MAY 06 2016

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U. S. Nuclear Regulatory Commission
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Subject: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
RAI Reply - License Amendment Request
Containment Vacuum GOTHIC Analyses and Conforming Changes

References:

1. FPL letter L-2015-255 dated October 15, 2015, "License Amendment Request Containment Vacuum GOTHIC Analyses and Conforming Changes." Accession No. ML15301A765

2. NRR E-mail Capture dated March 17, 2016, "Request for Additional Information - St Lucie Vacuum Gothic LAR - MF6980/MF6981." Accession No. ML16077A106

In Reference 1 Florida Power & Light Company (FPL) submitted proposed amendments for both St. Lucie units that would revise the containment vacuum analyses using the GOTHIC computer code and other conforming Technical Specification (TS) changes. In Reference 2, the NRC requested additional information (RAI) to complete the review of the proposed amendments.

The attachment to this letter provides FPL's reply to the RAIs. The original no significant hazards evaluation in Reference 1 bounds these RAI responses.

If you should have any questions, please contact Mr. Ken Frehafer at (772) 467-7748.

I declare under penalty of perjury that the foregoing is true and correct. MAY 06 2016

Sincerely,

Christopher R. Costanzo

Christopher R. Costanzo
Site Vice President
St. Lucie Plant

Attachment

cc: NRC Region II Administrator
St. Lucie Plant NRC Senior Resident Inspector
Ms. Cynthia Becker, Florida Department of Health

A001
NRR

Request for Additional Information MF6980/1-SCVB-01 through 08 Responses

RAI-MF6980/1-SCVB-01
How will the higher Containment Spray (CS) flow rates be incorporated? Will these CS flow rates be updated in the Updated Final Safety Analysis Reports (UFSARs)? Does the increase in flow rate impact any additional analyses?

Response:

Based on current system calculations which considered the installation of restricting orifices in the containment spray piping for the extended power uprate, a total spray flow of 6950 GPM for Unit 1 and 7250 GPM for Unit 2 was selected for the vacuum analysis. These flows bound the calculated maximum flows for this event and will be conservative for the vacuum analysis. These flows will be included in the UFSAR in the discussion of the vacuum analysis in the same manner that flows used for the existing vacuum analysis are described. With respect to other accident and capability analyses, the UFSAR reflects conservative CS pump flow rates with respect to the conditions evaluated (e.g., maximized flowrates for NPSH analyses, etc., Unit 1 Table 6.2-9A and Unit 2 Table 6.2-42).

RAI-MF6980/1-SCVB-02
Explain further the conclusion that for Unit 1 the GOTHIC benchmarking results appear more reasonable and conservative than the UFSAR's results.

Response:

As shown in the table below, the maximum values of DP(Annulus-Cont.) and DP(Atm.-Annulus) predicted by GOTHIC are in good agreement (i.e. less than ± 6%) with the UFSAR values except the maximum value of DP (Annulus-Cont.) for Case A (i.e.~ 49%).

Case	Cont. RH	Max DP(Annulus-Cont.) (psid)		Max DP(Atm. -Annulus) (psid)	
		UFSAR	GOTHIC	UFSAR	GOTHIC
A	0 %	0.66	0.986	1.17	1.10
B	40 %	0.60	0.584	1.46	1.55
C	100 %	0.27	0.285	2.25	2.33

The comparison of UFSAR Figure 6.2-56 and the chart of GOTHIC results below shows some deviation in the trend of differential pressure transient from the annulus to the containment for Case A. Considering that the lower initial containment relative humidity condition should lead to a faster and steeper depressurization in the containment, it can be concluded that GOTHIC prediction seems more reasonable and conservative. Note that the overlapping of the two differential pressure curves of Cases A and B up to approximately 30 seconds as shown in UFSAR Figure 6.2-56 seems less realistic than the GOTHIC results.

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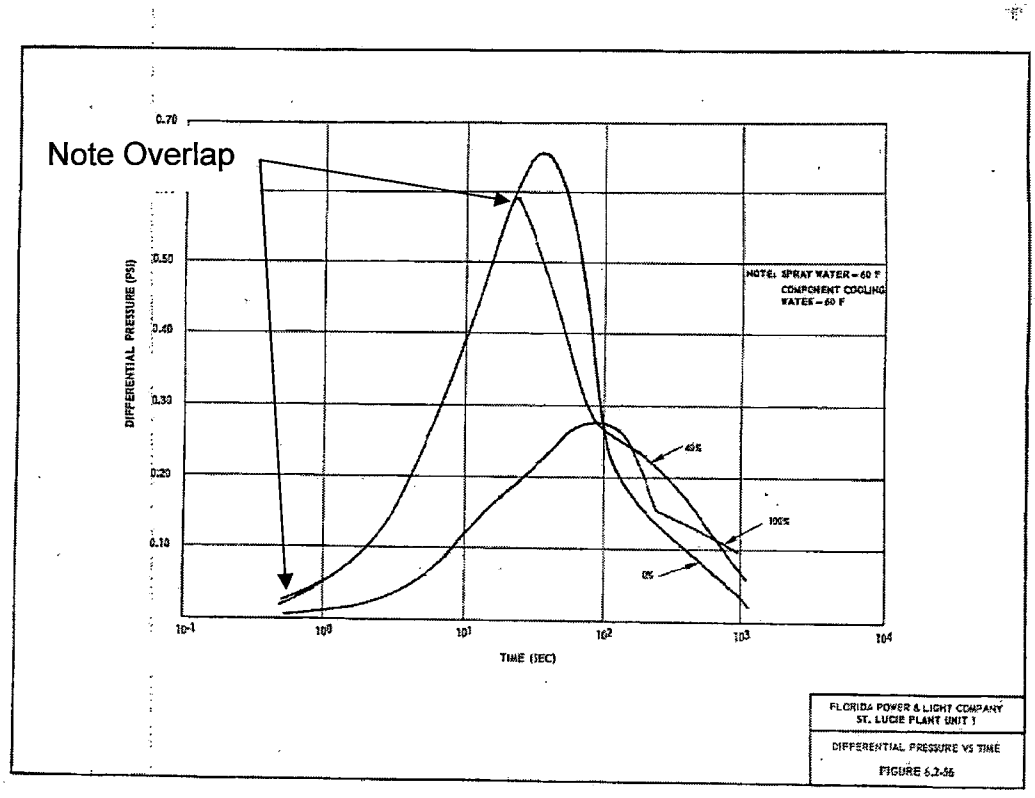
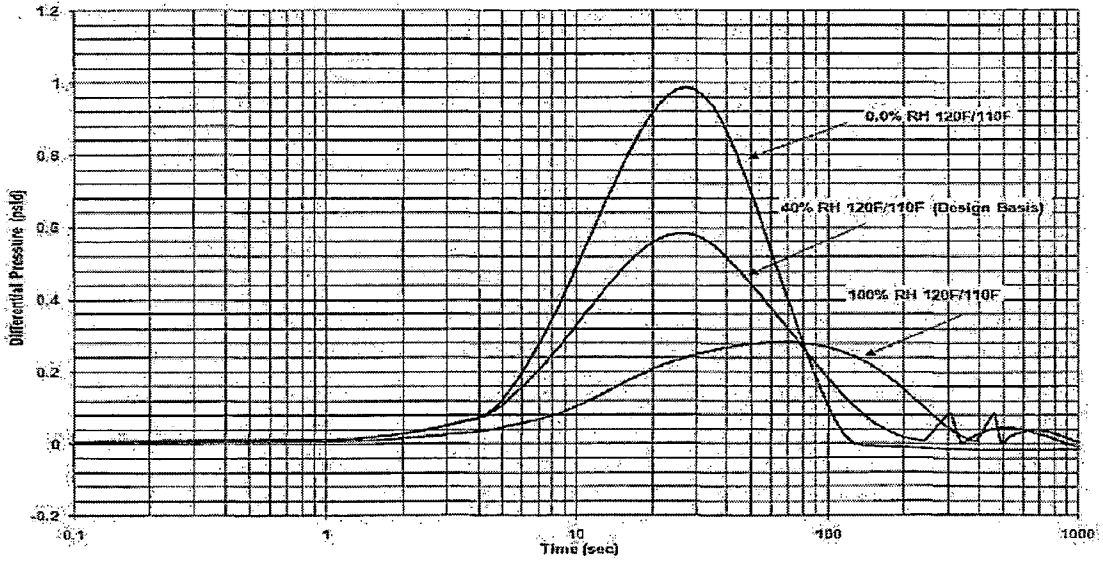


UFSAR FIGURE 6.2-56



GOTHIC BENCHMARK

Request for Additional Information MF6980/1-SCVB-01 through 08 Responses

RAI-MF6980/1-SCVB-03
For Unit 1, the maximum allowable initial differential pressure between the containment and annulus is -0.49 psid. What is the analytical limit used for the updated analyses? What is the margin between the TS and analytical limit?

Response:

The analytical limit is the revised containment external design pressure of -1.04 PSID. The analysis determined the proposed TS value of -0.49 PSID initial differential pressure between the containment and annulus combined with the butterfly valve opening setting of less than or equal to negative 16 inches of water gauge will assure the differential pressure between the containment and the annulus will not exceed -1.00 PSID during the analyzed event. The TS does not compare directly with the analytical limit; however, the margin between the revised containment design external pressure and maximum differential pressure from the analysis is 0.04 PSID or 4%.

RAI-MF6980/1-SCVB-04
For St. Lucie Unit 2, the maximum allowable initial differential pressure between the containment and annulus is -0.42 psid. What is the analytical limit used for the updated analyses? What is the margin between the TS and analytical limit?

Response:

The analytical limit is the revised containment external design pressure of -1.05 PSID. The analysis determined the proposed TS value of -0.42 PSID initial differential pressure between the containment and annulus combined with the butterfly valve opening setting of less than or equal to negative 14 inches of water gauge will assure the differential pressure between the containment and the annulus will not exceed -1.00 PSID during the analyzed event. The TS does not compare directly with the analytical limit; however, the margin between the revised containment design external pressure and maximum differential pressure from the analysis is 0.05 PSID or 5%.

RAI-MF6980/1-SCVB-05
In the St. Lucie Unit 2 benchmarking of GOTHIC, what is the impact of modeling the butterfly valve to open instantaneously with no delay?

Response:

Opening the butterfly valve instantaneously with no delay would minimize containment external pressure differential as the butterfly valve will be fully open earlier to allow flow from the annulus to the containment to equalize the pressure. The results of this benchmarking case showed that the GOTHIC analysis provided a higher external differential pressure than the present UFSAR analysis. Had a time delay for opening the butterfly valve and time for the butterfly valve to stroke to the full open position been considered, the maximum external pressure differential would be even higher. Using the input that the butterfly valve would open instantaneously with no time delay provided a conservative comparison of the GOTHIC methodology to the current UFSAR methodology.

The input that the butterfly valve opened instantaneously with no time delay was only used for the benchmark case to compare the two methodologies. The updated analysis conservatively

considers a 1.15 sec time delay to start opening the butterfly and an additional 8 seconds to reach the full open position.

RAI-MF6980/1-SCVB-06
For both Unit 1 and Unit 2, the butterfly valve setpoints changed by a significant amount and the range was removed from the TSs. How was the valve verified to respond appropriately at these new setpoints? How will the removal of the range change the operation of the valve?

Response:

In accordance with the analysis, the butterfly valves must receive a signal to open when or before the differential pressure from the containment to the annulus reaches the values determined in order to assure the differential pressure between the annulus and containment will not exceed -1.00 PSID. If the butterfly valve opened at a lower differential pressure, the resulting containment differential pressure would be reduced. For this reason it does not seem necessary to specify a range. The AOV calculations have been reviewed. The torque requirements are mostly from the seating/unseating load and the packing load. The change in opening pressure will have limited impact on the required torque. The actuators currently have a large margin to the required torque. The AOV calculations will be revised to justify any change to the opening setting.

RAI-MF6980/1-SCVB-07
In Attachment 5 to Florida Power & Light (FPL) letter (L-2010-259) dated November 22, 2010 (ML103560419), for St Lucie Unit 1 extended power uprate, Table 2.6.6-1 specifies total maximum spray flow rate (for 2 pumps) equal to 9000 gpm.

For Unit 1, Section 3.2 of the October 15, 2015, LAR specifies a total of 6750 gpm as the current UFSAR spray flow rate and Section 3.3 specifies 6950 gpm as the proposed total spray flow rate. The licensee used 6750 gpm for GOTHIC benchmarking vacuum analysis and 6950 gpm for the proposed GOTHIC vacuum analysis. Since 9000 gpm is the maximum total containment spray flow rate, please explain why the proposed analysis is not based on this value.

Response:

Section 2.6.6 of Attachment 5 to Florida Power & Light (FPL) letter (L-2010-259) dated November 22, 2010 provides a containment backpressure analysis for assessing the ECCS performance capability. The following statements were made:

> Following a loss-of-coolant accident (LOCA), the emergency core cooling system (ECCS) will supply water to the reactor vessel to reflood, and thereby cool the reactor core. The core flooding rate will increase with increasing containment pressure. FPL reviewed analyses of the minimum containment pressure that could exist during the period of time until the core is reflooded to confirm the validity of the containment pressure used in ECCS performance capability studies.
>
> The initial conditions and boundary conditions are given in LR Table 2.6.6-1. The containment pressure transient applied is conservatively low and includes the effect of the operation of all pressure reducing systems and processes.
>
> LR Table 2.6.6-1 provides the general parameters used in the containment model for

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> RLBLOCA [Realistic Large Break Loss of Coolant Accident] analysis. Ongoing processes ensure that the values and ranges used in the ECCS containment backpressure analyses for RLBLOCA bound the values and ranges of the plant as-operated for those parameters.

Table 2.6.6.1 lists a containment spray flow rate of 9000 GPM for this analysis. 9000 GPM is higher than the current calculated containment spray flow. This flow represents a bounding and conservative value for this containment backpressure analysis; however, this flow was overly conservative for the vacuum analysis.

RAI-MF6980/1-SCVB-08

In Attachment 5 to Florida Power & Light letter (L-2011-21) dated February 25, 2010, for St Lucie Unit 2 extended power uprate, Table 2.6.6-1 specifies total maximum spray flow rate per pump 4,500 gpm (for 1 pumps) equal to 9000 gpm for 2 pumps.

For Unit 2, Section 3.2 of the October 15, 2015, LAR specifies total of 6900 gpm as the current UFSAR spray flow rate and Section 3.3 specifies 7250 gpm as the proposed total spray flow rate. The licensee used 6900 gpm for GOTHIC benchmarking vacuum analysis and 7250 gpm for the proposed GOTHIC vacuum analysis. Since 9000 gpm is the maximum total containment spray flow rate, please explain why the proposed analysis is not based on this value.

Response:

Based on our review, the referenced letter is L-2011-21 dated February 25, 2011 (ML 110730116). Section 2.6.6 of Attachment 5 to Florida Power & Light letter (L-2011-21) dated February 25, 2011 provides a containment backpressure analysis for assessing the ECCS performance capability. The following statements were made:

> Following a loss-of-coolant accident (LOCA), the emergency core cooling system (ECCS) will supply water to the reactor vessel to reflood, and thereby cool the reactor core. The core flooding rate will increase with increasing containment pressure. Florida Power and Light (FPL) reviewed the analyses of the minimum containment pressure that could exist during the period of time until the core is reflooded to confirm the validity of the containment pressure used in ECCS performance capability studies.
>
> LR Table 2.6.6-1 lists the containment initial and boundary conditions. The input parameters that were used in the minimum containment pressure calculation for ECCS performance analysis conservatively bound the as-operated configuration.

Table 2.6.6.1 lists a containment spray flow rate of 9000 GPM (4500 GPM per pump) for this analysis. 9000 GPM is higher than the current calculated containment spray flow. This flow represents a bounding and conservative value for this containment backpressure analysis; however, this flow was overly conservative for the vacuum analysis.