCS) boric acid precipitation analysis.

A001
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NRR

The information presented in the attachment demonstrates that all EPU LAR acceptance criteria are met when taking into consideration the proposed modification to the CS system.

In accordance with 10 CFR 50.91(b)(1), a copy of this letter is being forwarded to the designated State of Florida official.

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2010-259 [Reference 1].

This submittal contains no new commitments and no revisions to existing commitments.

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate License Amendment Request (LAR) Project Manager, at 772-467-7138.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on 01 - December - 2011

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachment

cc: Mr. William Passetti, Florida Department of Health

Supplemental Information for EPU LAR Attachment 5 Section 2.6.1 "Primary Containment Functional Design"

1. Summary of Change

To address an existing plant condition, FPL plans to install a restriction orifice in each of the containment spray pump discharge lines upstream of the shutdown cooling heat exchangers. These restriction orifices will limit the containment spray (CS) flow such that minimum flow and brake horsepower (BHP) requirements are met with minimum pump performance and maximum flow and BHP requirements are met with maximum pump performance. This modification results in a minimum CS flow delivery that is different than that utilized in Extended Power Uprate (EPU) analyses.

2. Input Consideration

Containment Spray

A comparison of the CS flow delivery data used in the analyses prior to the CS system modification and that resulting from the CS system modification is provided in Table 1. The Loss of Coolant Accident (LOCA) and main Steam Line Break (MSLB) analyses prior to the CS system modification used a constant CS flow rate of 2700 gpm pre-Recirculation Actuation Signal (RAS) and 2750 gpm post-RAS after the specified delays. The revised LOCA and MSLB analyses for the EPU with the proposed CS system modification used a partial CS flow delivery curve that was developed as a part of the CS system modification. Table 1 provides the supplemental information to EPU License Amendment Request (LAR) Attachment 5, Table 2.6.1-1. Table 2 compares the CS flow delivery related data for the LOCA and MSLB containment analyses. The flowrate and delay time values labeled as "CS Mod" in Table 2 supersede those in EPU LAR Attachment 5, Table 2.6.1-1.

Containment Passive Heat Sink

The following is an addendum to EPU LAR Attachment 5, Section 2.6.1.2.2.1. The MSLB analysis performed for the EPU prior to the CS system modification did not consider the containment vessel liner as a heat sink. However, for the MSLB analysis with the modified CS flow delivery as with LOCA analysis, the containment vessel liner heat sink input data was modified to make the liner functional. The inclusion of the containment liner heat sink improved the containment response for the MSLB analysis with the modified CS flow delivery.

3. Summary of Results

The EPU LOCA and MSLB containment integrity analyses were revised to address the modified CS flow delivery. In addition, the revised MSLB containment integrity analysis added the containment vessel liner passive heat sink. The revised analysis results were evaluated against the previous EPU evaluations.

LOCA Results

As seen from Table 3-A, the reanalysis did not result in any change to the containment peak pressure and temperature for the limiting peak pressure case (double ended hot leg slot (DEHLS) break with minimum safeguards) and limiting long-term limiting temperature response case (double ended discharge leg slot (DEDLS) break with minimum safeguards) because the peaks occurs prior to initiation of the CS flow. However, as seen from Figures 1 and 2, there was a slight adverse impact on the long-term pressure and temperature response. In addition, as seen from Table 3-B, the pressure at 24 hours increased by 0.2 psi to 7.55 psig for DEHLS and 7.64 psig for DEDLS. These values supersede the values of 7.35 psig for DEHLS and 7.44 psig for DEDLS in EPU LAR Attachment 5, Section 2.6.1.2.1.3. Also, the containment vessel liner temperature increased by 1 °F to 230 °F for DEHLS and 246 °F for DEDLS which supersede the values of 229 °F and 245 °F, respectively, in EPU LAR Attachment 5, Section 2.6.1.2.1.3. These results are as expected because the CS flow is lower and initiates later in the revised analysis.

The acceptance criteria for the results of the LOCA containment integrity analysis is that the calculated peak containment pressure remains below the current containment design value of 44 psig. The calculated containment pressure at 24 hours shall be less than half of the peak calculated pressure and the containment vessel liner temperature shall be maintained below its design temperature of 264 °F. As seen from Tables 3-A and 3-B, all the containment acceptance criteria are met.

The data in the column labeled "EPU + CS MOD" in Table 3-A supersede the DEHLS and DEDLS Peak Containment Pressure and Vapor Temperature values in EPU LAR Attachment 5, Table 2.6.1-2. The data in the column labeled "EPU + CS MOD" in Table 3-B supersede the DEHLS and DEDLS Containment Pressure @ 24 hours and Peak Containment Vessel Temperature values in EPU LAR Attachment 5, Table 2.6.1-2. Figures 1-4 supersede EPU LAR Attachment 5, Figures 2.6.1-1 through 2.6.1-4, respectively.

MSLB Results

As seen from Table 4-A and Figures 5 and 6, the MSLB reanalysis resulted in a decrease in the containment peak pressure for the limiting peak pressure case (MSLB at full power with failure of 1 cooling train) and peak Equipment Qualification (EQ) temperature case. This is expected because although the CS flow is reduced, adding the containment vessel liner passive heat sink provides additional heat removal from the containment atmosphere. As seen from Table 4-A, the peak pressure decreased by 0.35 psi to 42.73 psig which supersedes the value of 43.08 psig in EPU LAR Attachment 5, Table 2.6.1-2. Also, the peak EQ temperature decreased by 11.49 °F to 387.0 °F which supersedes the value of 398.49 °F in EPU LAR Attachment 5, Table 2.6.1-2. In addition, as seen from Table 4-B, the peak containment vessel liner temperature decreases by 7.1°F to 232.3 °F. This supersedes the value of 239.4 °F in EPU LAR Attachment 5, Table 2.6.1-2.

The acceptance criteria for the results of the MSLB containment integrity analysis are that the calculated peak containment pressure remains below the current containment design value of 44 psig and the containment vessel liner temperature shall be maintained below its design temperature of 264 °F. As seen from Tables 4-A and 4-B, both of these acceptance criteria are met. Figures 5 and 6 supersede EPU LAR Attachment 5, Figures 2.6.1-5 and 2.6.1-6, respectively.

Table 1
Containment Spray Flow Delivery

Containment Spray (gpm)		**Time after Flow Initiation (sec)**	
EPU	**EPU + CS Mod**	**EPU**	**EPU + CS Mod**
0	0	-	≤ 16
0	500	-	30
0	900	-	35
0	1225	-	40
2700 (injection phase)	2550	33.5	≥ 46

Table 2
Containment Response Analysis Parameters

Parameter	**LOCA Value**	**MSLB Value**
Flowrate – Steady State (gpm)		
Injection Phase (per pump)	2700 (EPU) 2545[(1)] (CS Mod)	2700 (EPU) 2545[(1)] (CS Mod)
Recirculation Phase (per pump)	2750 (EPU) 2545 (CS Mod)	NA NA
Delay Time after the Setpoint is Reached (sec)		
Without Offsite Power	63.5 (EPU) 78.5 (CS Mod)	63.5 (EPU) 78.5 (CS Mod)
With Offsite Power	NA NA	52 (EPU) 67.0 (CS Mod)

Notes:

(1) The actual value is 2550 gpm; however, it is conservative to use a slightly lower value of CS flowrate for the containment pressure/temperature response analysis.

Table 3-A LOCA Containment Peak Pressure and Temperature Results for Limiting Pressure and Temperature Cases				
Case	**EPU**		**EPU + CS MOD**	
	Peak Containment Pressure @ Time	**Peak Containment Vapor Temperature @ Time**	**Peak Containment Pressure @ Time**	**Peak Containment Vapor Temperature @ Time**
LOCA DEHLS - (peak pressure response case)	42.77 psig @ 18.17 sec	265.57 °F @ 18.17 sec	42.77 psig @ 18.17 sec	265.57 °F @ 18.17 sec
LOCA DEDLS - (long-term temperature response case)	40.16 psig @ 13.97 sec	261.64 °F @ 13.97 sec	40.16 psig @ 13.97 sec	261.64 °F @ 13.97 sec

Table 3-B LOCA Long-Term Containment Response Results for Limiting Pressure and Temperature Cases				
Case	**EPU**		**EPU + CS MOD**	
	Containment Pressure @ 24 hours	**Peak Containment Vessel Temperature**	**Containment Pressure @ 24 hours**	**Peak Containment Vessel Temperature**
LOCA DEHLS - (peak pressure response case)	7.35 psig	229 °F @ 1449 sec	7.55 psig	230 °F @ 1449 sec
LOCA DEDLS - (long-term temperature response case)	7.44 psig	245 °F @ 1249 sec	7.64 psig	246 °F @ 1299 sec

Table 4-A MSLB Containment Peak Pressure and Temperature Results for Limiting Pressure and EQ Temperature Cases				
Case	EPU		EPU + CS MOD	
	Peak Containment Pressure @ Time	Peak Containment Vapor Temperature @ Time	Peak Containment Pressure @ Time	Peak Containment Vapor Temperature @ Time
MSLB (peak pressure response case)	43.08 psig	NA	42.73	NA
MSLB (EQ case)	NA	398.49 °F	NA	387.0 °F

Table 4-B MSLB Containment Temperature Results for EQ Temperature Cases		
Case	EPU	EPU + CS MOD
	Peak Containment Vessel Temperature	Peak Containment Vessel Temperature
MSLB (EQ case)	239.4 °F @ 119 sec	232.3 °F @ 104 sec

Figure 1
Containment Pressure, LOCA DEHLS (Peak Pressure Response Case)

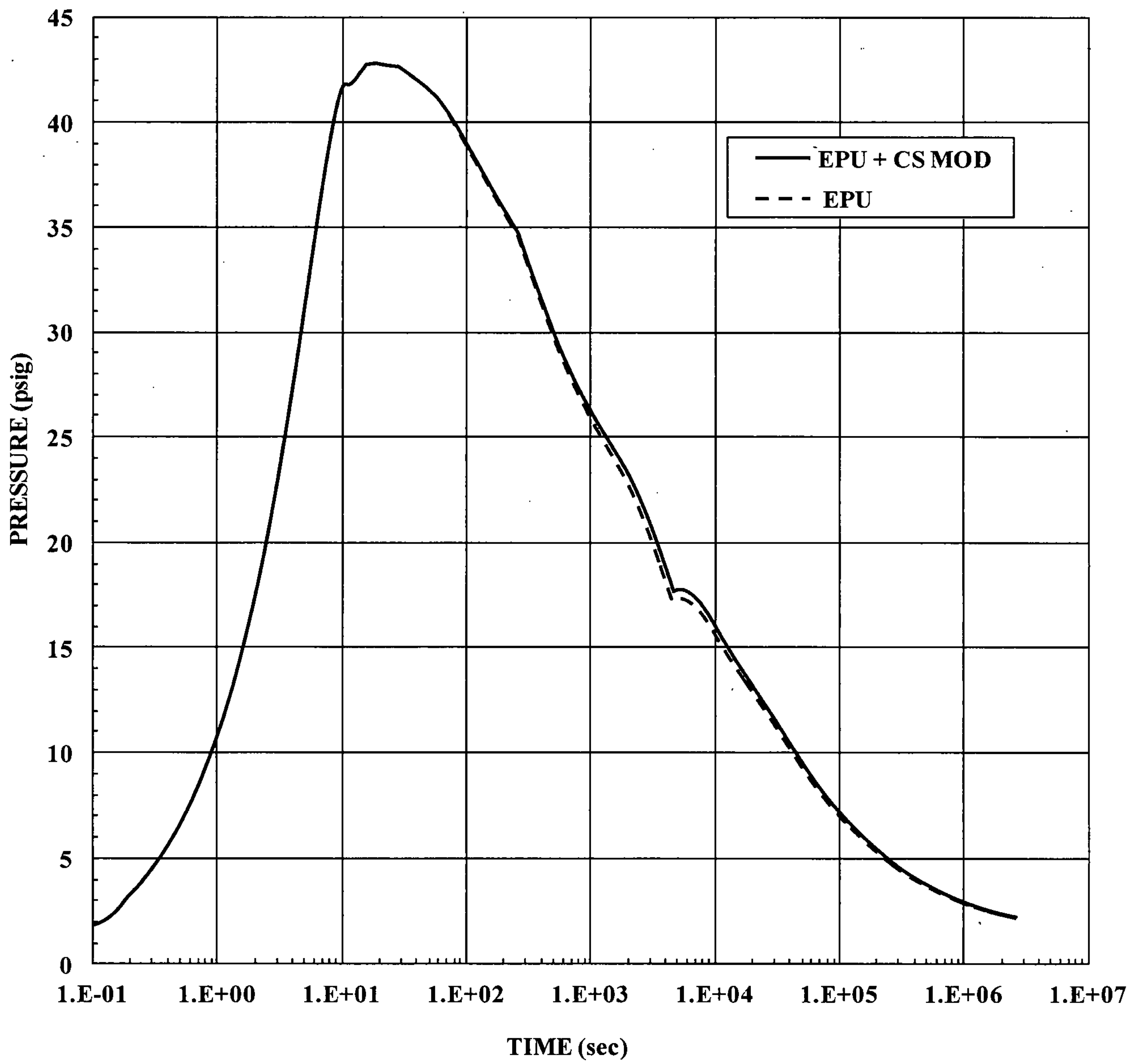


Figure 2
Containment Atmosphere Temperature, DEHLS LOCA
(Peak Pressure Response Case)

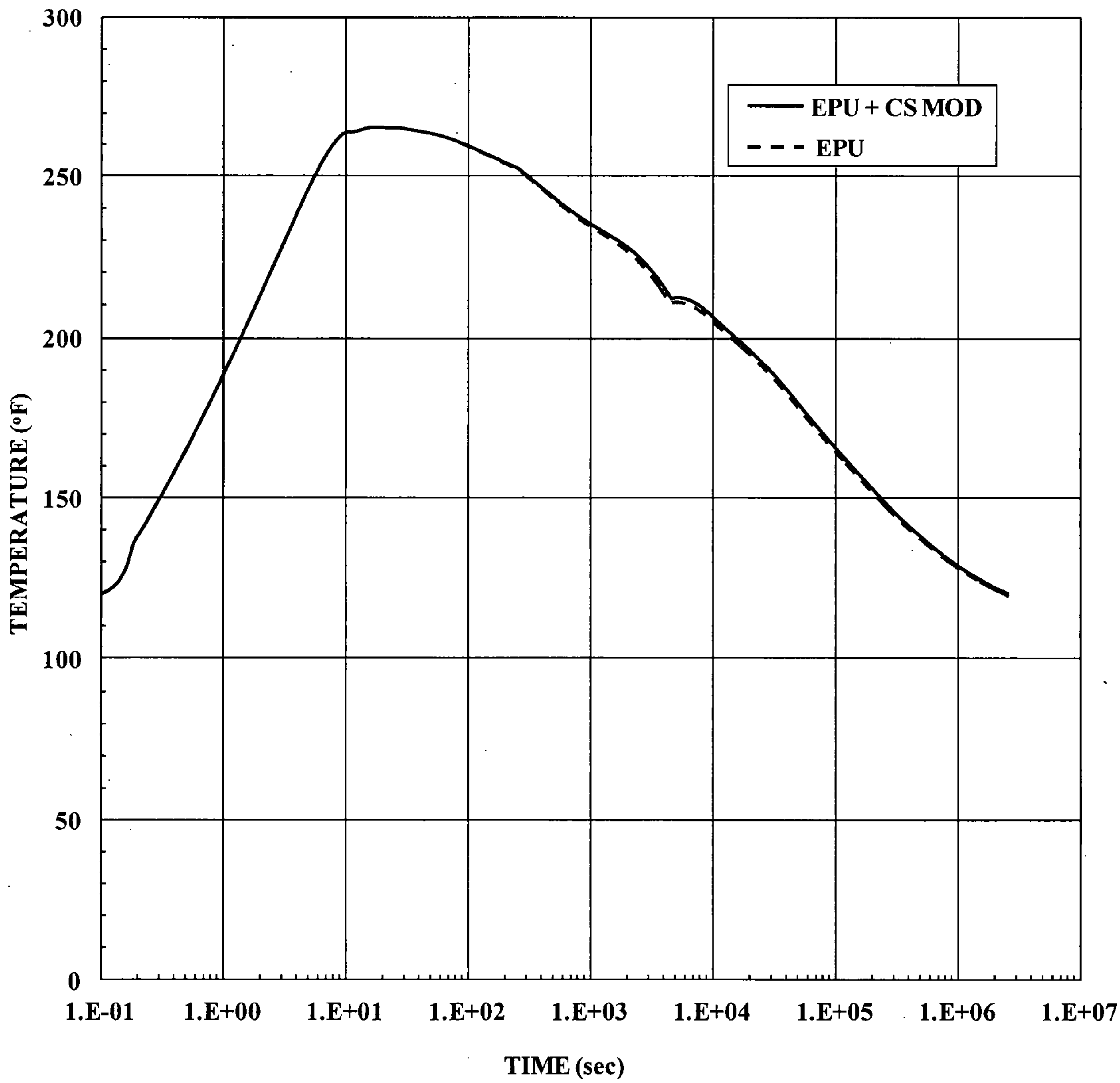


Figure 3
Containment Pressure, LOCA DEDLS
(Long-Term Temperature Response Case)

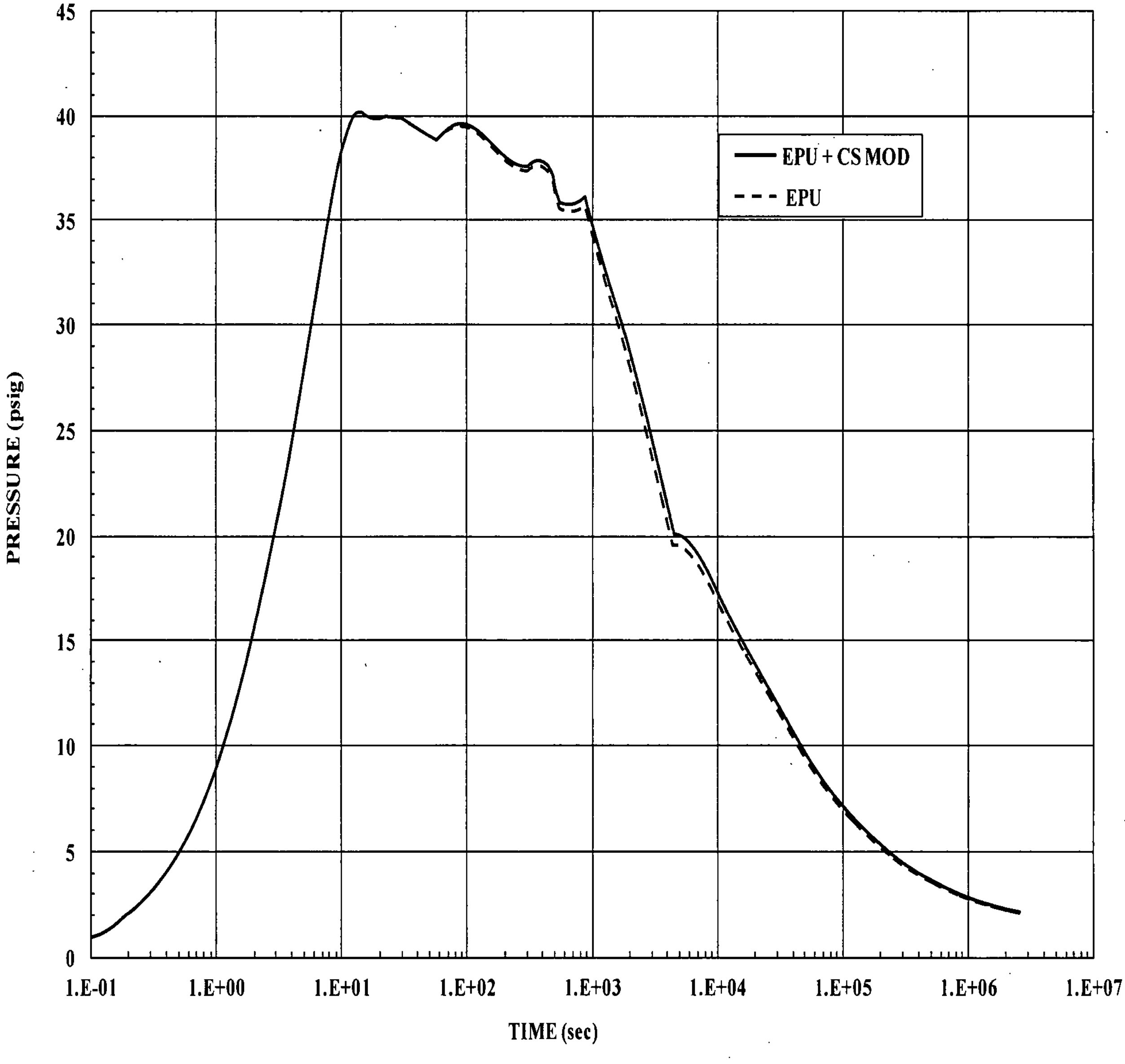


Figure 4
Containment Atmosphere Temperature, LOCA DEDLS
(Long-Term Temperature Response Case)

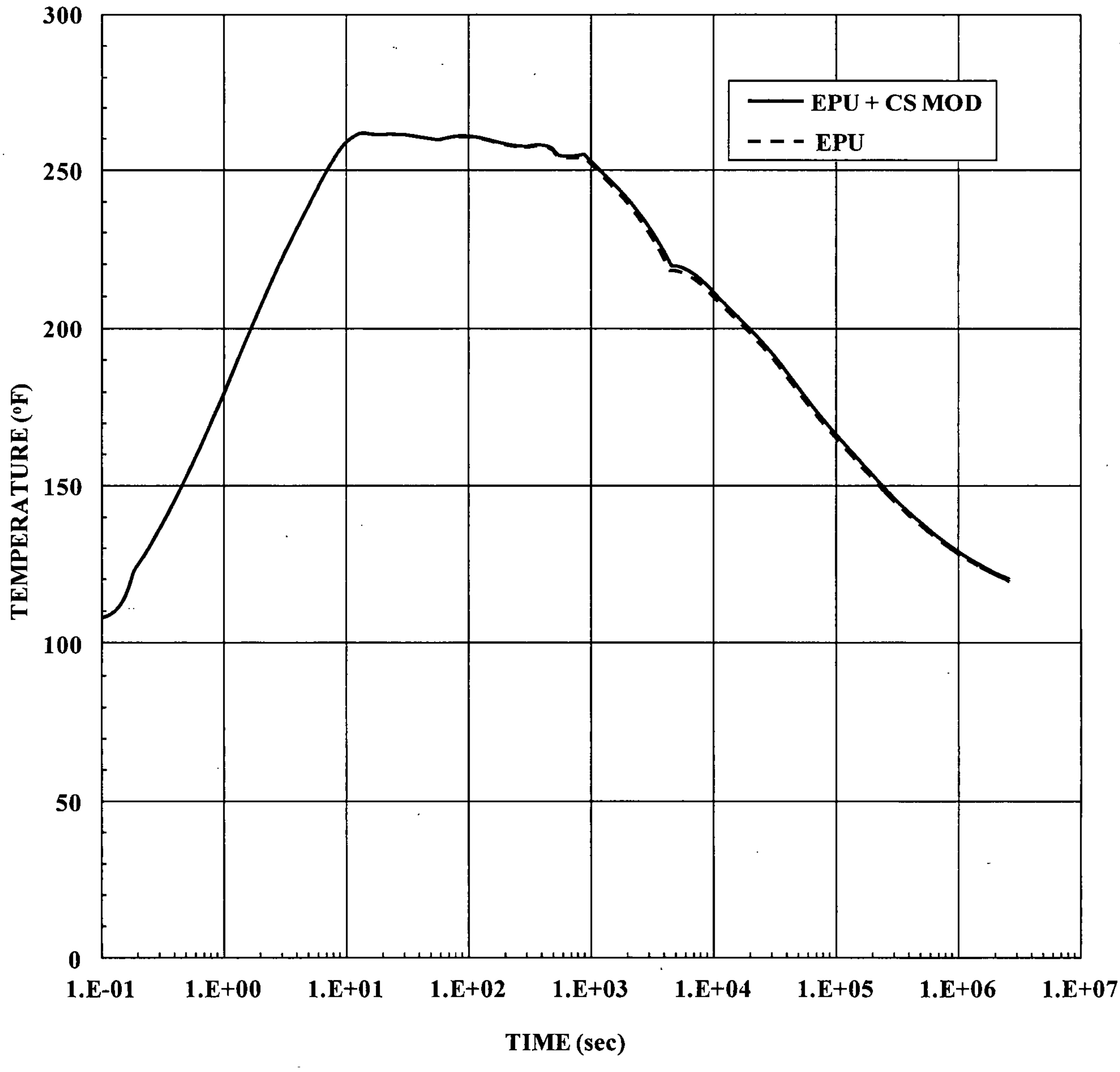


Figure 5
Containment Pressure – Main Steam Line Break at Full Power
Failure of 1 Cooling Train

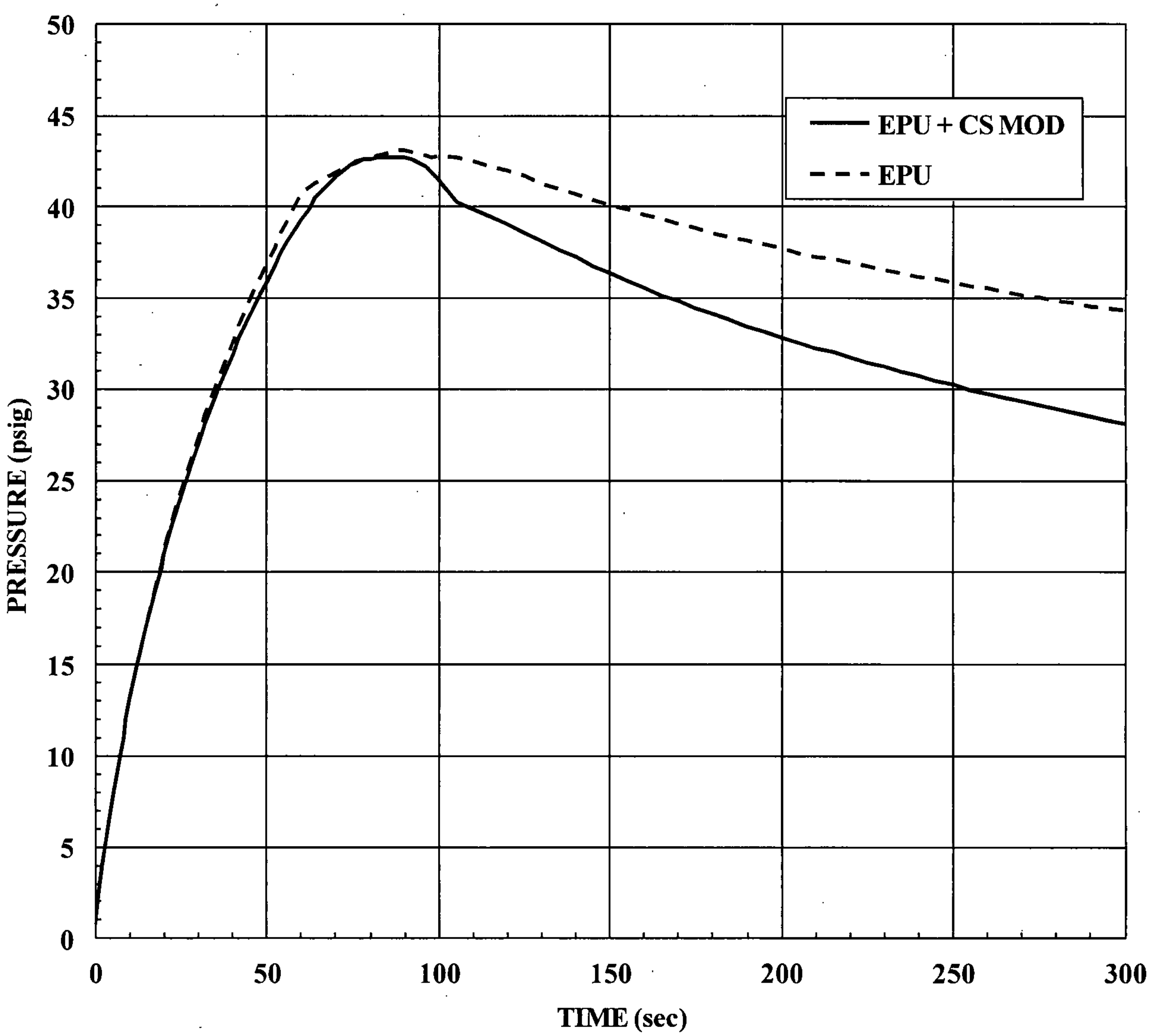
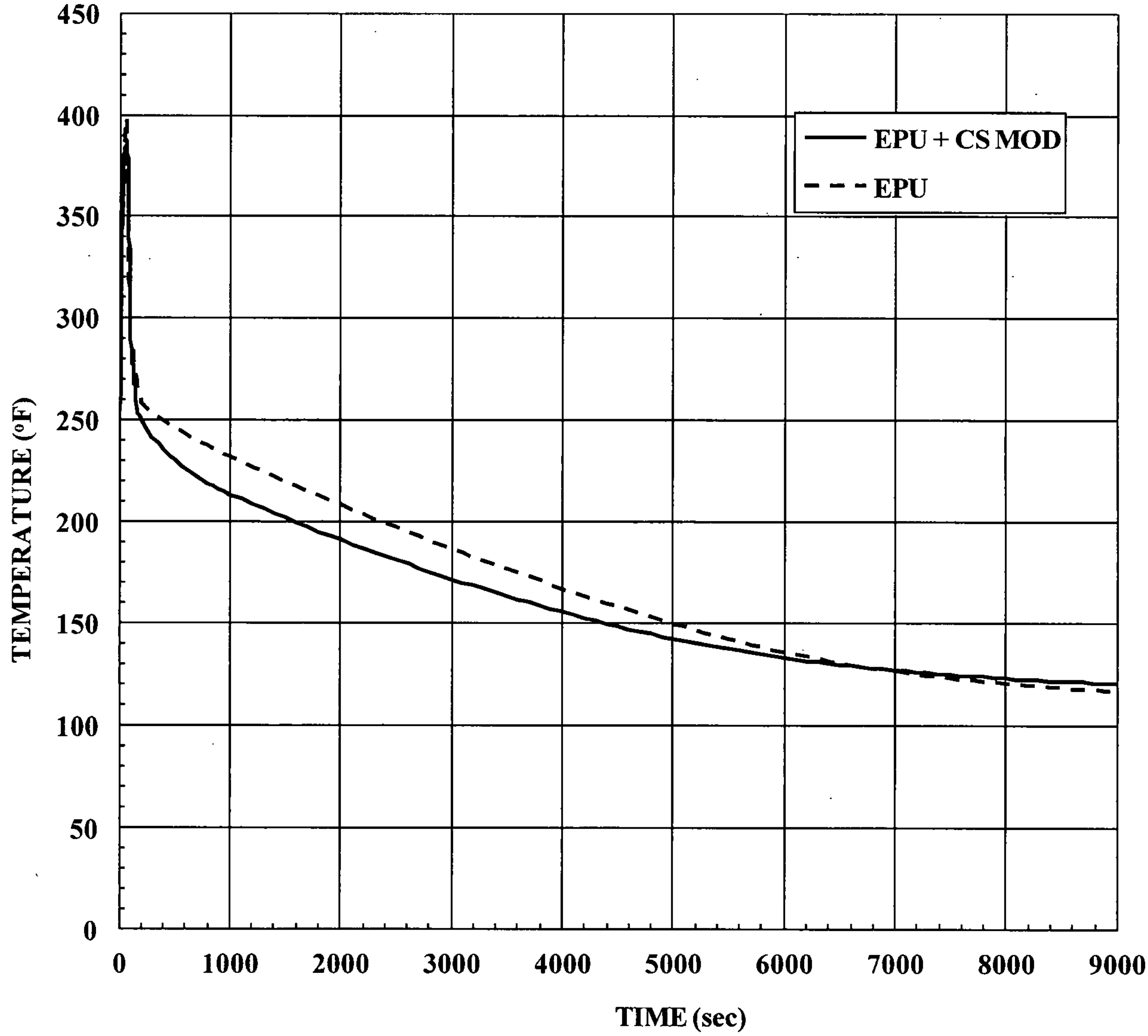


Figure 6
Containment Temperature – Main Steam Line Break
Equipment Qualification



Supplemental Information for EPU LAR Attachment 5 Section 2.6.3.2 "Mass and Energy Release Analysis for Secondary System Pipe Ruptures"

1. Summary of Change

The installation of a restriction orifice in the containment spray pump discharge lines upstream of the shutdown cooling heat exchangers will result in a CS flow delivery that is different than that utilized prior to the proposed CS system modification.

2. Input Consideration

Containment Spray

A comparison of the CS flow delivery data used in the analyses prior to the CS system modification and that resulting from the CS system modification is provided above in Table 1 of the Supplemental Information for EPU LAR Section 2.6.1, "Primary Containment Functional Design." A comparison of the CS flow analysis parameters for the Main Steam Line Break (MSLB) is presented above in Table 2 of the Supplemental Information for EPU LAR Section 2.6.1, "Primary Containment Functional Design."

Containment Passive Heat Sink

The MSLB analysis performed for the EPU prior to the CS system modification did not consider the containment vessel liner as a heat sink. However, for the MSLB analysis with the modified CS flow delivery, the containment vessel liner passive heat sink was considered as described above in the Supplemental Information for EPU LAR Section 2.6.1, "Primary Containment Functional Design." This consideration is added as an assumption to EPU LAR Attachment 5, Section 2.6.3.2.2.2.

3. Summary of Results

The MSLB mass and energy release analysis was revised to address the modified CS flow delivery. In addition, the revised MSLB containment mass and energy release analysis considered the containment vessel liner as a heat sink. The revised analysis results were evaluated against the previous EPU evaluation.

MSLB Results

Table 5 provides the comparison of the mass and energy releases generated for the EPU and that with CS system modification. The data in the columns of Table 5 labeled "EPU + CS Mod" supersedes that in the columns labeled "EPU" in EPU LAR Attachment 5, Table 2.6.3.2-1. As seen from Table 5, there are no significant changes in the MSLB mass and energy releases. Table 6 provides the comparison of the various milestones during the MSLB event. The data in the column of Table 6 labeled "EPU + CS Mod" supersedes the data in the column labeled "EPU" in EPU LAR Attachment 5, Table 2.6.3.2-2. As seen from Table 6, differences of interest are the times at which the peak pressure and temperature occur. The peak pressure for the revised analysis occurs at 86.99 seconds, approximately 2.5 seconds earlier than the EPU analysis time of 89.5 seconds. Also, the peak temperature for the revised analysis occurs at 59.3 seconds, approximately 0.9 seconds earlier than the EPU analysis time of 60.23 seconds. As documented above in the Supplemental Information for EPU LAR Section 2.6.1, the peak pressure and temperature are lower because of greater heat removal from the containment atmosphere by the containment vessel liner heat sink and, therefore, are expected to occur earlier. The difference in time of the initiation of the auxiliary feedwater (AFW) flow to the intact steam generator (SG) is inconsequential since the transient is nearly over.

There are no acceptance criteria for the MSLB containment mass and energy release analysis.

Table 5
Blowdown M&E Release Rates to Containment for the Limiting Main Steam Line Break

Time (Sec)	EPU Mass Rate (lbm/sec)	EPU + CS Mod Mass Rate (lbm/sec)	EPU Energy Rate (BTU/sec)	EPU + CS Mod Energy Rate (BTU/sec)
0	6811	6810	8.15E+06	8.15E+06
1	6056	6056	7.26E+06	7.26E+06
2	5499	5499	6.61E+06	6.61E+06
3	5094	5094	6.13E+06	6.13E+06
4	4782	4782	5.75E+06	5.75E+06
5	4543	4543	5.47E+06	5.47E+06
6	4360	4360	5.25E+06	5.25E+06
7	4218	4218	5.08E+06	5.08E+06
8	4107	4107	4.95E+06	4.95E+06
9	4007	4007	4.83E+06	4.83E+06
10	3908	3908	4.71E+06	4.71E+06
11	3806	3806	4.59E+06	4.58E+06
12	3703	3703	4.46E+06	4.46E+06
13	3606	3606	4.34E+06	4.34E+06
14	3519	3519	4.24E+06	4.24E+06
15	3444	3444	4.15E+06	4.15E+06
16	3380	3380	4.07E+06	4.07E+06
17	3321	3321	4.00E+06	4.00E+06
18	3265	3265	3.93E+06	3.93E+06
19	3208	3208	3.86E+06	3.86E+06
20	3152	3152	3.80E+06	3.80E+06
30	2707	2707	3.26E+06	3.26E+06
40	2394	2394	2.88E+06	2.88E+06
50	2152	2152	2.59E+06	2.59E+06
60	1920	1920	2.30E+06	2.30E+06
70	1712	1712	2.05E+06	2.05E+06
80	1531	1531	1.83E+06	1.83E+06
90	1205	1205	1.45E+06	1.44E+06
100	418	436	492672	513711
110	145	146	170454	171477
120	174	136	207730	164581
125	3.584	3.498	4514	4408
150	1.589	2.102	2013	2664
200	1.091	1.452	1390	1851
250	0.794	1.099	1014	1406
300	0.628	0.803	804	1029
INTEGRAL	241536 (lbm)	241665 (lbm)	2.90E+08 (BTU)	2.90E+08 (BTU)

Table 6
Sequence of Events for Limiting Main Steam Line Break Inside Containment

Event	EPU (Sec)	EPU + CS Mod (Sec)
Break occurs	0.00	0.00
Reactor trip analytical setpoint reached, Containment High Pressure	2.43	2.43
AFW isolation to the affected SG (high SG ΔP) analytical setpoint reached	10.78	10.78
Control Element Assemblies (CEAs) begin entering core	3.83	3.83
SIAS analytical setpoint reached, Containment High Pressure	3.73	3.73
Turbine Stop Valves closed	4.09	4.09
Main Steam Isolation Signal (MSIS) analytical setpoint reached, SG Low Pressure	5.21	5.21
Containment Spray Actuation Signal (CSAS) analytical setpoint reached, Containment High-High Pressure	8.30	8.30
Main Steam Isolation Valve (MSIV) Closure	12.11	12.11
Main Feedwater Isolation Valves closed	23.73	23.73
Containment peak temperature occurs	60.23	59.30
Containment Sprays on	61.0 (full)	61.0 (partial) 76.0 (full)
Containment peak pressure occurs	89.50	86.99
AFW to Intact SG initiated	237.00	251.00
End of simulation of the transient	300.00	300.00

Supplemental Information for EPU LAR Attachment 5 Section 2.8.5.6.3.5 "Technical Evaluation – Post-LOCA Boric Acid Precipitation"

1. Summary of Change

To address an existing plant condition, FPL plans to install a restriction orifice in each of the containment spray pump discharge lines upstream of the shutdown cooling heat exchangers. These restriction orifices will limit the containment spray (CS) flow such that minimum flow and brake horsepower (BHP) requirements are met with minimum pump performance and maximum flow and BHP requirements are met with maximum pump performance. This modification results in a minimum CS flow delivery that is different than that utilized in Extended Power Uprate (EPU) analyses.

2. Input Consideration

Containment Spray

A comparison of the CS flow delivery data used in the Emergency Core Cooling System (ECCS) boric acid precipitation analysis prior to the CS system modification and that resulting from the CS system modification is provided below.

Input Parameter	Previous Value (EPU)	New Value (EPU plus CS Mod)
Containment Spray Pump Flow (gpm per pump)	2750	2550

3. Summary of Results

The ECCS boric acid precipitation analysis was revised to address the modified CS flow delivery. The revised analysis results were evaluated against the previous EPU evaluation.

Boric Acid Precipitation Results

The boric acid precipitation analysis was revised to address the revised input conditions documented above and the revised results were evaluated against the previous EPU evaluations. The reanalysis only saw a change in the results of one case, which was the case with 250 gpm of hot side injection initiated at 6.0 hours post-LOCA. The time for maximum boric acid concentration for this case decreased by 0.1 hours, from 7.4 to 7.3 hours. The maximum boric acid concentration continues to be 26.6 wt%, which is less than the solubility limit of 27.6 wt%. Therefore, the proposed EPU remains acceptable with the revised EPU boric acid precipitation analysis.

4. EPU LAR Changes

Based on the above changes due to the updated CS flow rate, the following changes are made to EPU LAR Attachment 5, Section 2.8.5.6.3.5. Entries are updated in EPU LAR Attachment 5, Tables 2.8.5.6.3-10 and 2.8.5.6.3-11, and EPU LAR Attachment 5, Figures 2.8.5.6.3-14 and 2.8.5.6.3-15 are replaced. These changes and updates are shown in the Tables and Figures below. Note that the tables are not reproduced in their entirety; only the information that is updated is shown below.

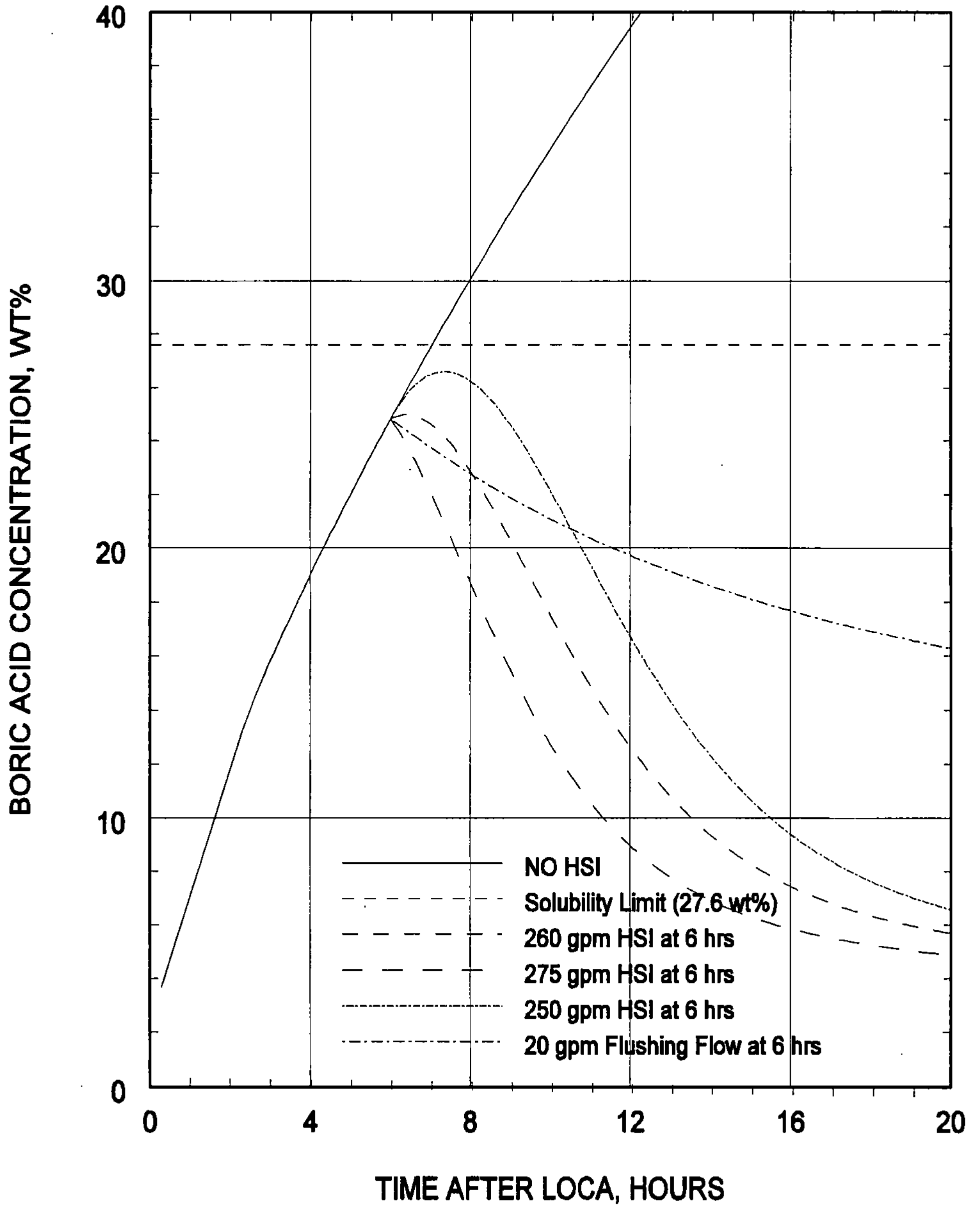
EPU LAR Table 2.8.5.6.3-10
PLANT DESIGN DATA
USED IN THE BORIC ACID PRECIPITATION ANALYSIS

Pump parameters	
Minimum containment spray pump flow rate	2550 gpm

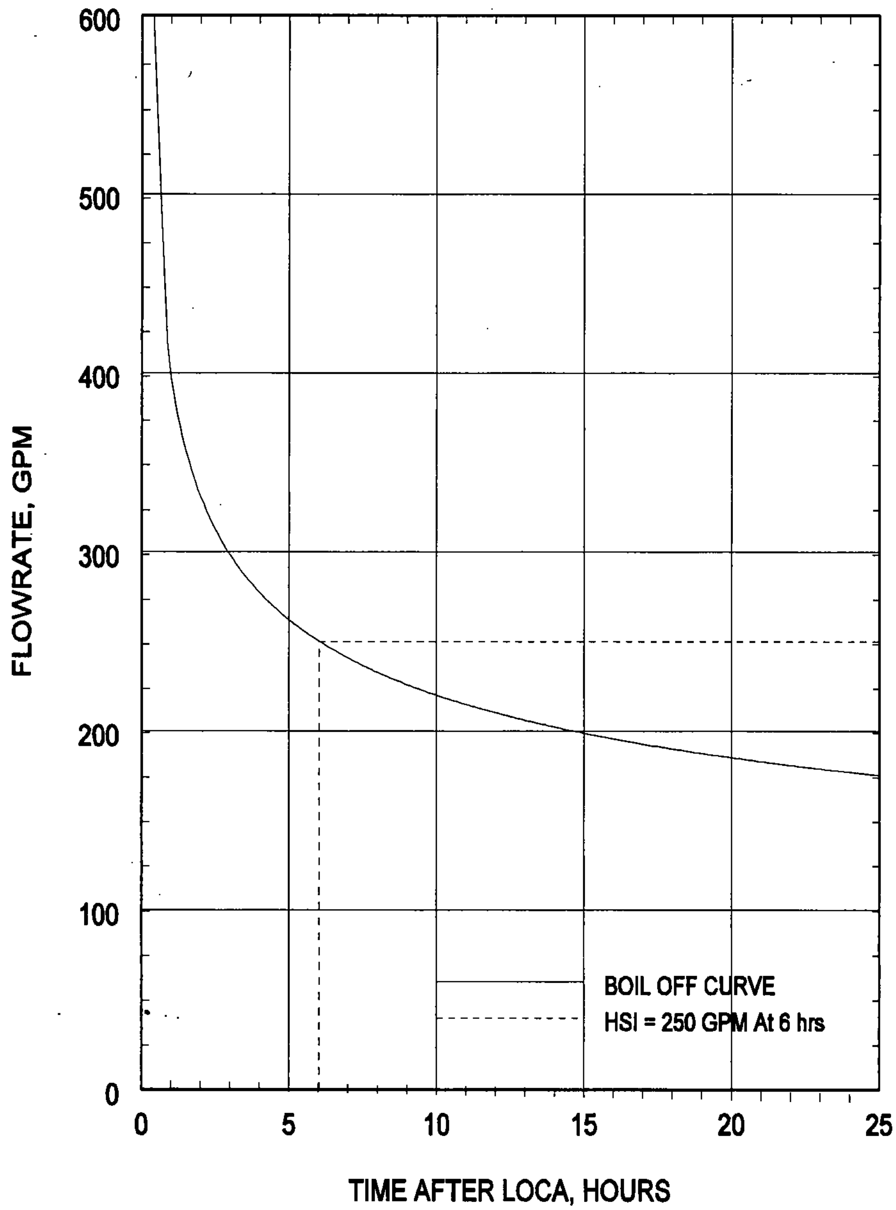
EPU LAR Table 2.8.5.6.3-11
SUMMARY OF RESULTS
FOR THE BORIC ACID PRECIPITATION ANALYSIS

EPU Analysis	
CENPD-254-P-A Methodology Modified by the Waterford Approach	
Parameter	EPU Result
Maximum core boric acid concentration with 250 gpm of simultaneous hot and cold side injection started at 6 hours	26.6 wt% at 7.3 hours post-LOCA

EPU LAR Figure 2.8.5.6.3-14
Boric Acid Concentration in the Core versus Time



EPU LAR Figure 2.8.5.6.3-15
Core Boil-off and Simultaneous Hot/Cold Leg Injection versus Time



Additional Sections of Attachment 5 of the EPU LAR with Revised Analyses

2.1.7 Protective Coating Systems (Paints) – Organic Materials

Protective coating systems (paints) provide a means for protecting the surfaces of facilities and equipment from corrosion and from contamination by radionuclides and also provide wear protection during plant operation and maintenance activities. Table 2.1.7-1 of EPU LAR Attachment 5 provides a comparison of the EPU containment LOCA parameters versus the Service Level 1 coating design basis accident (DBA) test conditions. The St. Lucie Unit 1 containment coatings minimum qualifying DBA test temperature is 286 °F (0 to 2.8 hours) and 219 °F (2.8 to 23.9 hours). The minimum qualifying DBA test pressure is 54 psig. As can be seen from Figures 1 through 4 above, these DBA test conditions bound the revised LOCA containment temperatures and pressures. An assessment of the post-LOCA containment radiation dose concludes that the reduced containment spray flow modification does not impact the integrated EPU dose of 2.25 x 10^7 Rads presented in EPU LAR Attachment 5, Table 2.1.7-1. The effects of reduced containment spray and sump pH changed were analyzed to determine an impact to the qualification of the containment coatings. The results of the reanalysis conclude that the minimum containment sump pH will remain at approximately 7. In conclusion, the containment coatings system parameters remain within the acceptance criteria for EPU when considering reduced CS system flow.

2.6.5 Containment Heat Removal

Section 2.6.5 of EPU LAR Attachment 5 evaluated the effects of the proposed EPU on the analyses of available net positive suction head (NPSH) to the containment heat removal system pumps. Analyses at EPU conditions showed that the available NPSH exceeds the NPSH required with adequate margin in both the injection and the recirculation phases of a LOCA for the CS, high pressure safety injection and low pressure safety injection pumps. The existing NPSH analysis demonstrates sufficient margin to meet the NRC requirement of 21%. A lower CS pump flow rate will increase NPSH available and reduce NPSH required. In addition, an assessment of the post-LOCA containment sump level has been performed assuming a reduction in CS pump flow. The results of the assessment conclude that the containment sump level results presented in the EPU LAR are unchanged. Therefore, the EPU LAR pump NPSH results bound the NPSH conditions that will exist after the CS system modification is implemented.

2.9.2 Radiological Consequences Analyses Using Alternative Source Terms (AST)

The results of the EPU LAR radiological analyses using the AST methodology were originally presented in Section 2.9.2 of Attachment 5 to the EPU LAR. These EPU radiological analyses were revised to include updated site meteorological data and associated revised atmospheric dispersion factors (X/Q's). The results of the revised radiological consequences analyses were submitted to NRC via FPL letter L-2011-360 [Reference 2] and the analyses included consideration of reduced CS system flow. The radiological analysis results meet all applicable EPU regulatory acceptance criteria.

Other Sections of Attachment 5 of the EPU LAR Assessed for Impact

2.3.1 Environmental Qualification of Electrical Equipment

The impact of reduced CS system flow on the containment response for the LOCA and MSLB events is presented above in the Supplemental Information for EPU LAR Section 2.6.1 "Primary Containment Functional Design." As shown in Table 3-A, the peak containment pressure and temperature for the limiting LOCA DEHLS and DEDLS cases are unchanged as a result of reduced CS flow. Although the Table 3-B results for long-term post-LOCA containment response show a slight increase in containment pressure and temperature 24 hours into the event for the "EPU + CS Mod" case, these results are still bounded by the equipment Environmental Qualification (EQ) curve. Tables 4-A and 4-B show that the peak pressure and temperature results of the revised MSLB analysis with consideration of reduced CS system flow are below the peak values presented in EPU LAR Attachment 5. It is therefore concluded that the revised containment pressure and temperature response for EPU considering reduced CS system flow remain bounded by the existing EQ curves and no additional analysis is required.

In addition to the above, the following EQ evaluations were performed for the EPU taking into account a reduction in CS system flow rate:

a) An assessment was performed to determine the validity of the EPU EQ radiation zone maps. The results of this evaluation demonstrate that the 1 day, 30 day, and 1 year integrated EPU dose estimates in each of the St. Lucie Unit 1 EQ radiation zones were not impacted by the reduction in CS flow rate.

b) An assessment was performed that determines the revised integrated dose for specific HVAC components listed in EPU LAR Attachment 5 Table 2.3.1-1 assuming reduced CS system flow. The results of the evaluation conclude that the estimated shielding requirements remain unchanged. In addition, components considered to be in a mild environment post-EPU are not impacted by the reduction in CS flow rate.

c) The containment flood level analysis addresses the maximum flood level for EQ of equipment located within containment. The maximum flood level calculation does not consider the CS pump flow rate in determining the flood level; therefore, analysis results prior to the proposed CS system modification are unchanged.

2.5.4.3 Reactor Auxiliary Cooling Water Systems

The proposed CS system modification (addition of flow restricting orifices) results in a decrease in CS flow during both the injection and recirculation phases of a Loss of Coolant Accident (LOCA). This CS flow reduction will increase the time to recirculation actuation signal (RAS) since the CS pumps will be drawing less volume from the refueling water tank (RWT). This increased time to RAS will decrease the heat load on the shutdown cooling heat exchanger (SDCHx) when the pump suction is switched to the sump since the temperature of the water in the sump will decrease over time. The SDCHx is cooled by the component cooling water (CCW) system; therefore, a decrease in the SDCHx heat load will decrease the CCW system temperatures as well. The CCW temperatures reported in EPU LAR Attachment 5 remain bounding due to the reduction in CS flow rate.

2.7.2 <u>Engineered Safety Feature Atmosphere Cleanup</u>

The shield building ventilation system is part of the Engineered Safety Feature Atmosphere Cleanup systems and is designed to limit the pressure rise and establish and maintain a slight negative pressure in the shield building annulus following a LOCA. An assessment was performed to determine the increase in the pressure in the shield building annulus relative to a reduction in CS flow rate. The results of the assessment conclude that the pre-CS system modification analysis results presented in EPU LAR Attachment 5 are unchanged.

2.7.6 <u>Engineered Safety Feature Ventilation System</u>

The emergency core cooling system (ECCS) area ventilation system is part of the Engineered Safety Features (ESF) ventilation systems. The ECCS area ventilation system is designed to provide post-LOCA filtration and adsorption of fission products in the exhaust air from areas of the reactor auxiliary building (RAB). An assessment was performed to determine the post-LOCA temperatures in the various ECCS areas of the RAB relative to a reduction in CS flow rate. The results of the assessment conclude that the pre-CS system modification analysis results presented in EPU LAR Attachment 5 are unchanged.

2.10.1 <u>Occupational and Public Radiation Doses</u>

Section 2.10.1 of Attachment 5 to the EPU LAR includes the analysis that determines the post-accident dose to operators for specified vital missions. The result of the analysis for the EPU concludes that the limiting calculated dose to an operator performing a vital task is in compliance with the regulatory limit of 5 rem whole body. An assessment has been performed on the vital operator mission dose with consideration for reduced CS system flow. The results of the assessment conclude that vital mission dose for EPU is unchanged.

References

1. R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2010-259), "License Amendment Request for Extended Power Uprate," November 22, 2010, Accession No. ML103560419.

2. R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2011-360), "Response to NRC Accident Dose Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request," September 2, 2011, Accession No. ML11251A159.