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Document Control Desk
U. S. Nuclear Regulatory Commission
Washington D. C. 20555-0001

ATTENTION: Chief, Information Management Branch
Division of Program Management
Policy Development and Analysis Staff

Subject: Duke Energy Corporation
Oconee Nuclear Station - Units 1, 2, and 3
Docket Nos. 50-269, 50-270, and 50-287

Revisions to Topical Report DPC-NE-3003 In Support of Steam Generator Replacement
Response to NRC Staff Request for Additional Information

Reference: Duke Submittal Dated June 13, 2002

Enclosed herein, please find the Duke Energy Corporation (Duke) response to question 13 of the May 12, 2003 NRC staff's request for additional information concerning topical report DPC-NE-3003, Revision 1, "Mass and Energy Release and Containment Response Methodology."

Attachment 1 to this letter constitutes Duke's response.

This completes Duke's response to all questions asked in the staff's May 12, 2003 request for additional information. If there are any questions or if additional information is needed on this matter, please call J. A. Effinger at (704) 382-8688.

Very truly yours,

K. S. Canady

Attachment

A001

xc: with attachment

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ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
QUESTION 13

Attachment 1

Duke Power Response To
Request For Additional Information - Question 13

DPC-NE-3003 Revision 1
"Mass and Energy Release and Containment Response Methodology"

13. Provide a temperature envelope curve for EQ purposes calculated with GOTHIC and with FATHOMS. Discuss the differences in EQ envelopes calculated with FATHOMS and GOTHIC due to the different models in the two codes, especially those models which affect moisture in the atmosphere.

Response: A comparison of the results of analyses of the long-term cold leg break LOCA containment response with GOTHIC and FATHOMS is shown in the following figures. This event is limiting for Oconee for the long-term EQ temperature. The containment vapor temperature, liquid temperature, and pressure trends are shown for the limiting break location.

Figure 13.1 shows the predicted containment vapor temperature trends for the GOTHIC and FATHOMS analyses, overlaid with the EQ envelope. It is noted that this is an updated version of the EQ envelope shown in Figure 6.3-4 of DPC-NE-3003. There is excellent agreement between the FATHOMS and GOTHIC analyses for the Reactor Building vapor temperature trend. The GOTHIC analysis shows a slightly higher vapor temperature, exceeding the FATHOMS result by about 3°F at ten hours into the event.

Figure 13.2 shows the comparison of the containment pressure results. There is good agreement between the GOTHIC and FATHOMS analyses. The FATHOMS results are slightly higher in the first few minutes of the transient, as noted in the response to Question 3. In the long term, the GOTHIC results are about 1 to 2 psi higher, with the analyses results converging to nearly the same pressure after several days into the transient.

Figure 13.3 shows the comparison of the containment liquid temperature results. The FATHOMS result is one sump temperature curve since the liquid and droplet phases are assumed to be at the same temperature. The GOTHIC results are for the sump liquid temperature, the droplet temperature, and the film temperature. The GOTHIC droplet and film temperatures are significantly higher than the sump liquid temperature for the first hour due to significant liquid phase break flow. The curves for these parameters stop at about 6000 seconds due to an insignificant mass for these two phases. The GOTHIC sump temperature trends closely with the FATHOMS sump temperature beginning at approximately 3000 seconds. This is consistent with nearly all of the liquid phase being in the sump at this point in time and beyond.

In Figure 13.4, a mass-weighted liquid temperature from the GOTHIC analysis is compared with the results from FATHOMS. The GOTHIC results are an average for the combined liquid and droplet phases to facilitate an equivalent comparison with the FATHOMS results, in which the liquid and droplet phases are at the same temperature. Early in the GOTHIC analysis, a much greater percentage of the liquid present in the containment is in a film on the building structures, or in the form of entrained droplets, relative to the FATHOMS analyses. In the FATHOMS results, the liquid reaches the containment floor in the continuous liquid phase earlier. The

FATHOMS liquid temperature is lower than GOTHIC for about the first 10 minutes of the analysis for this reason. At about 7 to 8 minutes into the transient, the amount of droplets present in the GOTHIC analysis decreases as the total mass flow rate from the break decreases. This causes the GOTHIC liquid temperature to drop and to trend in a similar manner as the FATHOMS liquid temperature for the remainder of the analysis. In the long term, the mass of entrained droplets in the GOTHIC analysis is actually less than in the FATHOMS analysis. The liquid temperature in both analyses is in excellent agreement well before the switchover to sump recirculation mode at 5466 seconds, with a difference of 1-2°F for the remainder of the transient.

Since the GOTHIC liquid temperature is slightly less than the FATHOMS liquid temperature during sump recirculation mode, there is slightly less energy being removed by the LPI coolers in the GOTHIC analysis than in the FATHOMS analysis. Over time this results in a higher containment pressure in GOTHIC since more energy is left in the vapor phase. Also, the break quality in the GOTHIC analysis, as calculated by the BFLOW results in the long-term mass and energy release model, will be slightly higher in the GOTHIC analysis due to higher pressure. This causes the containment vapor temperature in the GOTHIC analysis to be slightly higher than the FATHOMS results after several hours in the sump recirculation mode. As the decay heat level decreases, the cooler sump temperatures in GOTHIC allows the GOTHIC vapor temperature to decrease (due to cooler ECCS water and cooler spray flow) and approach the FATHOMS analysis results in the latter stage of the transient.

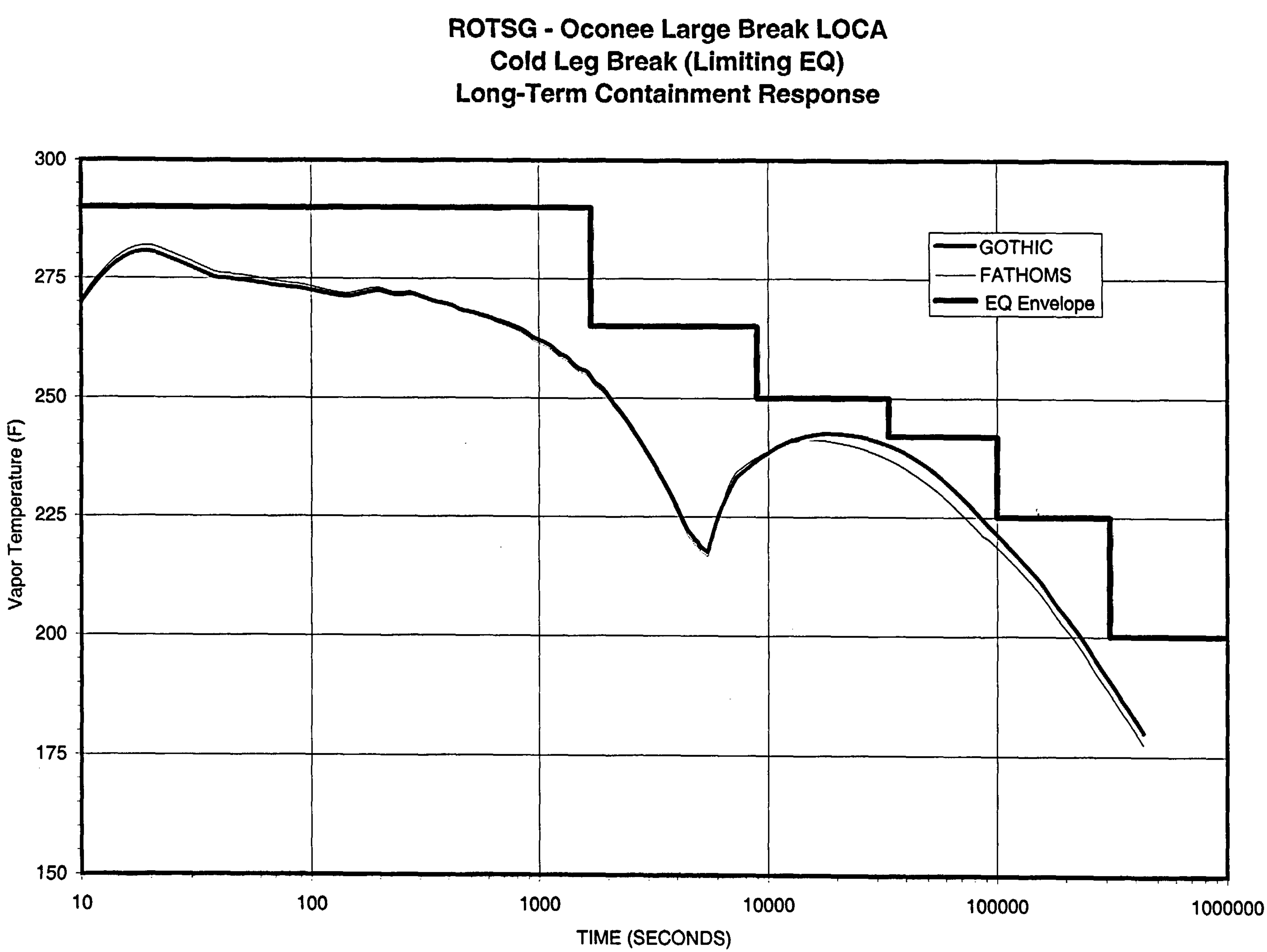

FIGURE 13.1
Reactor Building Temperature

ROTSG - Oconee Large Break LOCA
Cold Leg Break (Limiting EQ)
Long-Term Containment Response

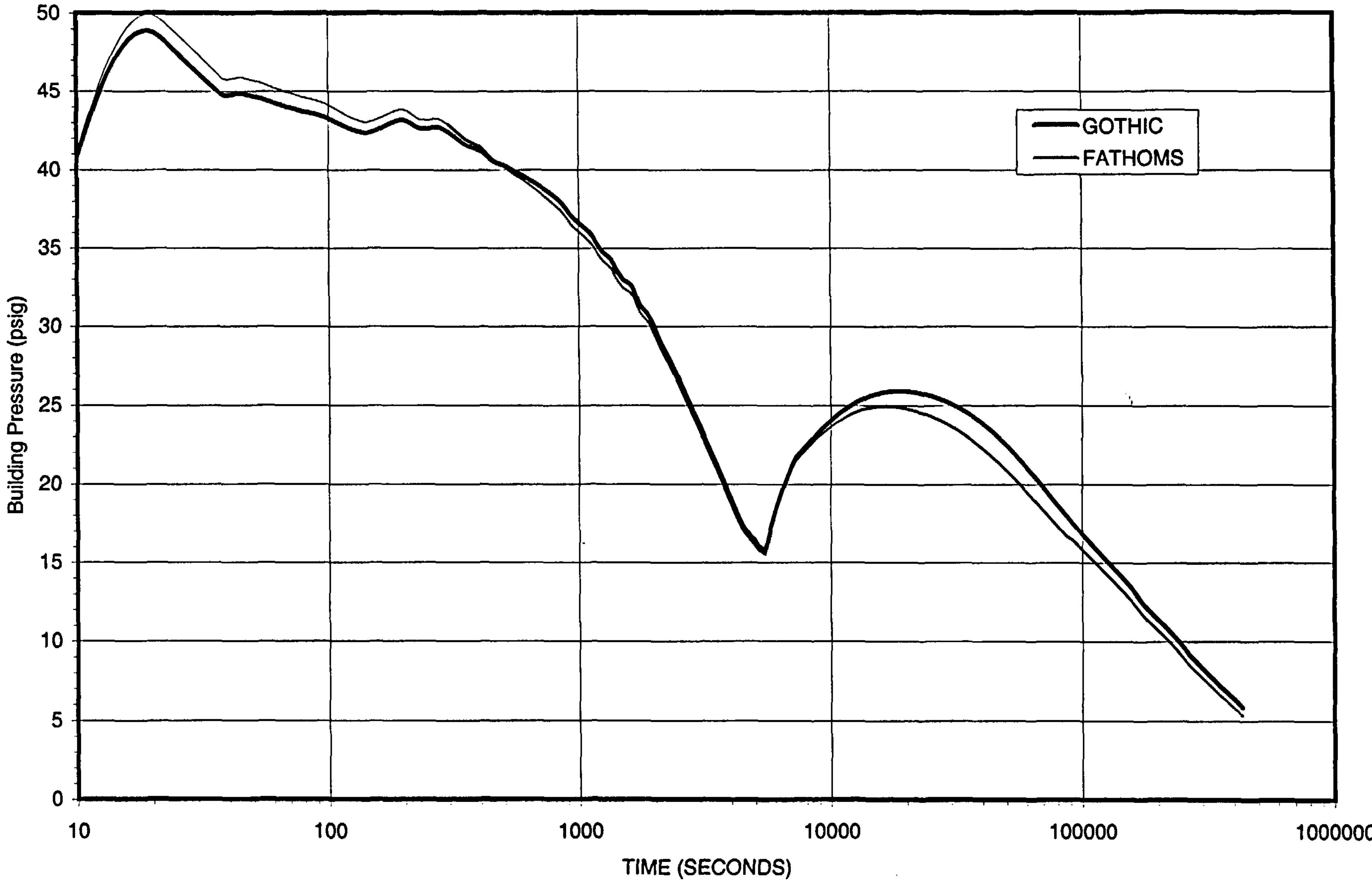

FIGURE 13.2
Reactor Building Pressure

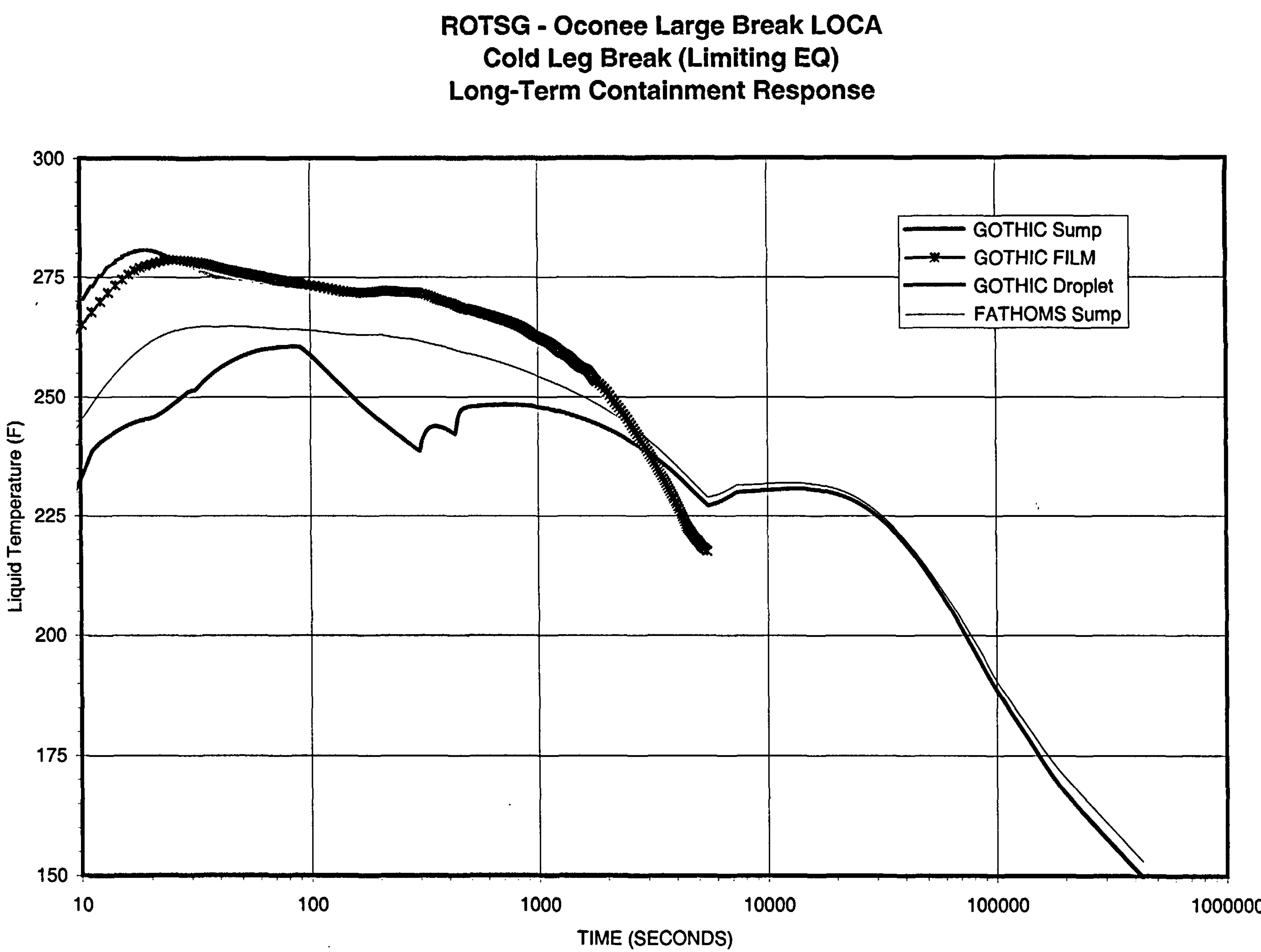

FIGURE 13.3
Reactor Building Liquid Temperature

ROTSG - Oconee Large Break LOCA
Cold Leg Break (Limiting EQ)
Long-Term Containment Response

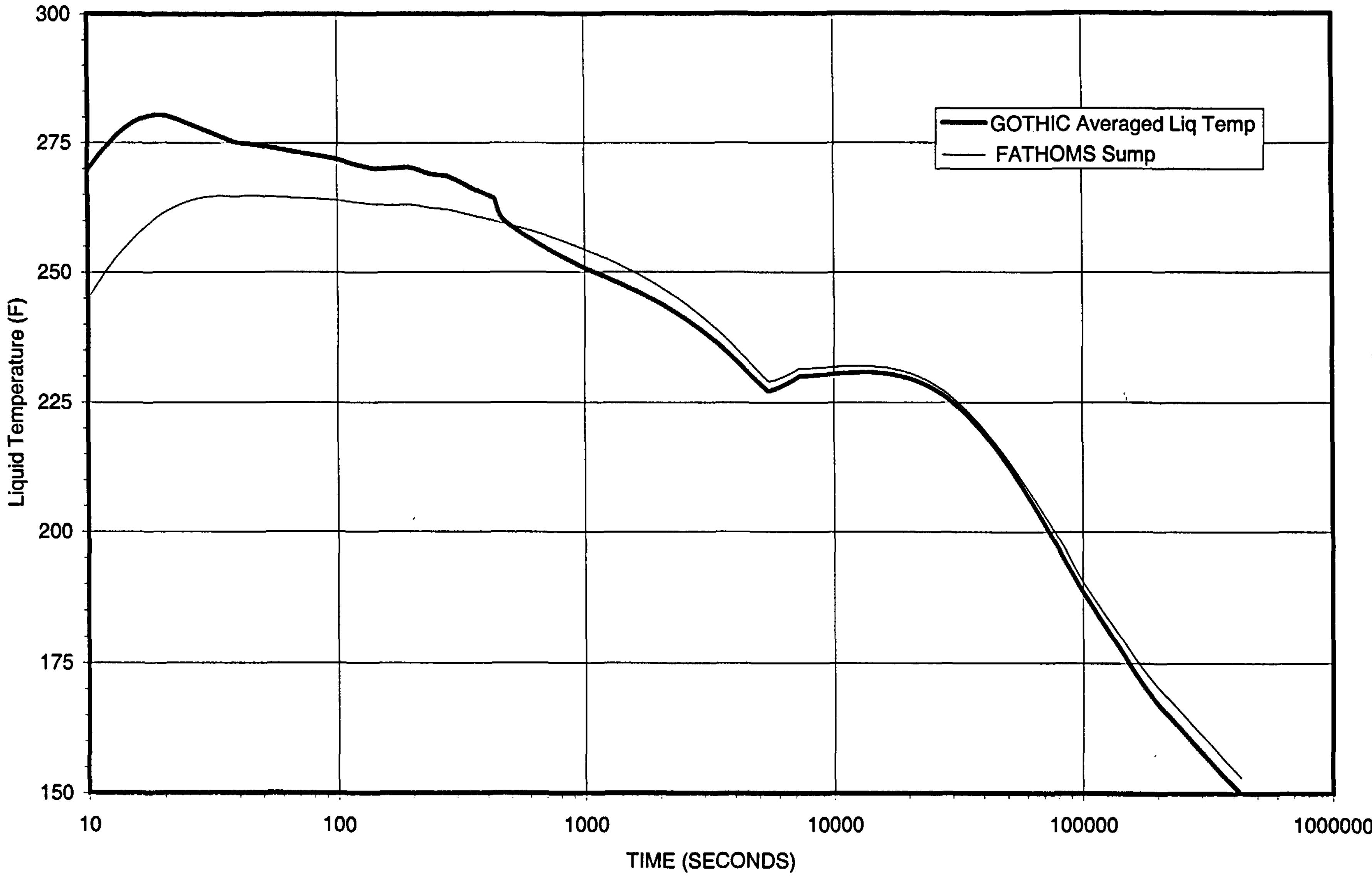

FIGURE 13.4
Reactor Building Liquid Temperature