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

November 3, 2011

L-2011-484
10 CFR 50.90

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

Re: St. Lucie Plant Unit 2
Docket No. 50-389
Renewed Facility Operating License No. NPF-16

Response to NRC Request for Additional Information (RAI) Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2011-021), "License Amendment Request for Extended Power Uprate," February 25, 2011, Accession No. ML110730116.
(2) Email from T. Orf (NRC) to C. Wasik (FPL), "St. Lucie 1 (and 2) EPU draft RAI -- Nuclear Performance and Code Branch (SNPB)," September 28, 2011.

By letter L-2011-021 dated February 25, 2011 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. NPF-16 and revise the St. Lucie Unit 2 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).

By email dated September 28, 2011, the NRC Project Manager requested additional information for the NRC staff in the Nuclear Performance and Code Branch (SNPB) to support their review of the EPU License Amendment Request (LAR). The request for additional information (RAI) identified one question for each St. Lucie unit. The response to this RAI for St. Lucie Unit 2 is provided in the attachment to this letter.

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

A002
NRR

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2011-021 [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 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

Very truly yours, 03 - November - 2011

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachment

cc: Mr. William Passetti, Florida Department of Health

Response to NRC Nuclear Performance and Code Branch Request for Additional Information

The following information is provided by Florida Power & Light in response to the U. S. Nuclear Regulatory Commission's (NRC) informal Request for Additional Information (RAI). This information was requested to support Extended Power Uprate (EPU) License Amendment Request (LAR) for St. Lucie Unit 2 that was submitted to the NRC by FPL via letter L-2011-021 dated February 25, 2011, Accession Number ML110730116.

In an email from the NRC Project Manager dated September 28, 2011, additional information was requested by the NRC staff in the Nuclear Performance and Code Review Branch (SNPB) to support their review of the St. Lucie Unit 2 EPU LAR. The draft RAI identified one question for St. Lucie Unit 2. The response to this RAI is provided below.

SNPB-16

Please provide the results of the seismic LOCA loads analysis for the limiting break. Identify the maximum hot channel deformation/flow area reduction, the maximum hot bundle flow area reduction, the peak linear heat rate for the hottest rod in the assembly undergoing maximum deformation. Also, provide the linear heat rate for the bundle containing the rod with the max deformation. The analysis should provide the plots typical of the limiting large break LOCA analysis given in a chapter 15 analysis.

Response

The seismic LOCA loads analysis confirms that 10CFR50.46 criteria related to peak cladding temperature and maximum cladding local oxidation criteria are satisfied for LOCA analysis of hot rods in peripheral fuel assemblies with maximum credible grid deformation, i.e., fully collapsed grids. The LOCA analysis is performed with the 1999 EM and conforms to guidelines for the evaluation of fuel assembly structural response to externally applied forces specified in NUREG 0800, SRP 4.2, Appendix A, Section IV, related to requirements from 10CFR50.46 ECCS Performance design basis criteria and use of maximum credible grid deformation. The maximum allowable LHR in peripheral distorted assemblies is determined to be 95% relative to the maximum LHR in the core.

LOCA results of the seismic LOCA loads analysis are provided in Table 1 and Figures 1-47.

The maximum hot channel deformation/flow area reduction is 25.3%.

The maximum hot bundle flow area reduction is 13.5%.

The peak linear heat rate for the hottest rod in the assembly undergoing deformation is 11.88 kw/ft.

The average linear heat rate for the bundle containing the rod with the maximum deformation is 7.39 kw/ft.

The variables listed in Table 2 are plotted as functions of time in Figures 1 through 9 for the 1.0 DEG/PD break, in Figures 10 through 18 for the 0.8 DEG/PD break, and in Figures 39 through 47 for the 0.4 DEG/PD break.

The variables listed in Tables 2 and 3 are plotted as functions of time for the 0.6 DEG/PD break, the limiting LBLOCA, in Figures 19 through 38.

ECCS Performance results for the seismic LOCA loads analysis demonstrate conformance to the applicable ECCS acceptance criteria as summarized below.

Parameter	Criterion	Results
Peak Cladding Temperature	≤2200 °F	2035°F
Maximum Cladding Oxidation	≤17%	10.39%
Coolable Geometry	Yes	Yes

Table 1

Large Break LOCA ECCS Performance Results for Limiting Seismic Loads Analysis

Break Size (DEG/PD)	Peak Cladding Temperature (°F)	Maximum Cladding Oxidation (%)
1.0	2009.9	9.50
0.8	2021.8	9.91
0.6	2034.7	10.39
0.4	1983.8	8.48

Table 2

Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis Variables Plotted as a Function of Time for Each Break

Variable
Core Power
Pressure in Center Hot Assembly Node
Break Flow Rate
Hot Assembly Flow Rate (below hot spot)
Hot Assembly Flow Rate (above hot spot)
Hot Assembly Quality
Containment Pressure
Mass Added to Core during Reflood
Peak Cladding Temperature (1)

(1) The cladding temperature at the elevation of cladding rupture is also shown for the limiting break

Table 3

Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis Additional Variables Plotted as a function of time for the Limiting Break

Variable
Mid Annulus Flow rate
Quality Above and Below the Core
Core Pressure Drop
Safety Injection Flow Rate into Intact Discharge Legs
Water Level in Downcomer During Reflood
Hot Spot Gap Conductance
Maximum Local Cladding Oxidation Percentage
Fuel Centerline, Fuel Average, Cladding, and Coolant Temperature at the Hot Spot
Hot Spot Heat Transfer Coefficient
Hot Rod Internal Gas Pressure
Core Bulk Channel Flow Rate

Figure-1
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Core Power

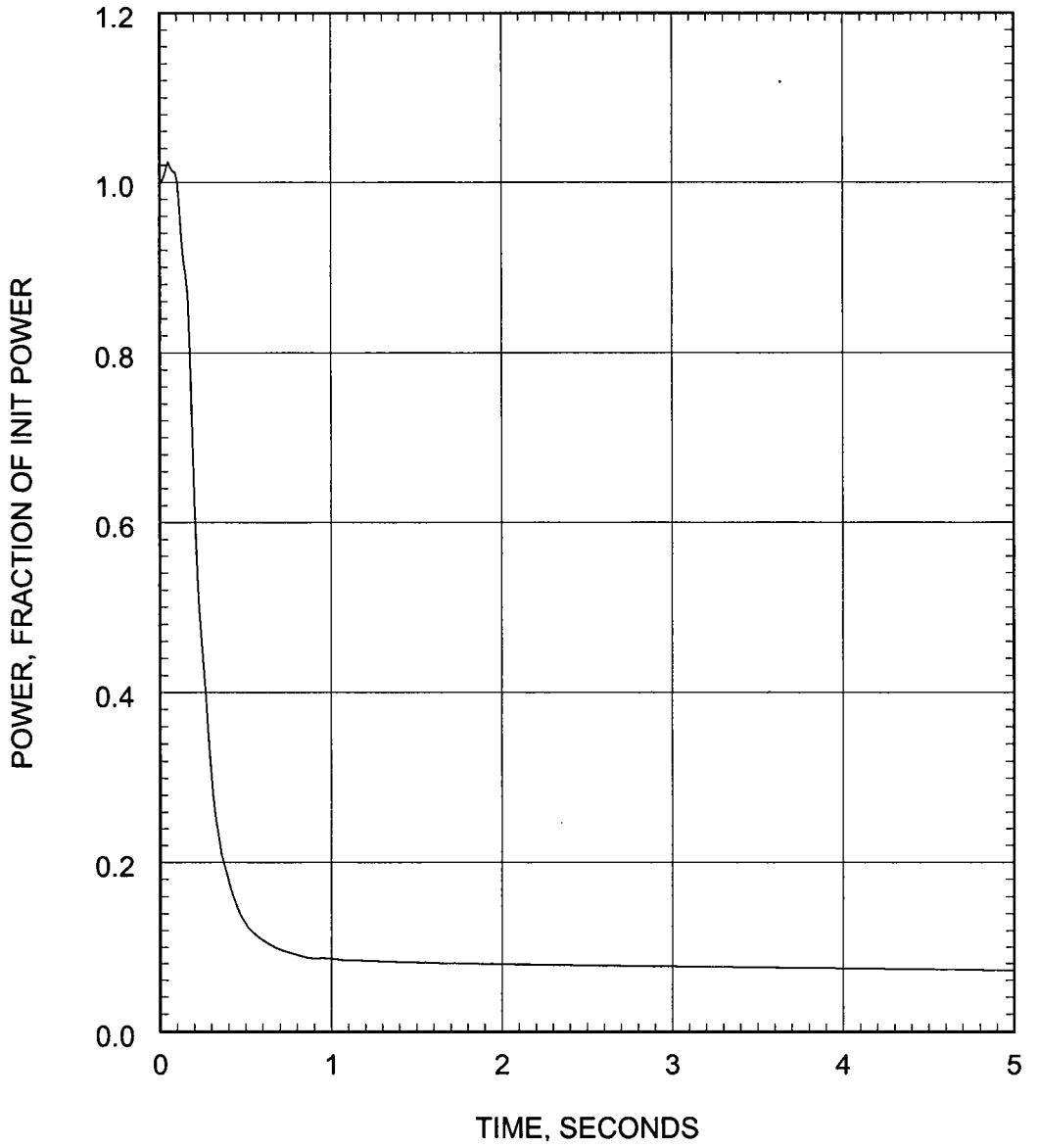

Figure-2
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Pressure in Center Hot Assembly Node

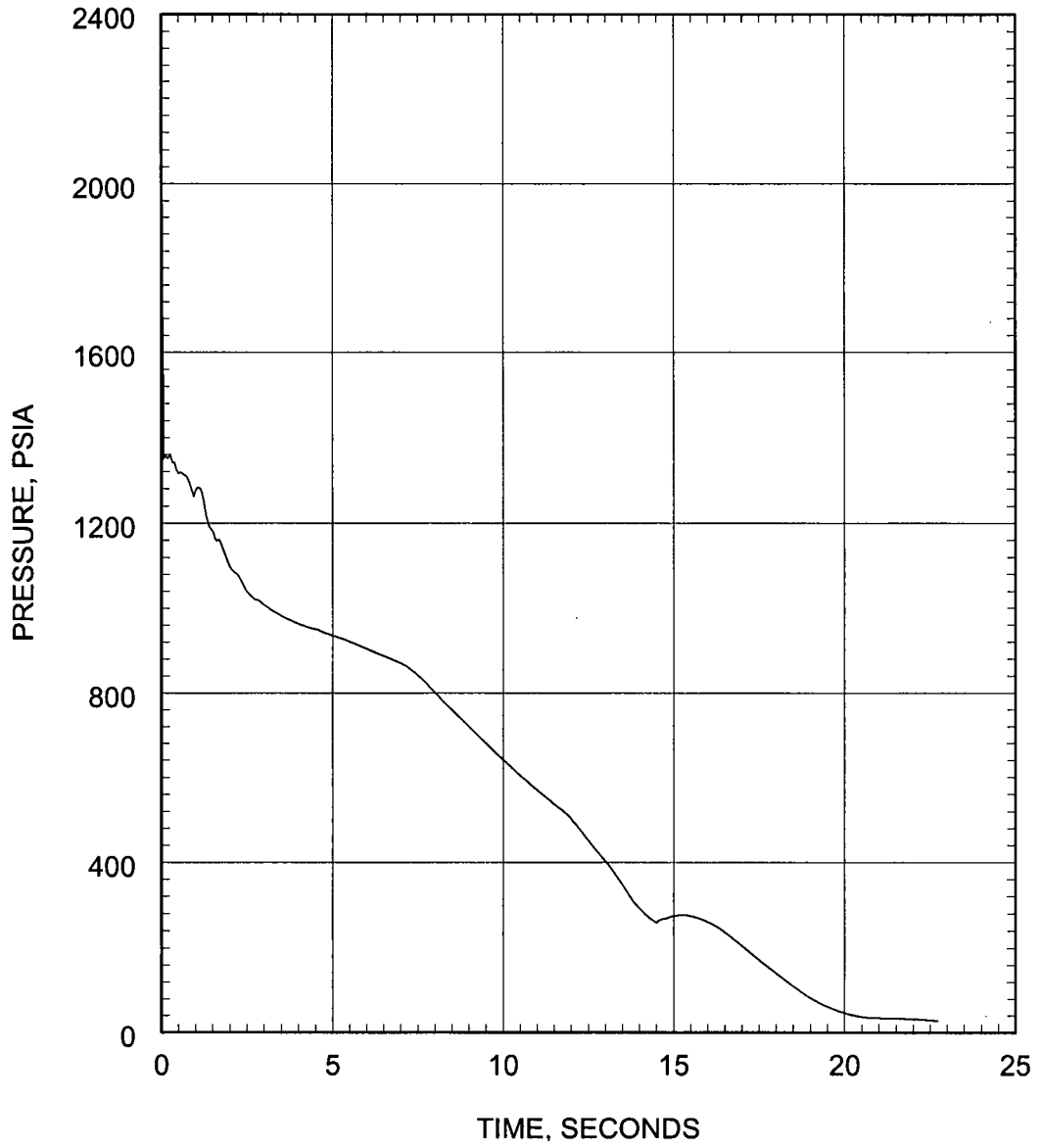

Figure-3
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Break Flow Rate

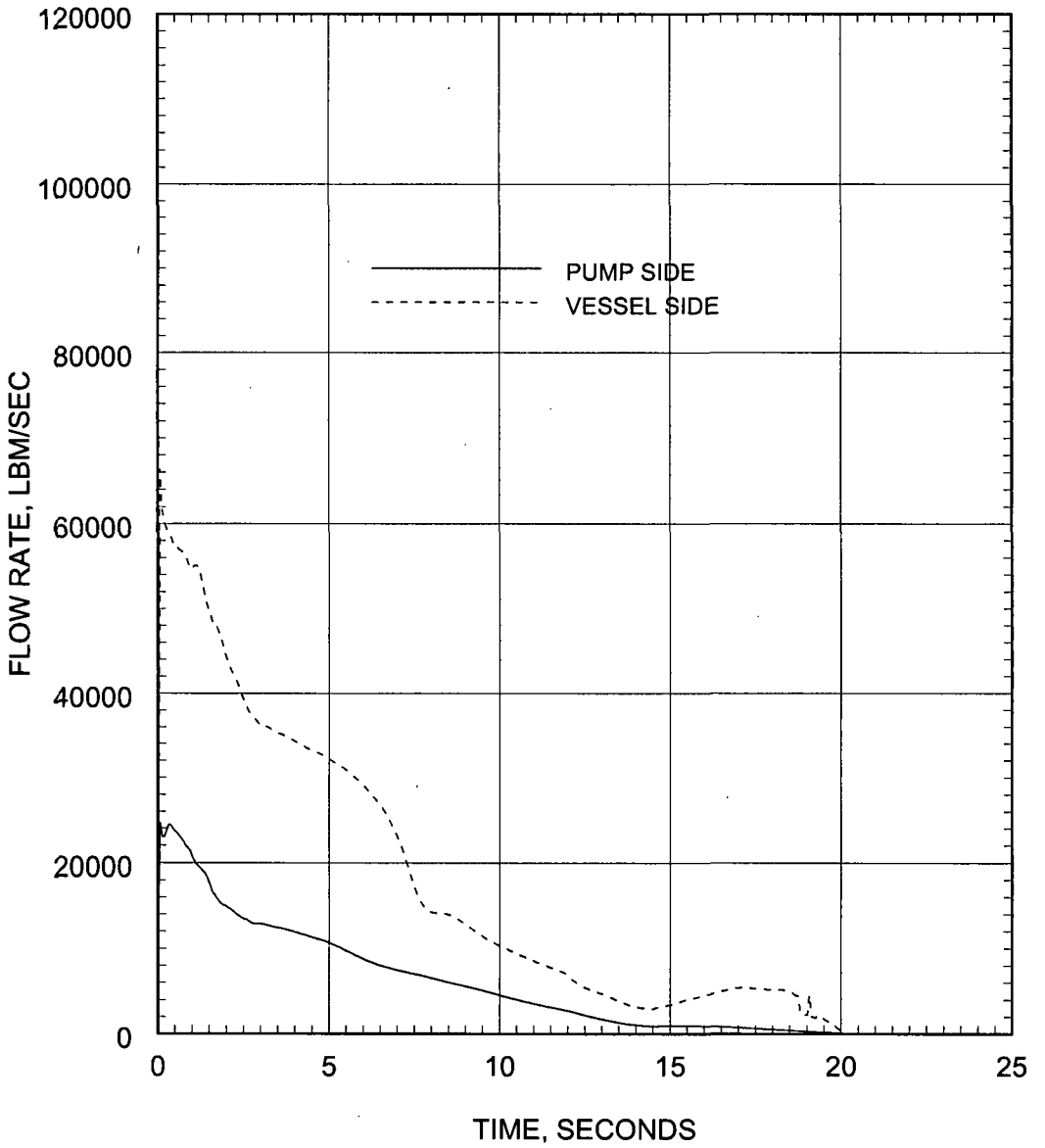

Figure-4
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Hot Assembly Flow Rate (Below Hot Spot)

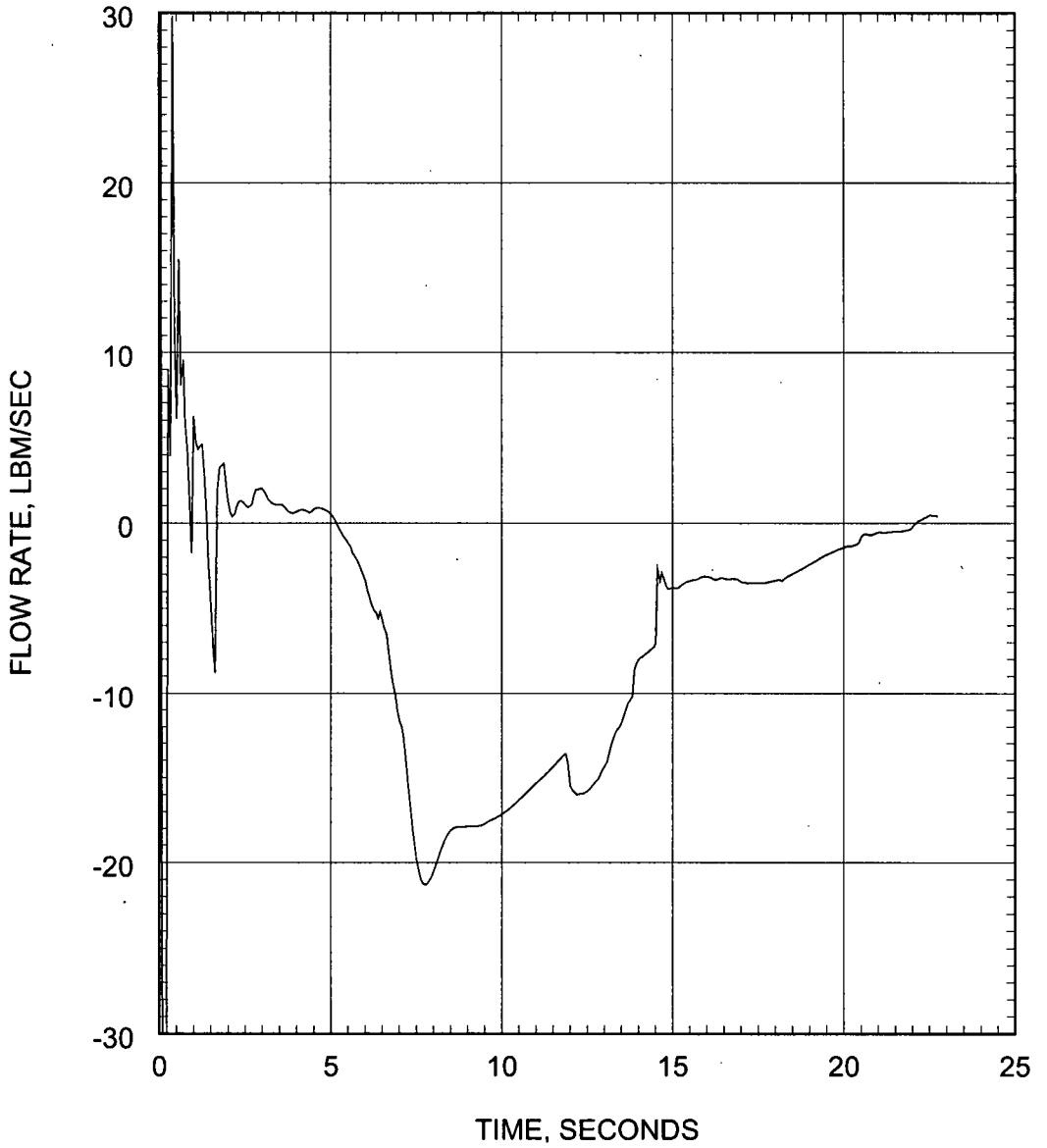

Figure-5
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Hot Assembly Flow Rate (Above Hot Spot)

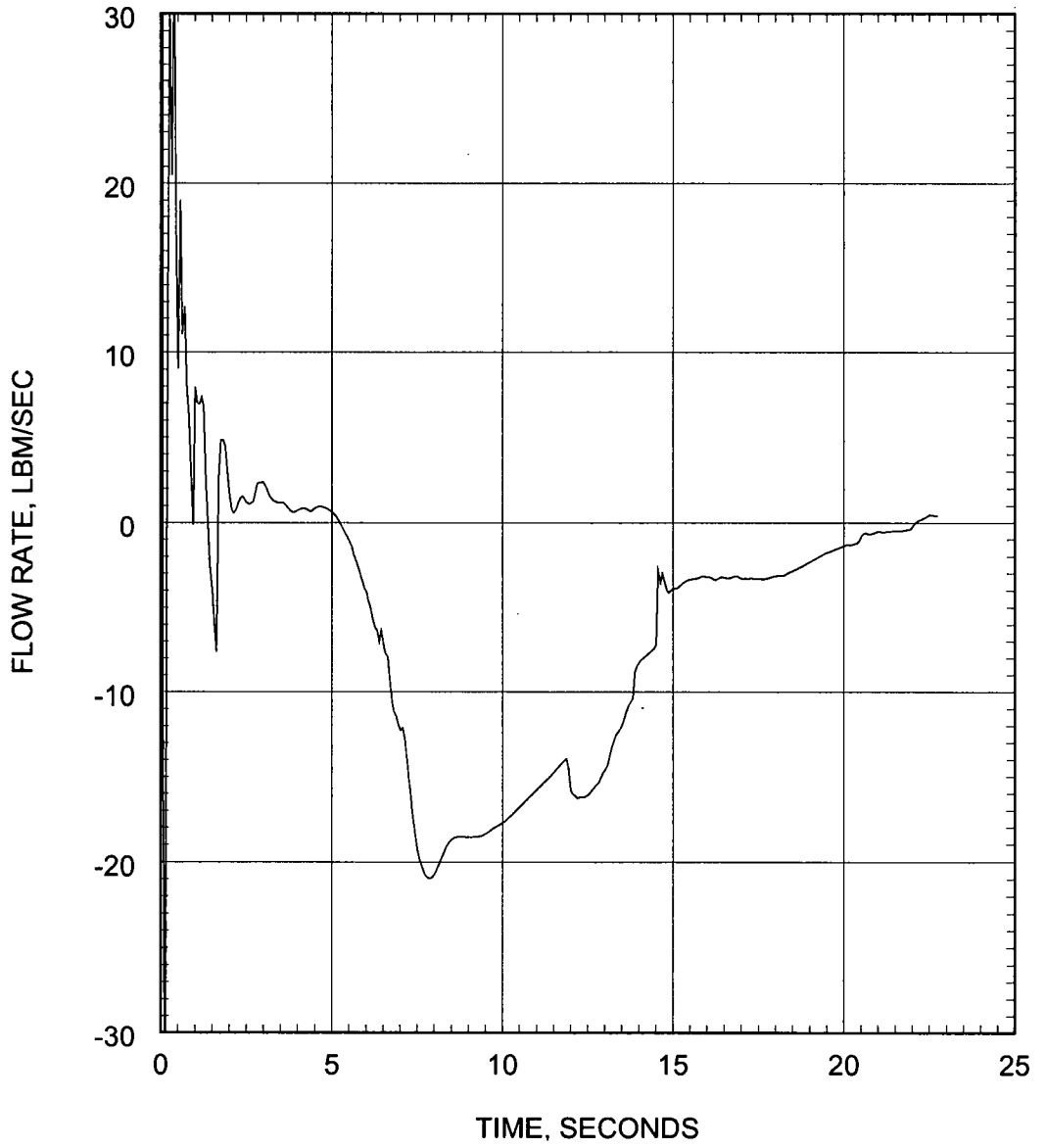

Figure-6
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Hot Assembly Quality

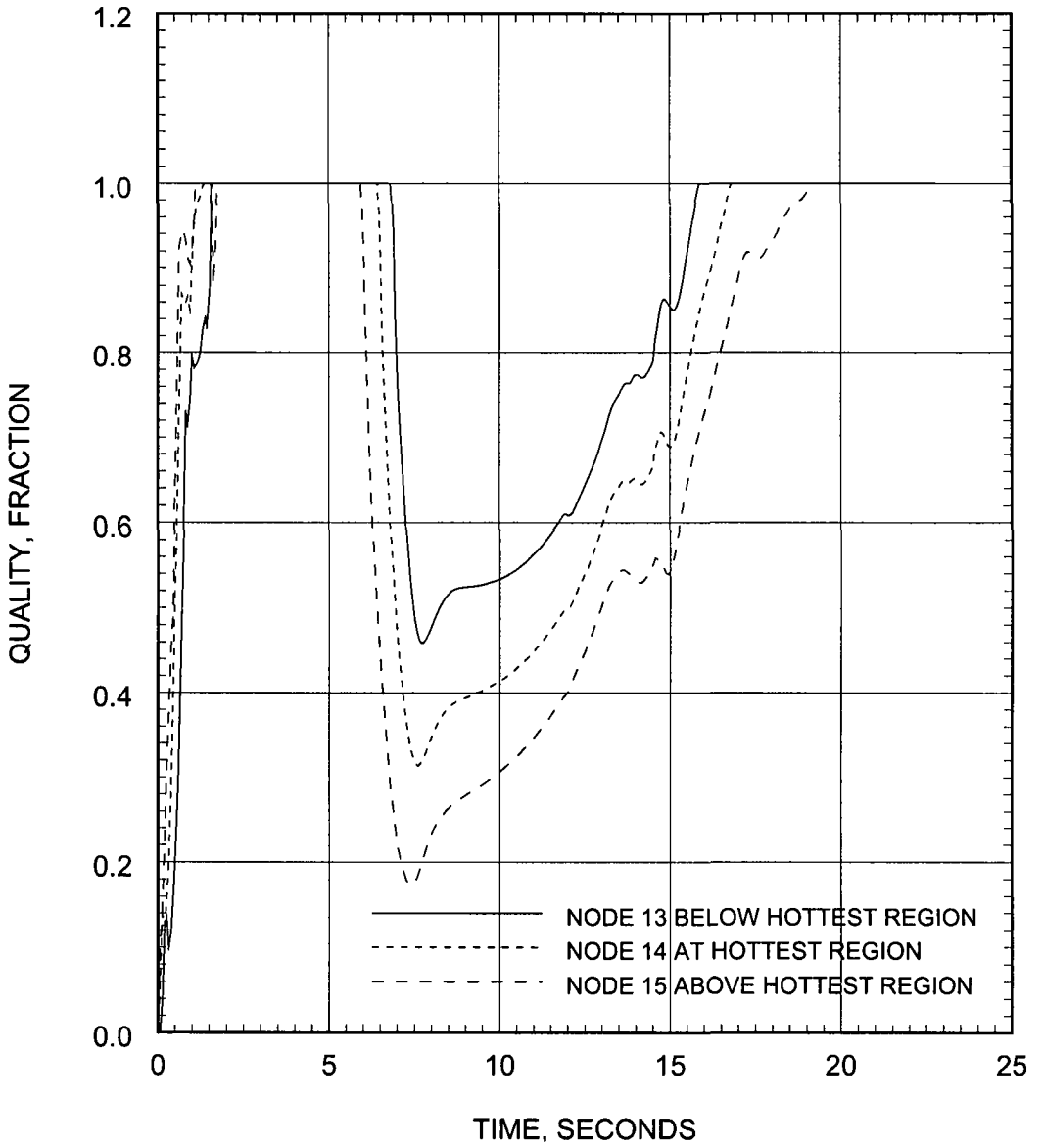

Figure-7
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Containment Pressure

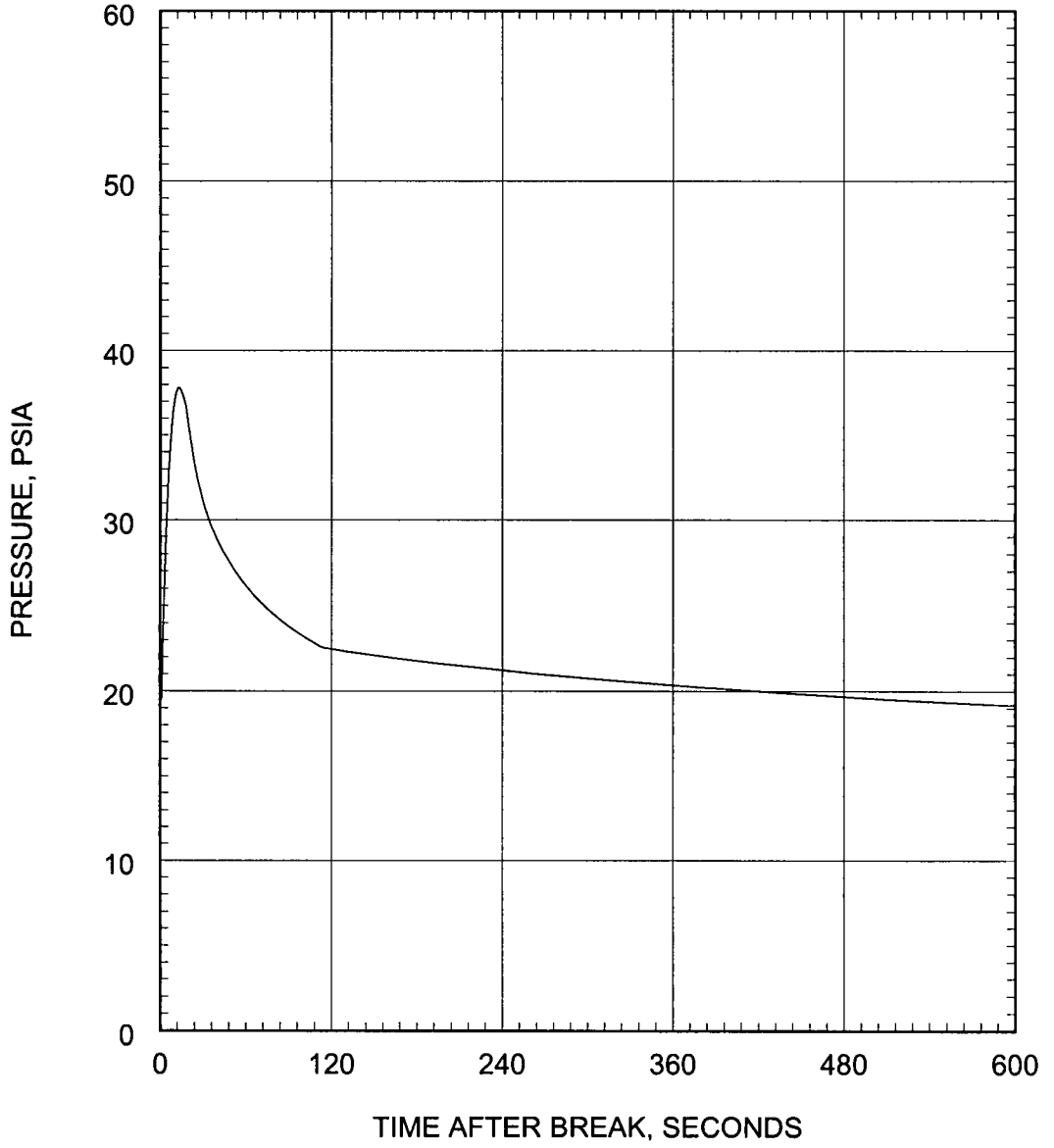

Figure-8
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Mass Added to Core During Reflood

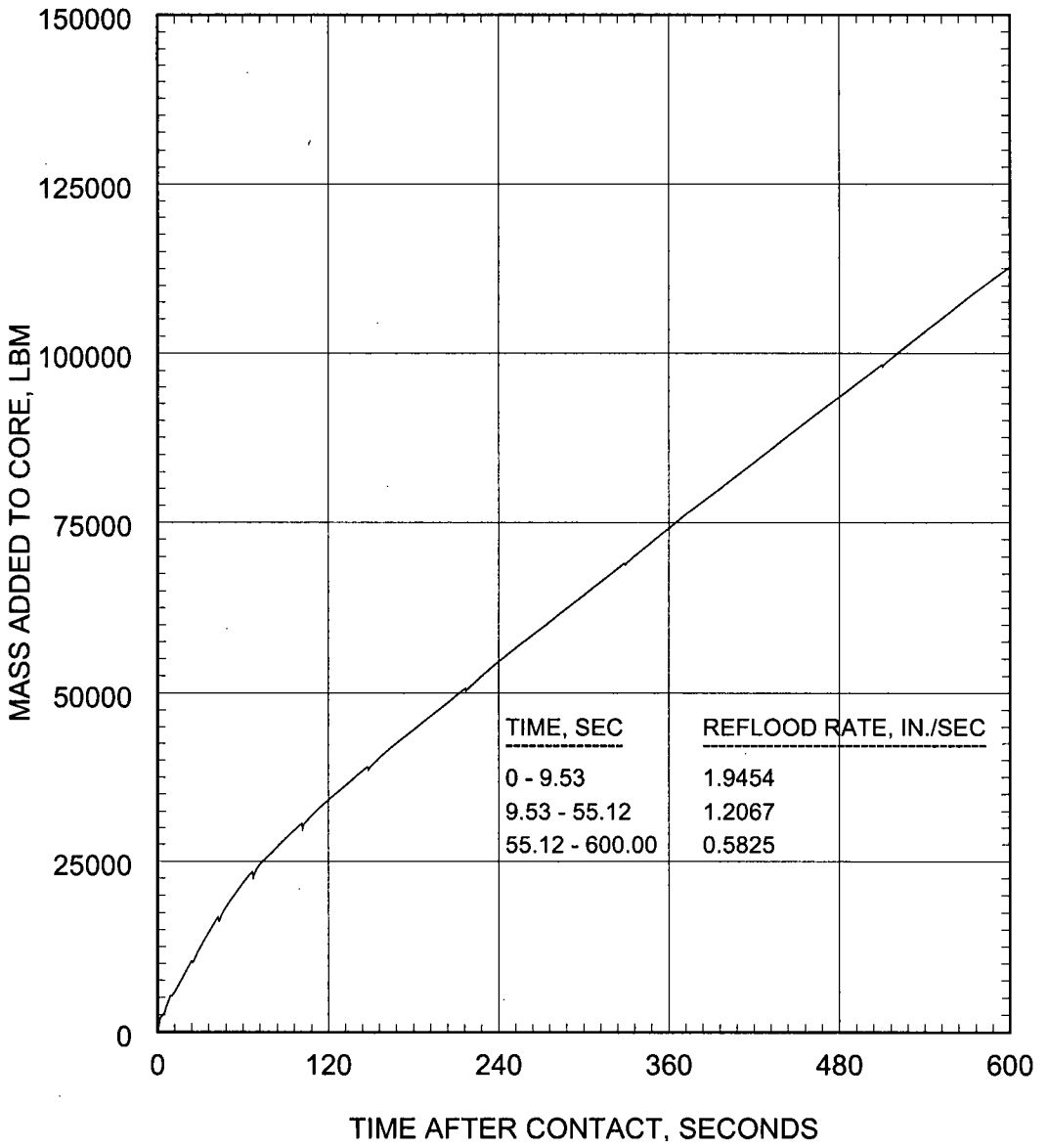

Figure-9
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
1.0 DEG/PD Break
Peak Cladding Temperature

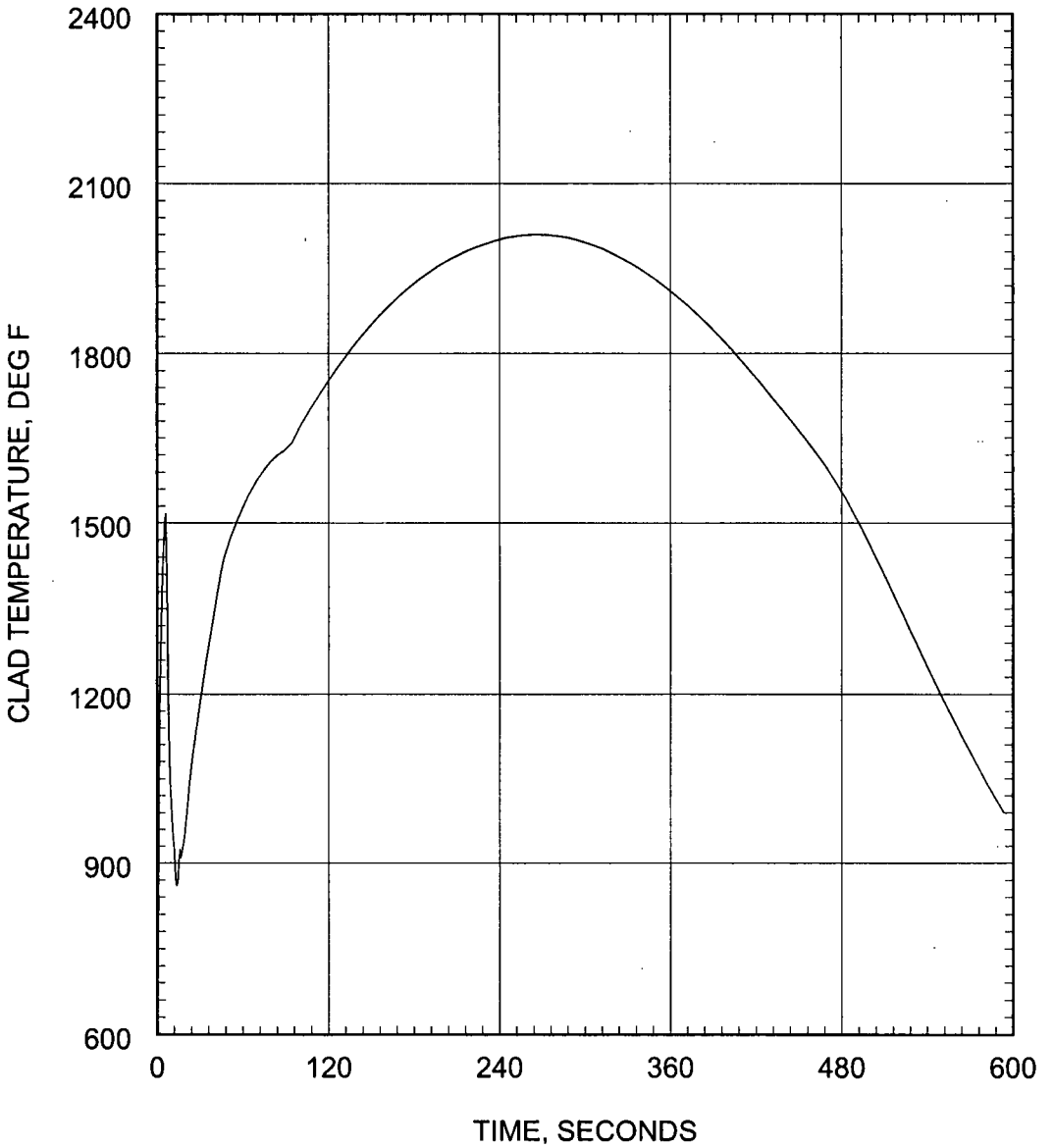

Figure-10
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Core Power

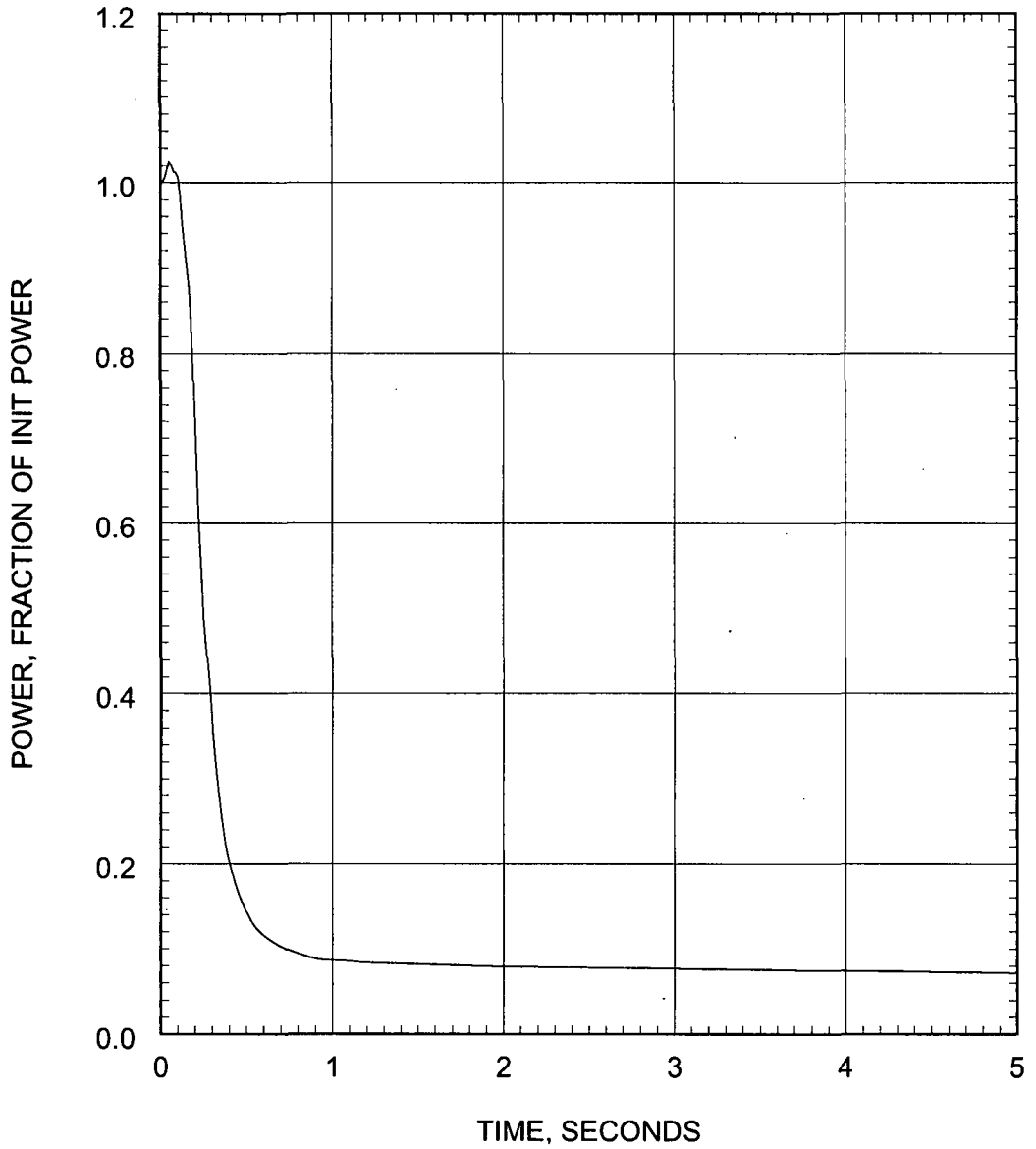

Figure-11
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Pressure in Center Hot Assembly Node

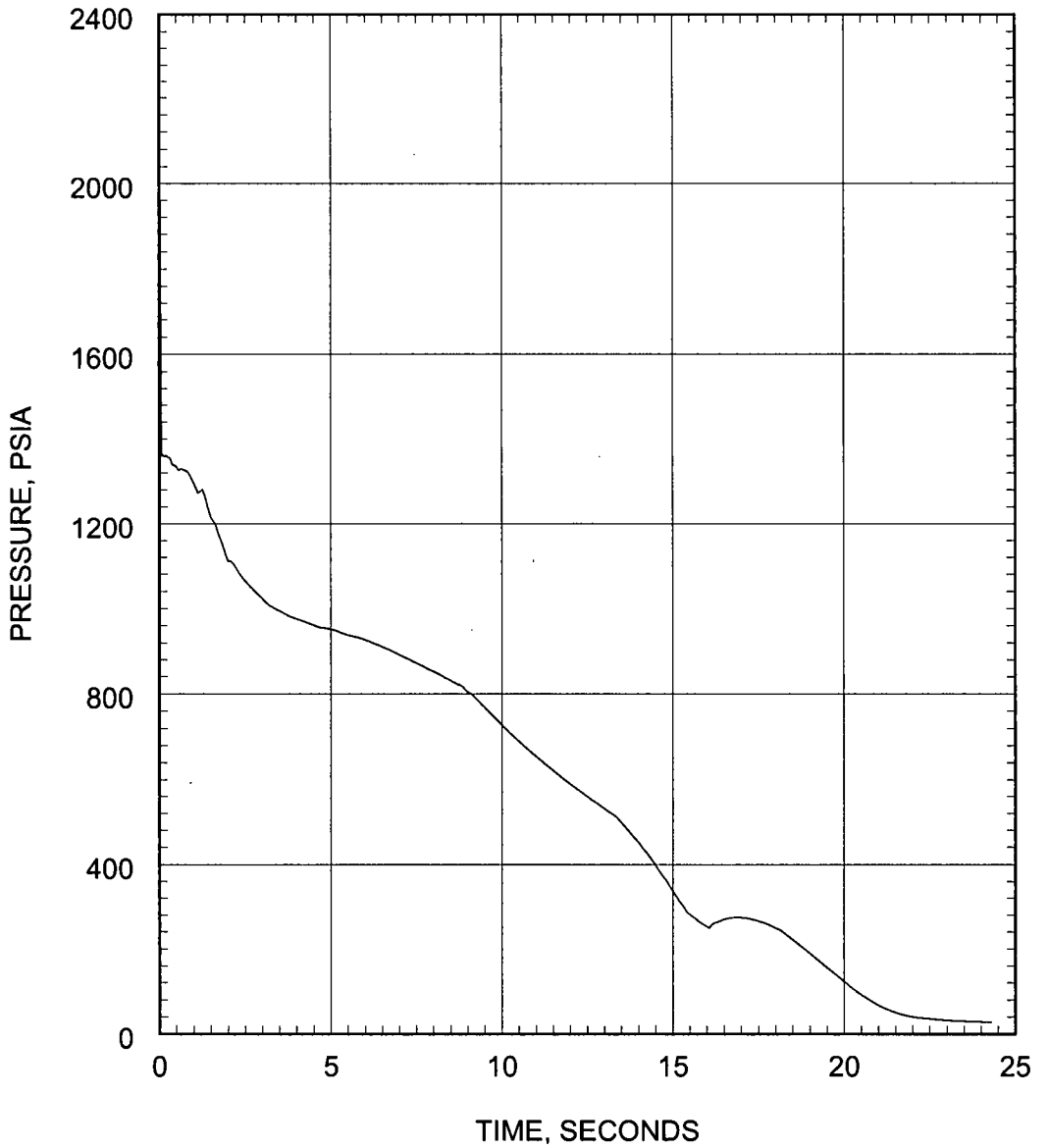

Figure-12
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Break Flow Rate

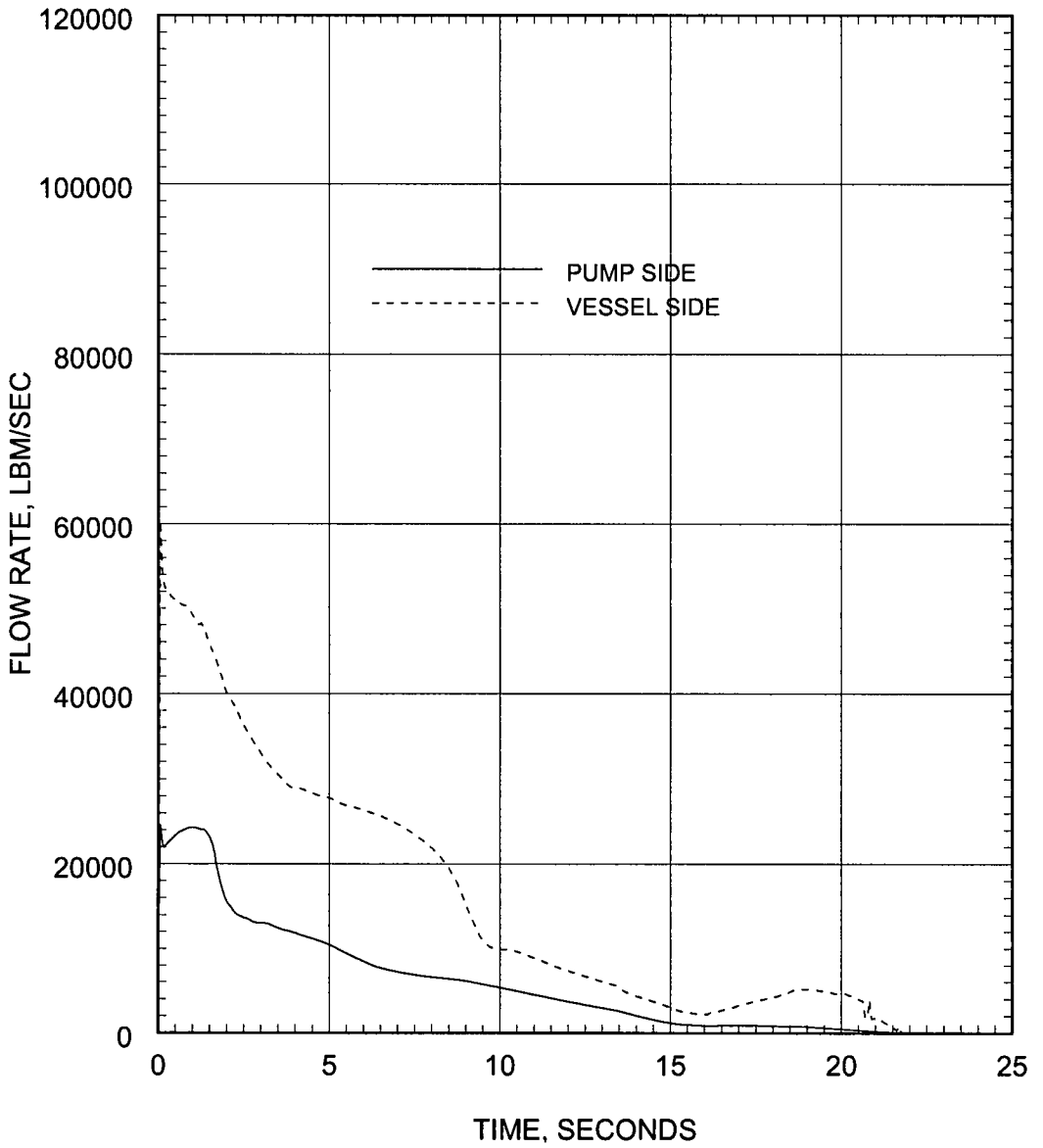

Figure-13
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Hot Assembly Flow Rate (Below Hot Spot)

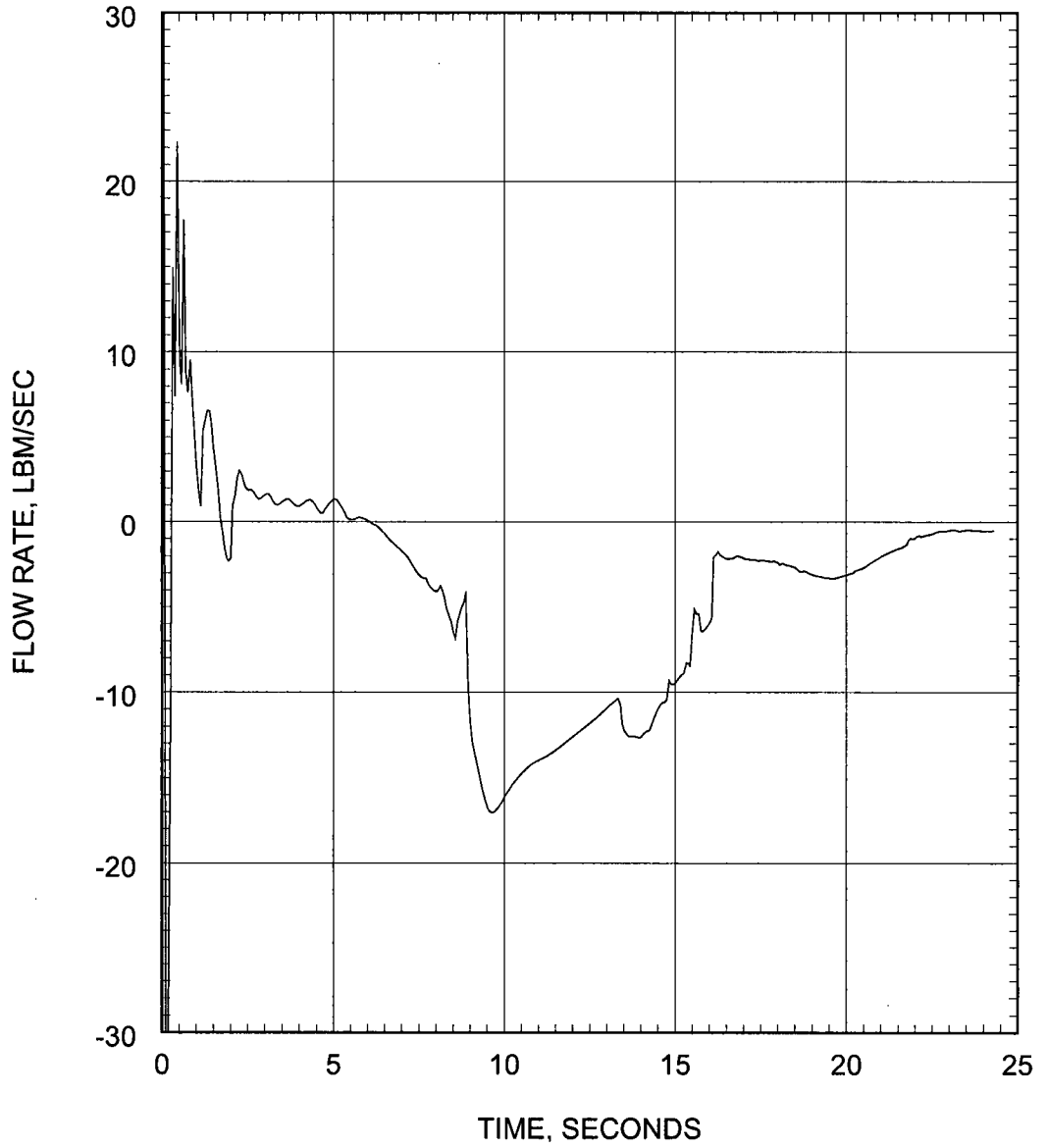

Figure-14
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Hot Assembly Flow Rate (Above Hot Spot)

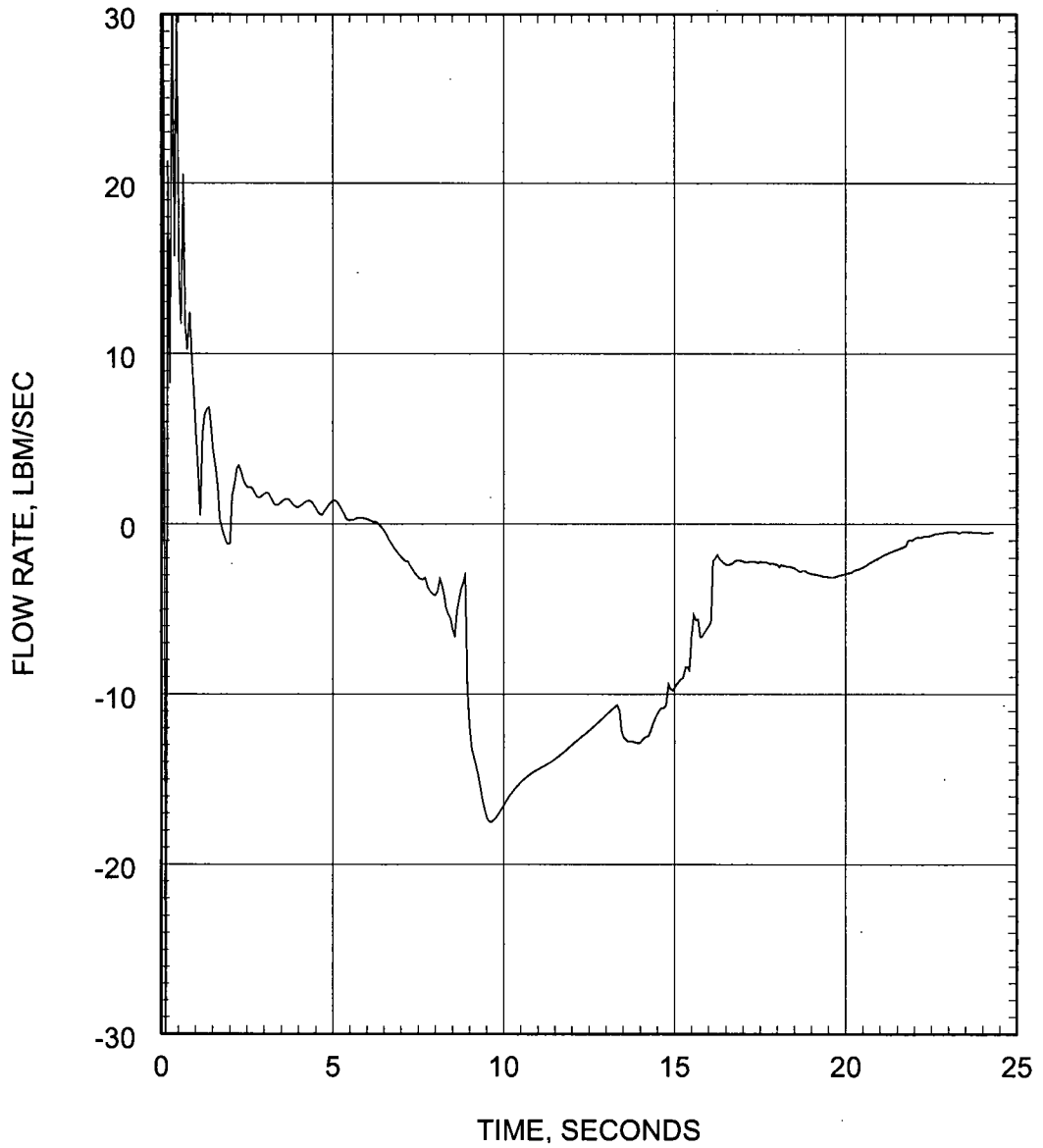

Figure-15
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Hot Assembly Quality

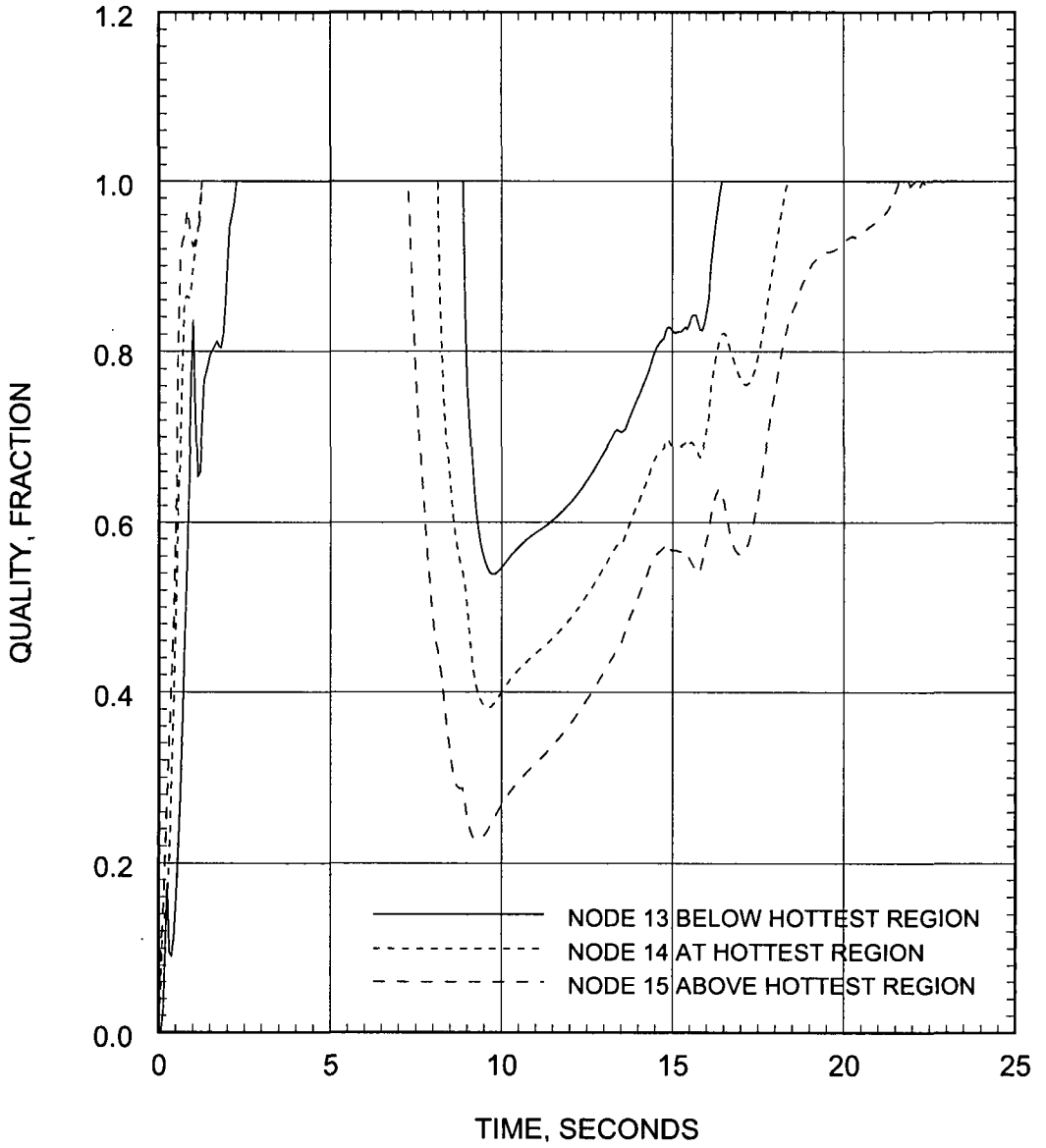

Figure-16
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Containment Pressure

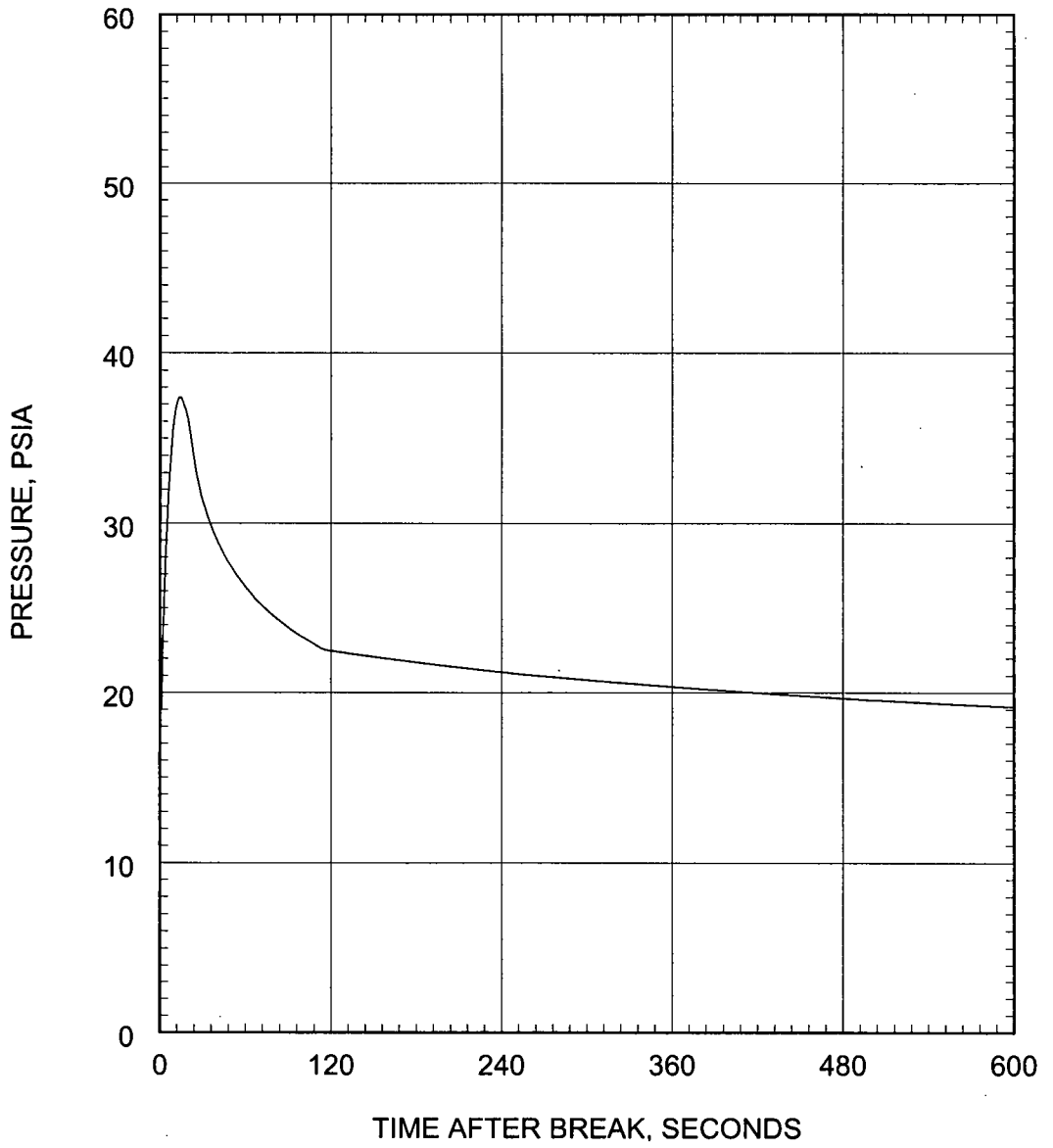

Figure-17
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Mass Added to Core During Reflood

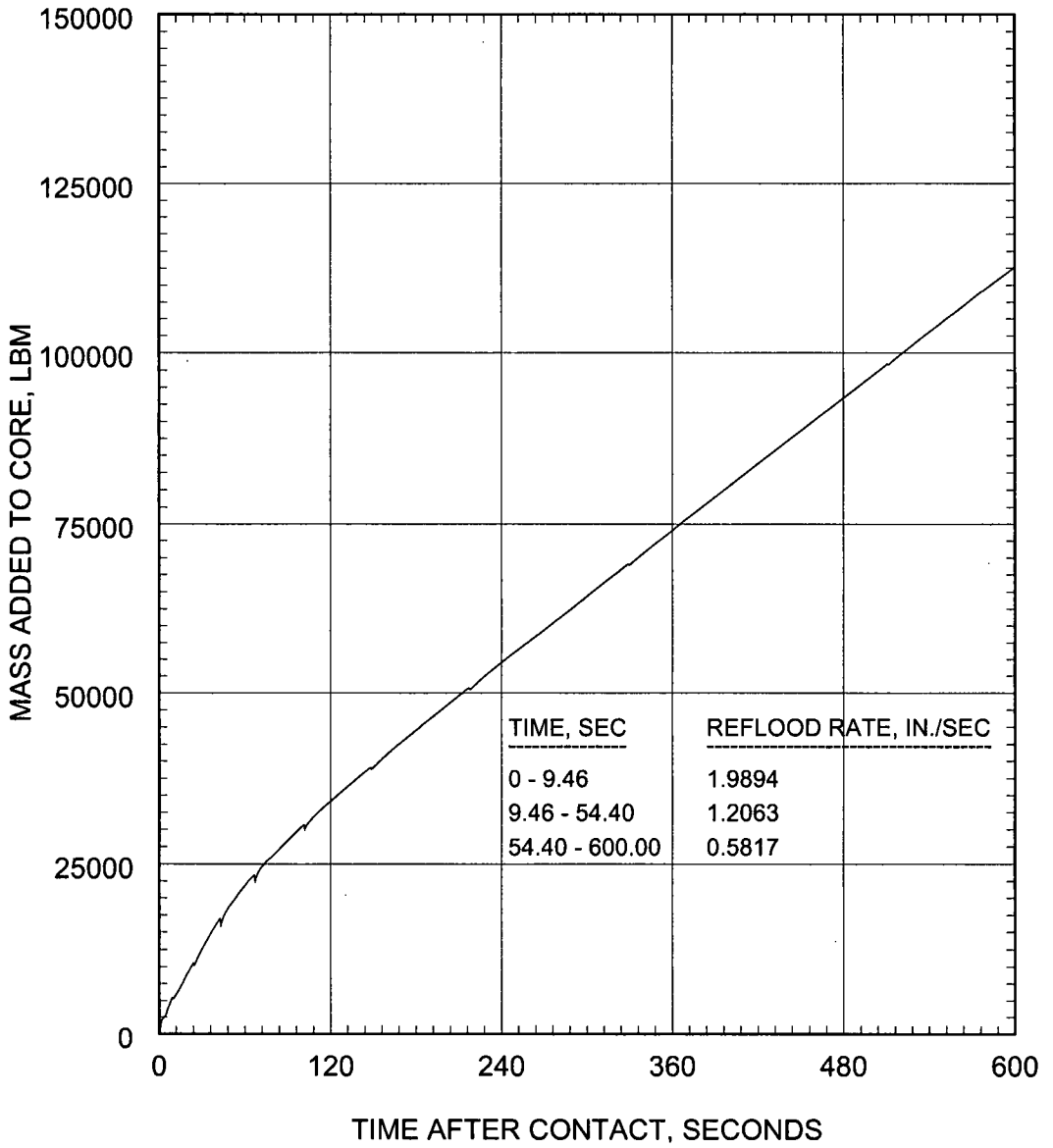

Figure-18
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.8 DEG/PD Break
Peak Cladding Temperature

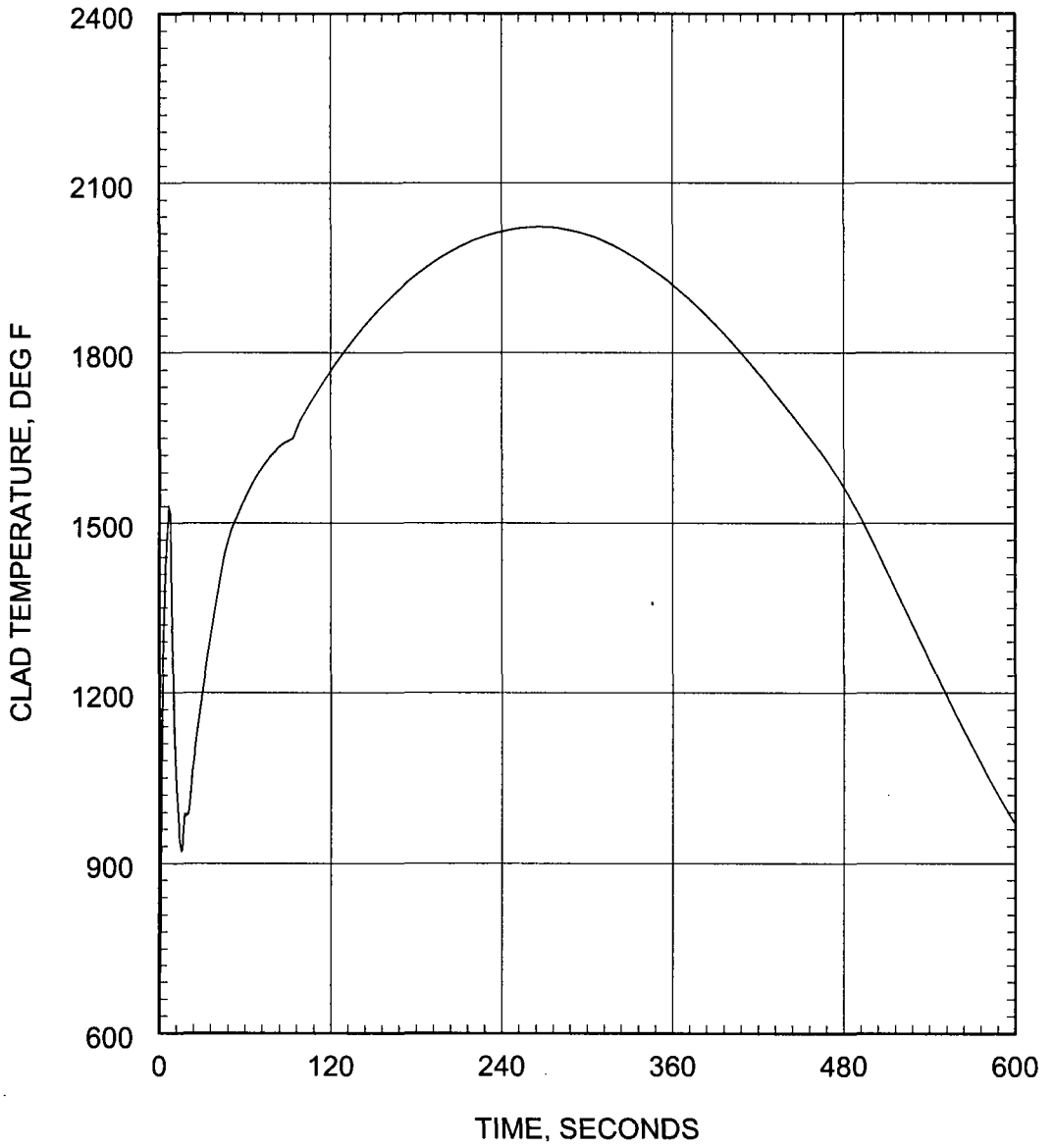

Figure-19
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Core Power

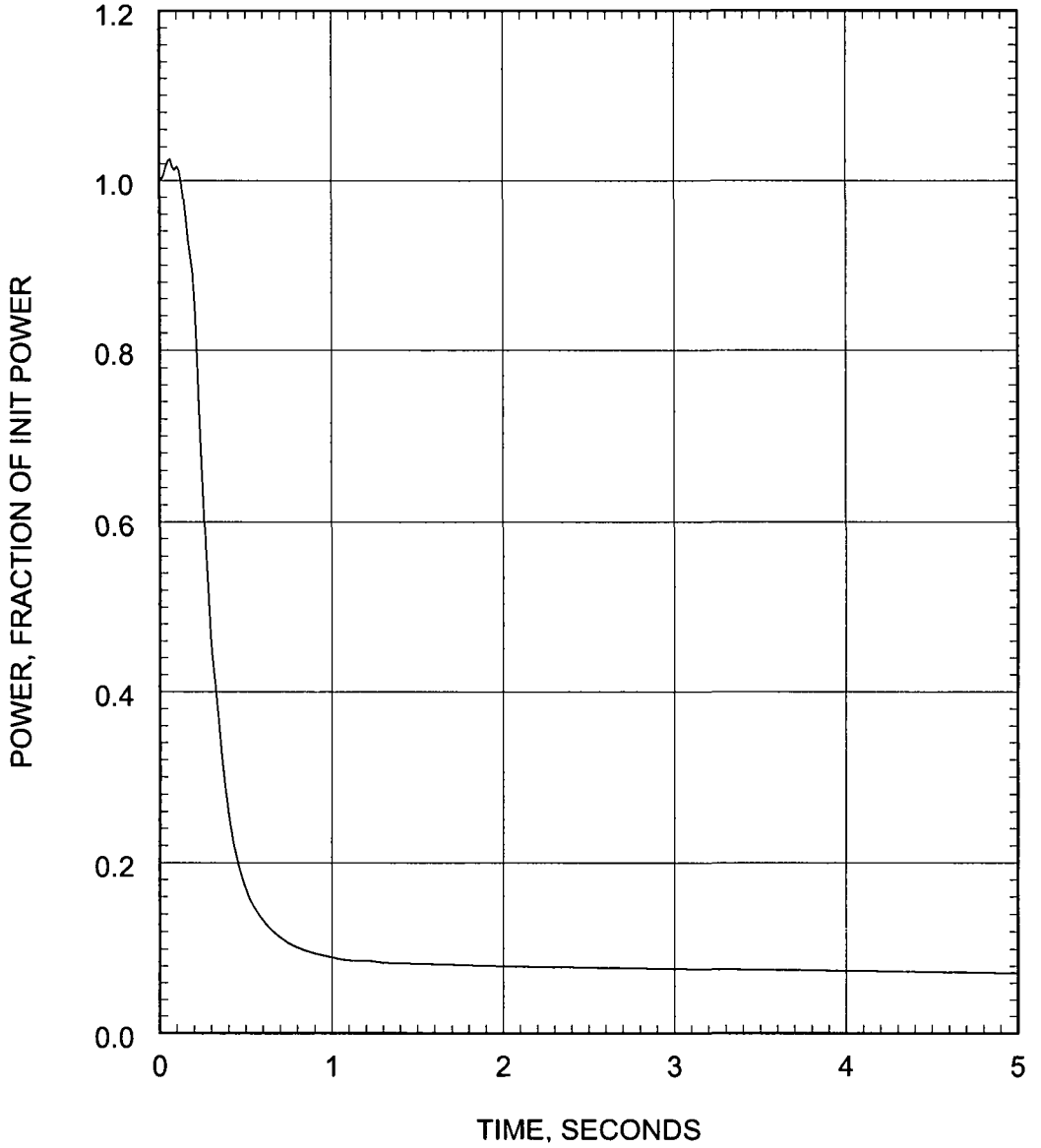

Figure-20
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Pressure in Center Hot Assembly Node

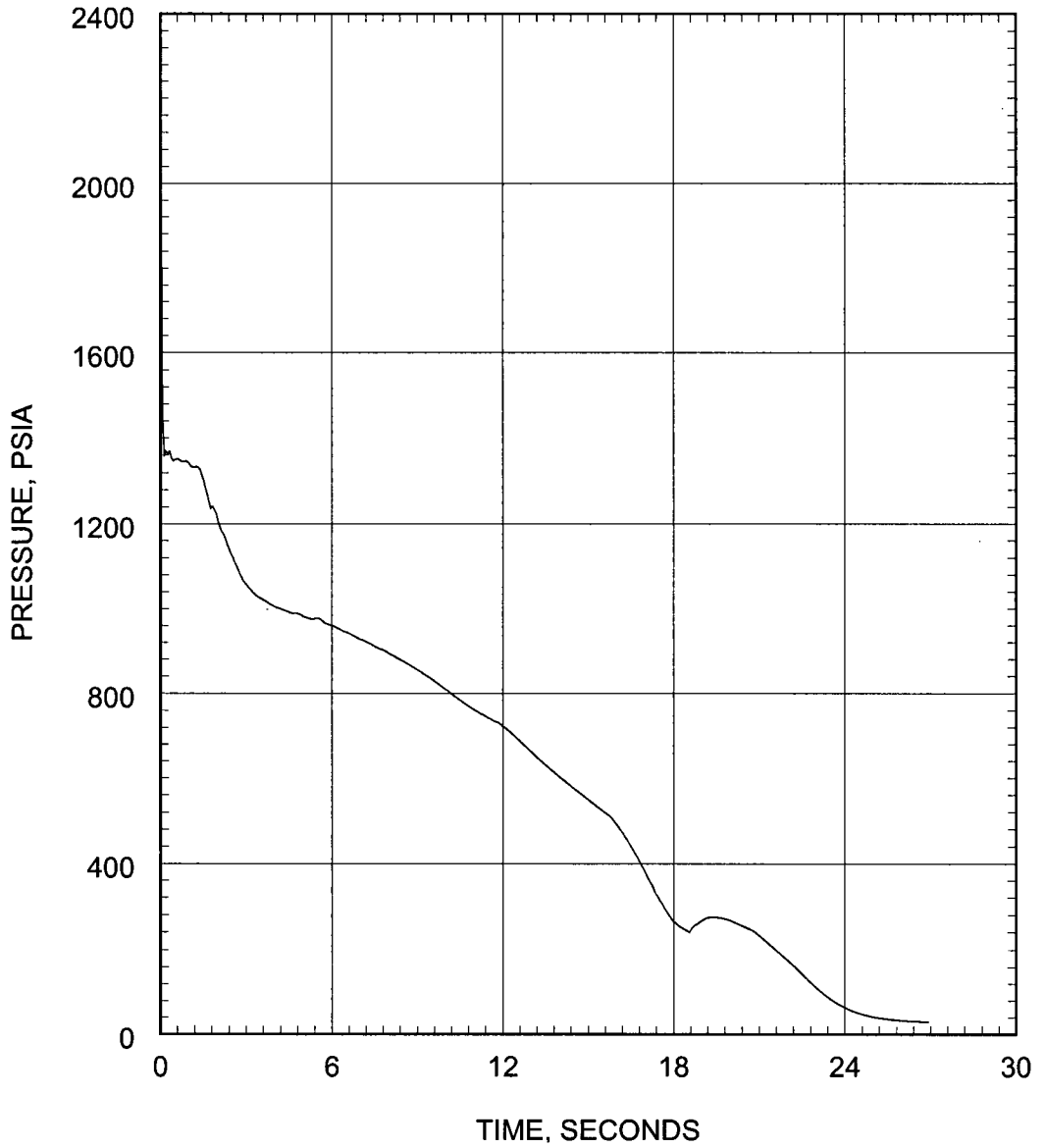

Figure-21
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Break Flow Rate

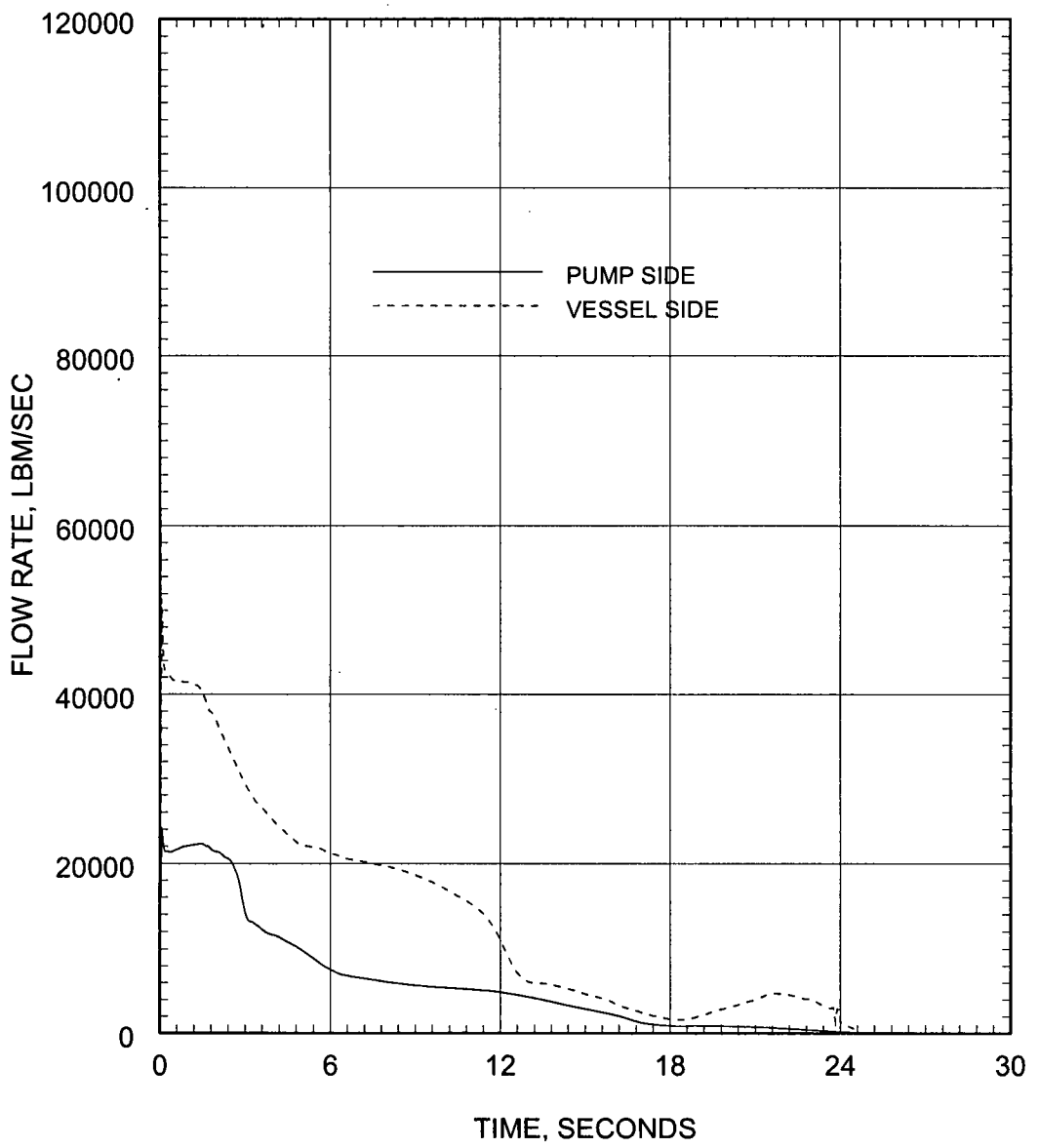

Figure-22
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Hot Assembly Flow Rate (Below Hot Spot)

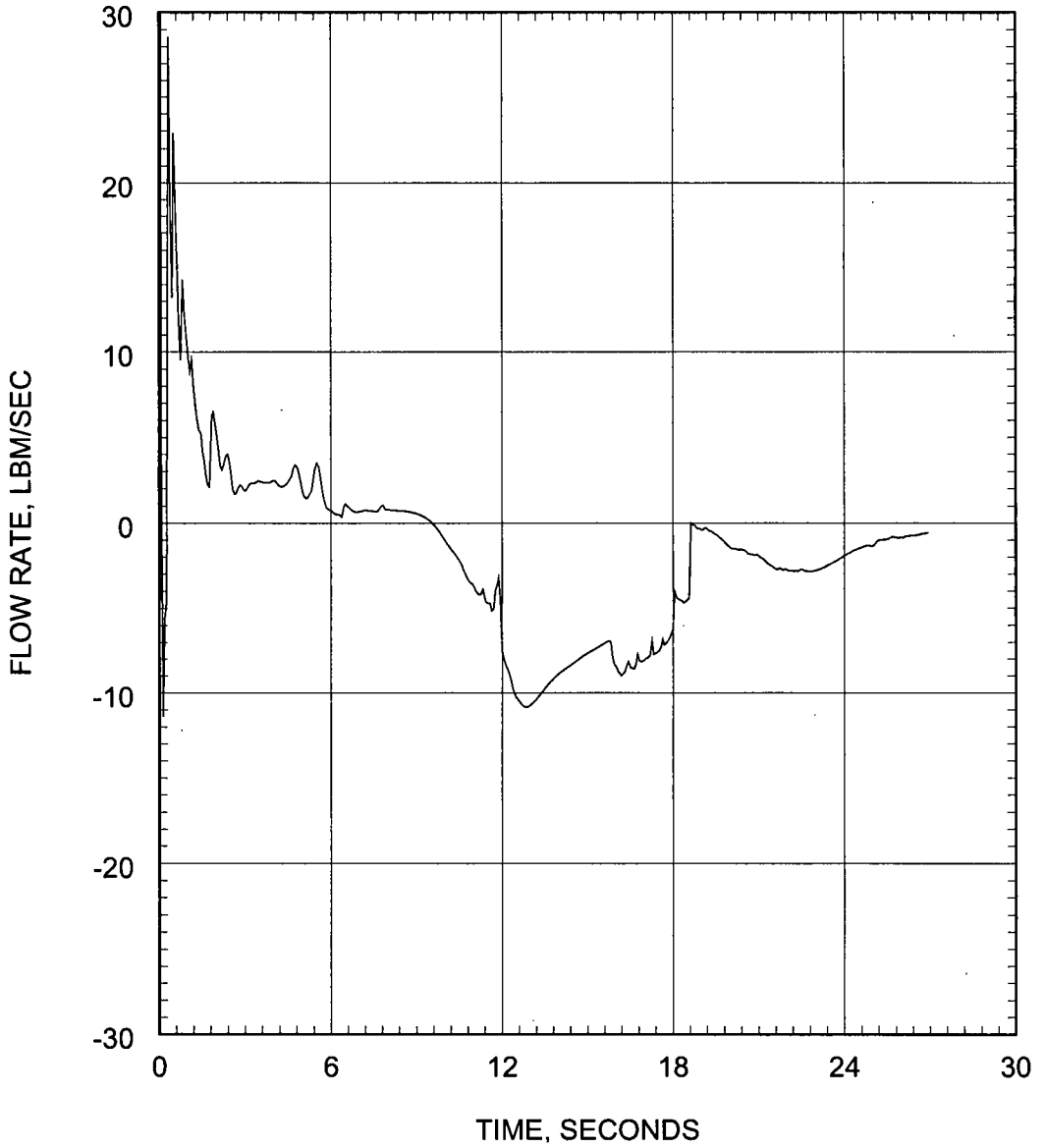

Figure-23
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Hot Assembly Flow Rate (Above Hot Spot)

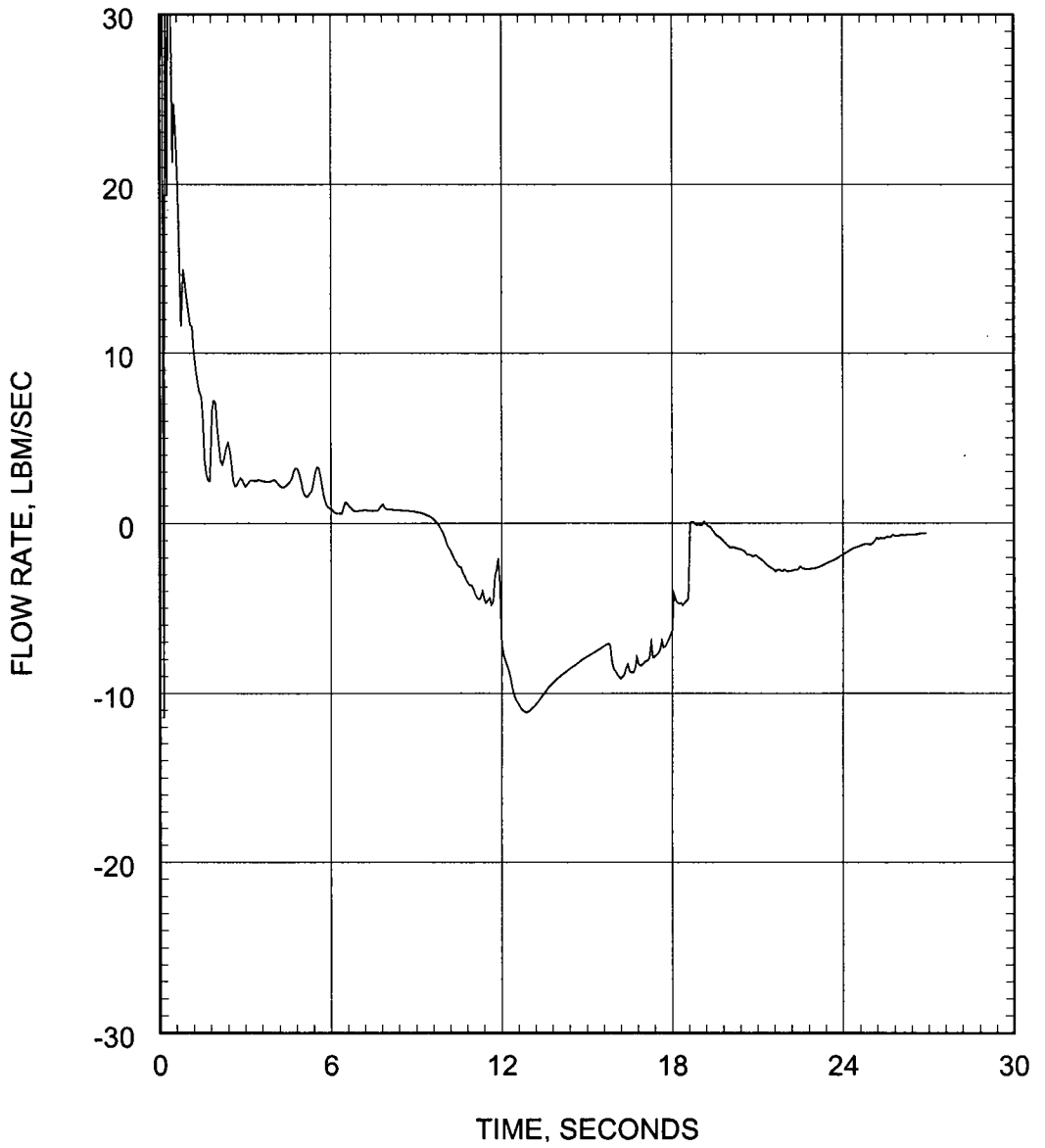

Figure-24
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Hot Assembly Quality

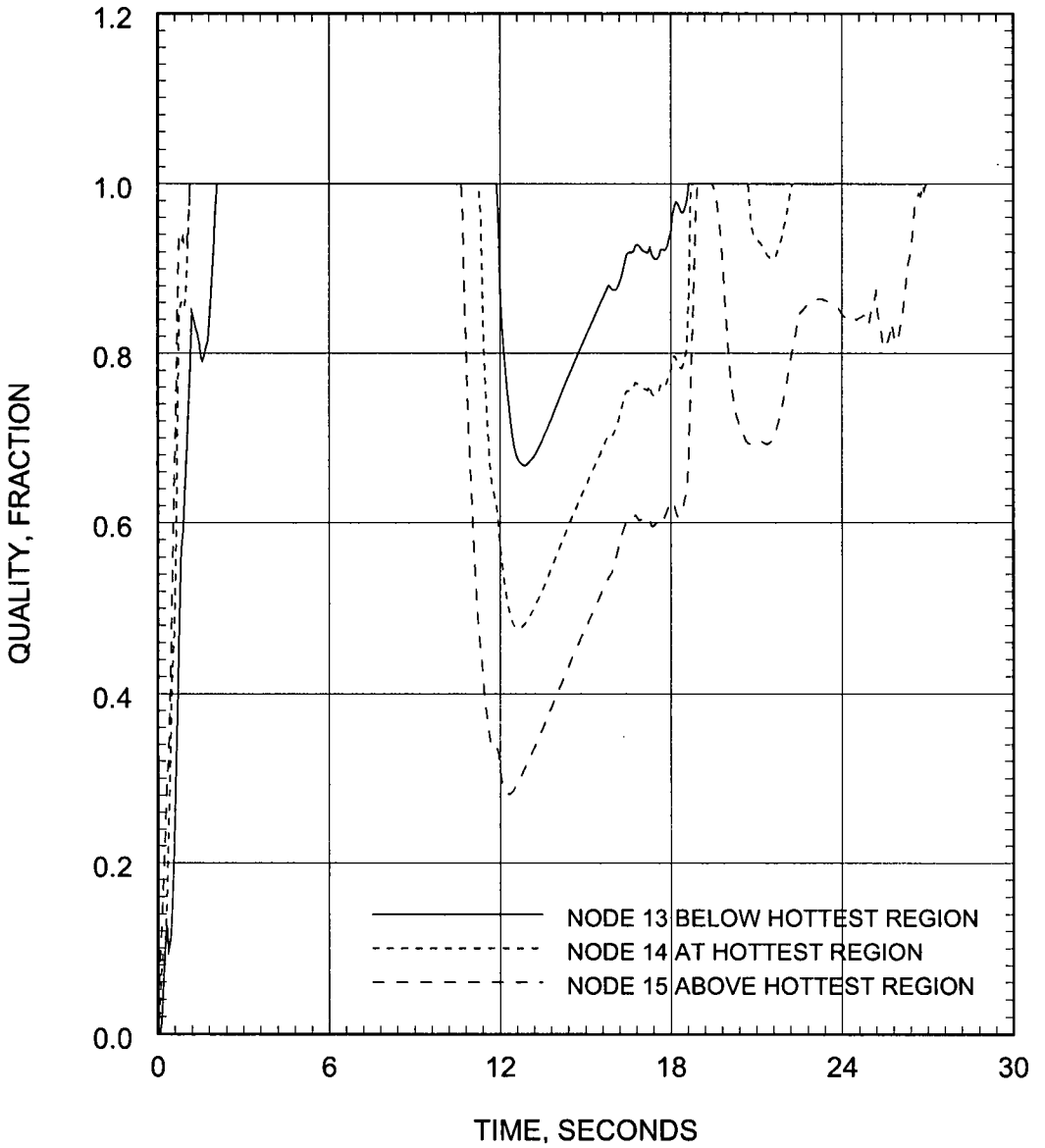

Figure-25
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Containment Pressure

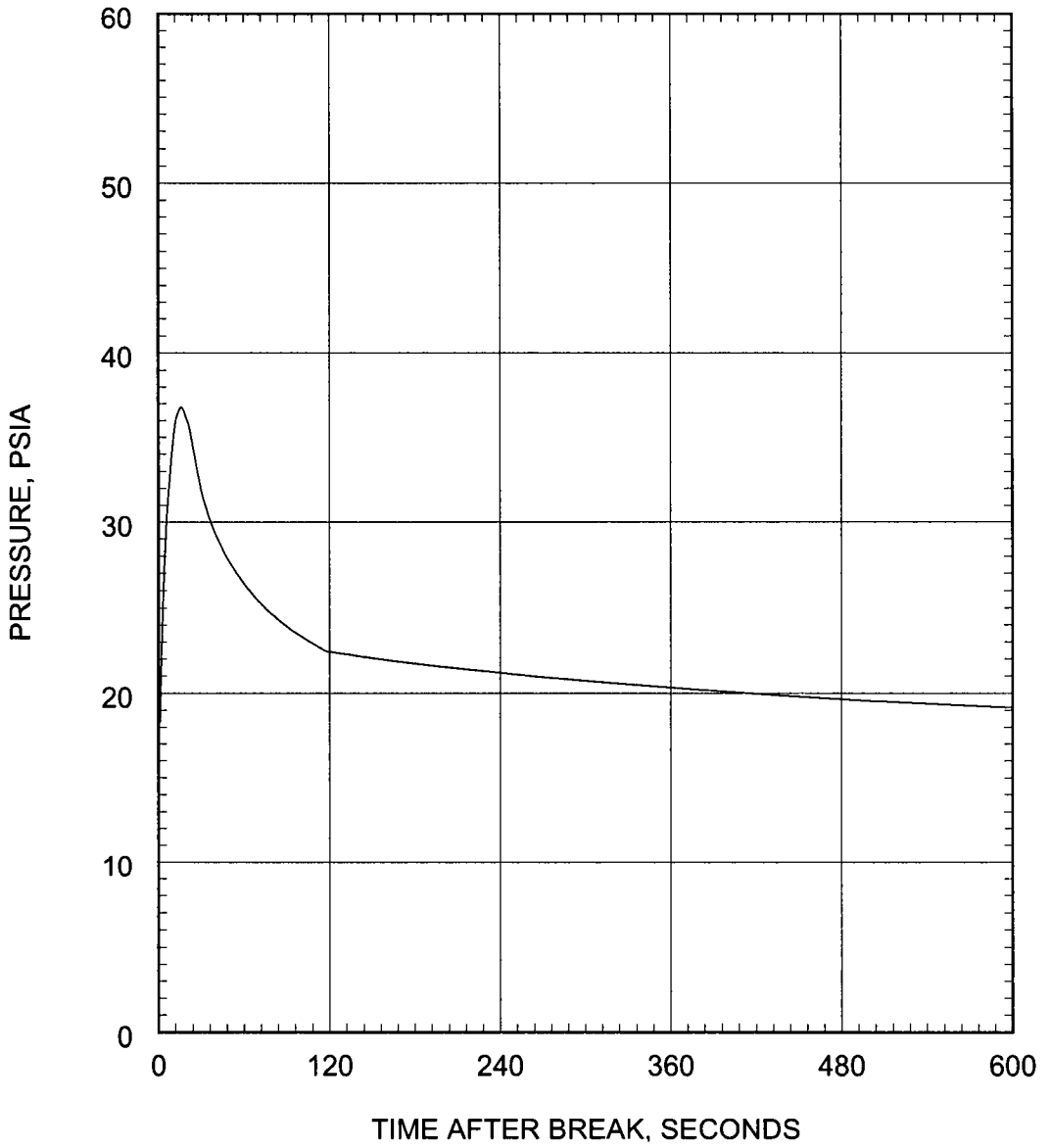

Figure-26
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Mass Added to Core During Reflood

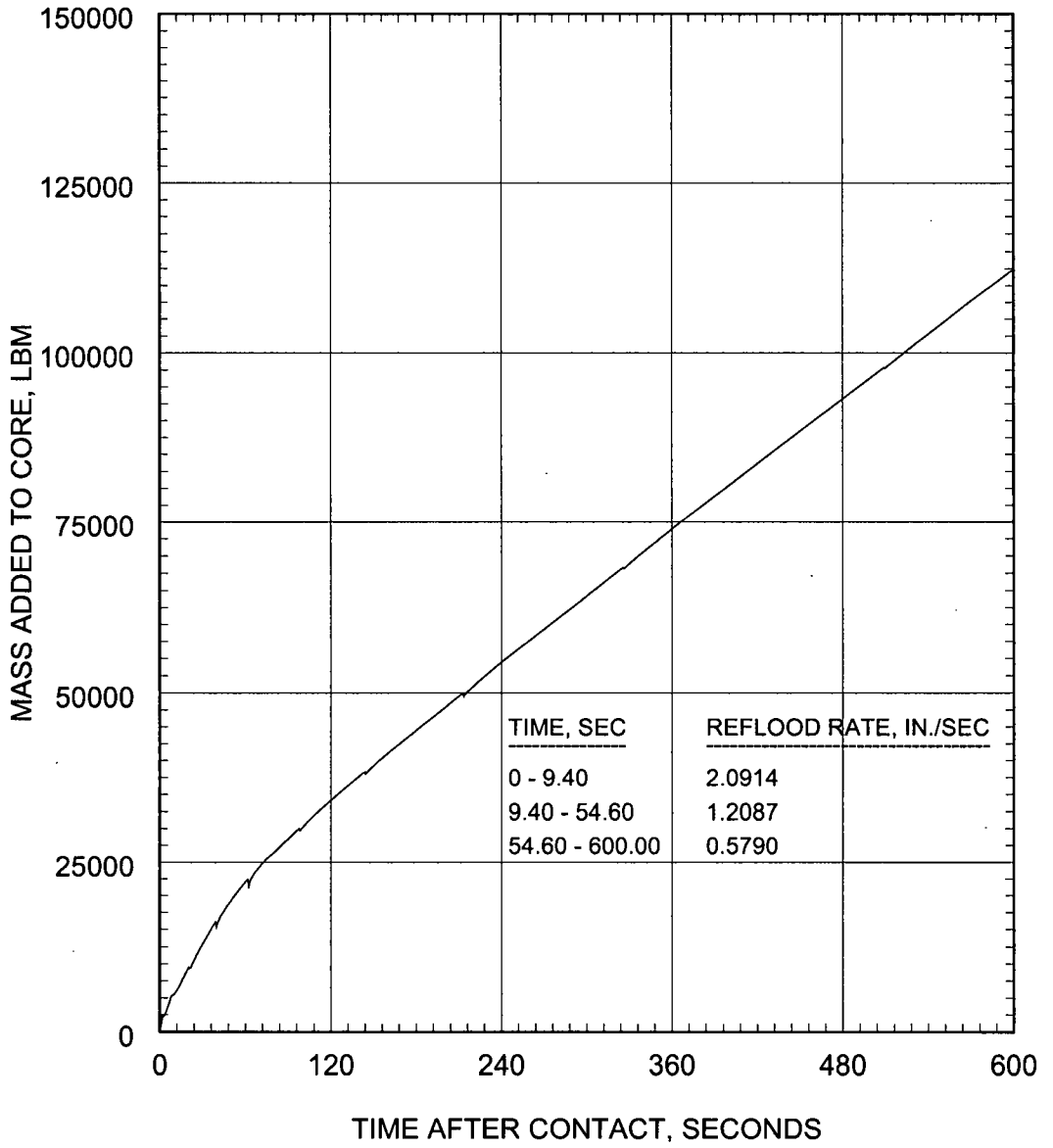

Figure-27
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Peak Cladding Temperature

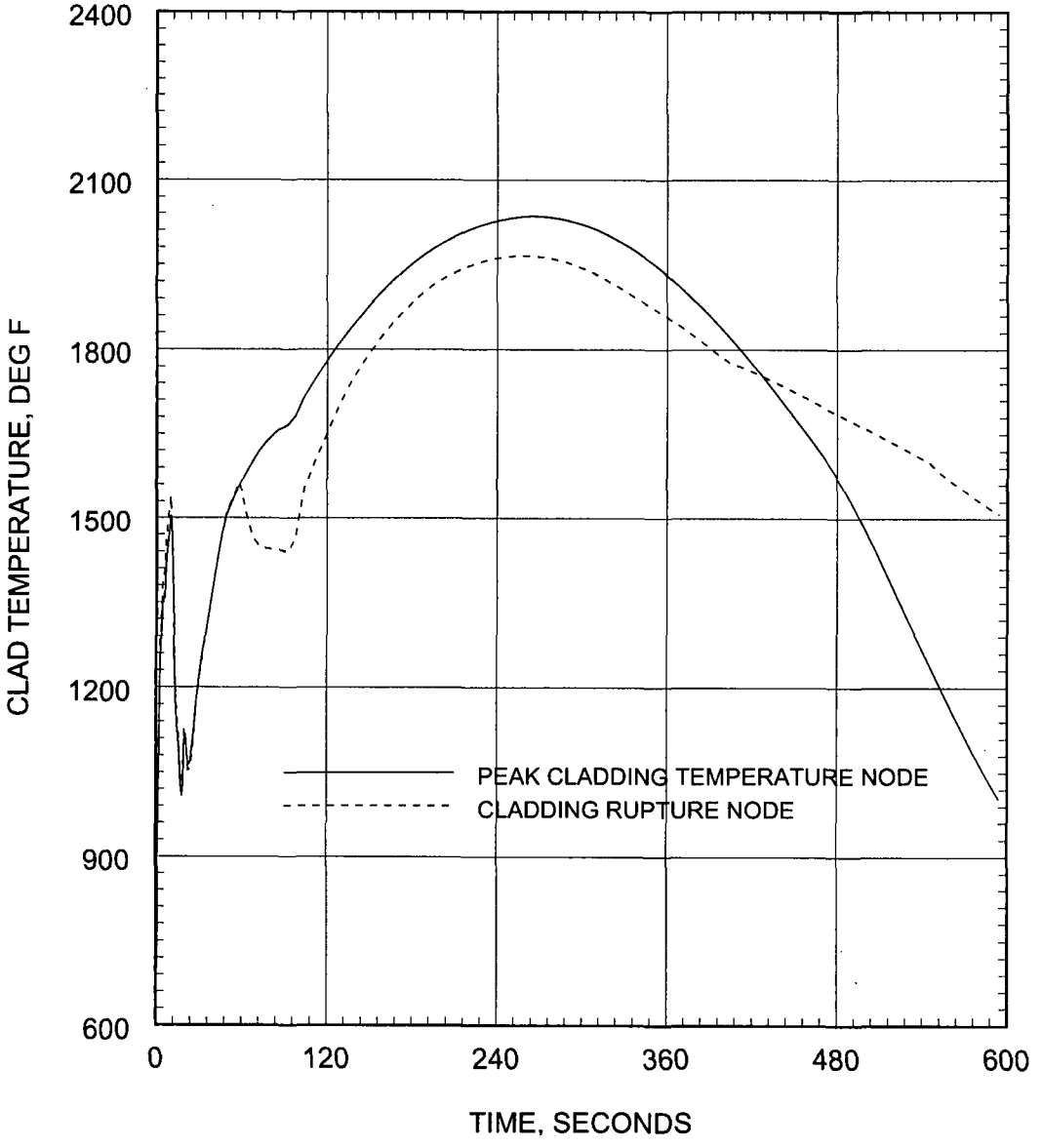

Figure-28
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Mid Annulus Flow Rate

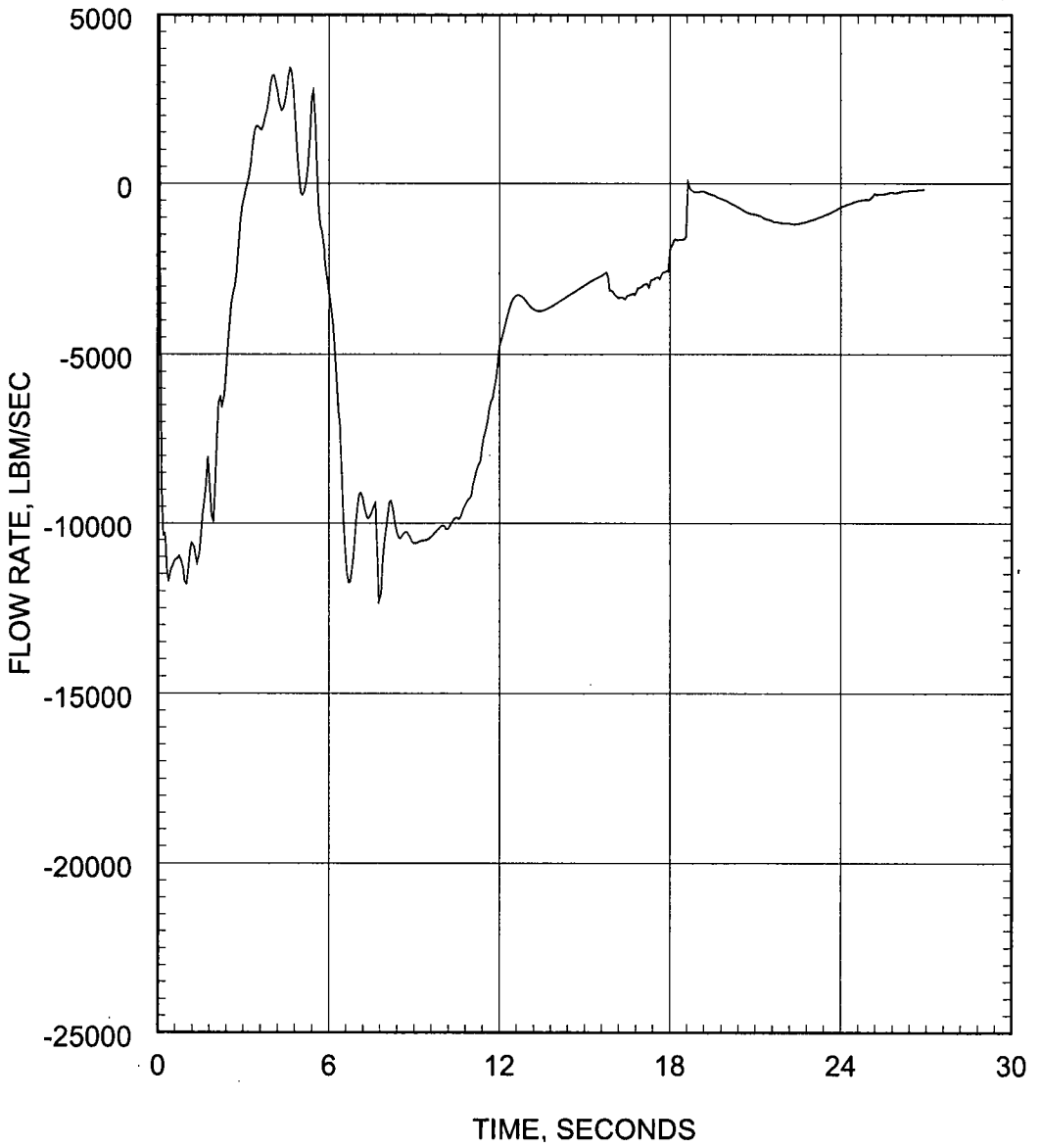

Figure-29
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Quality Above and Below the Core

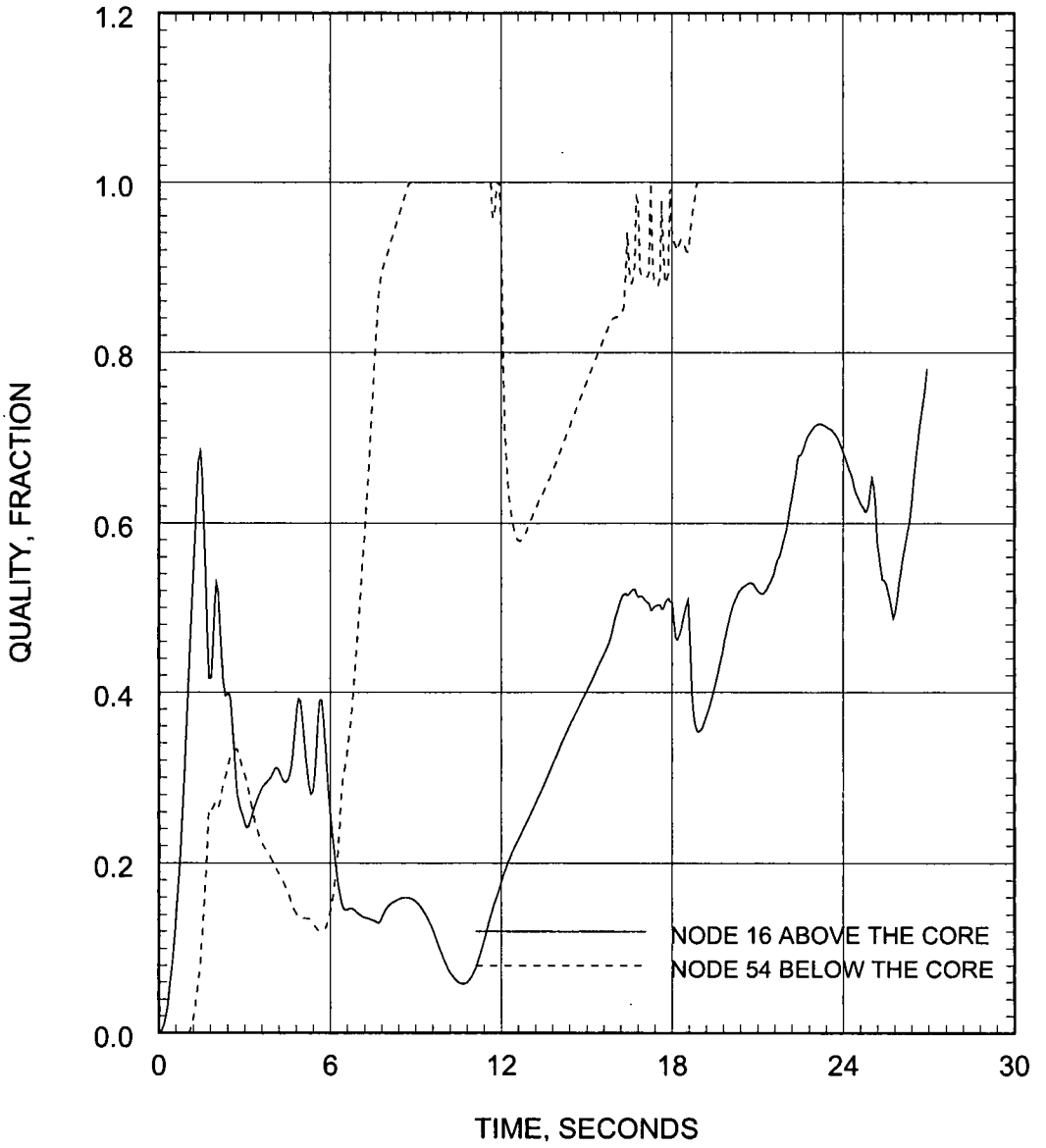

Figure-30
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Core Pressure Drop

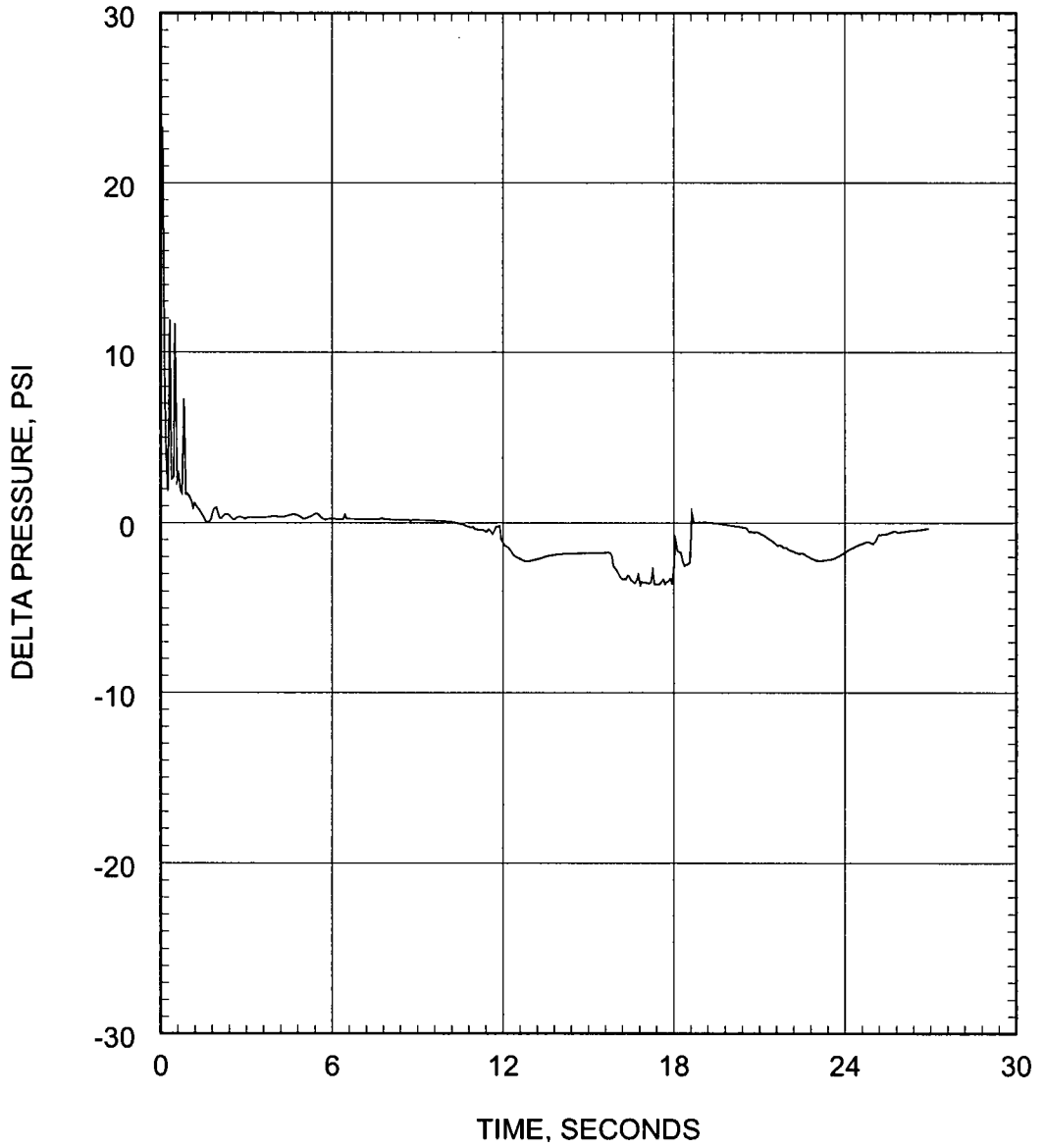

Figure-31
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Safety Injection Flow Rate into Intact Discharge Legs

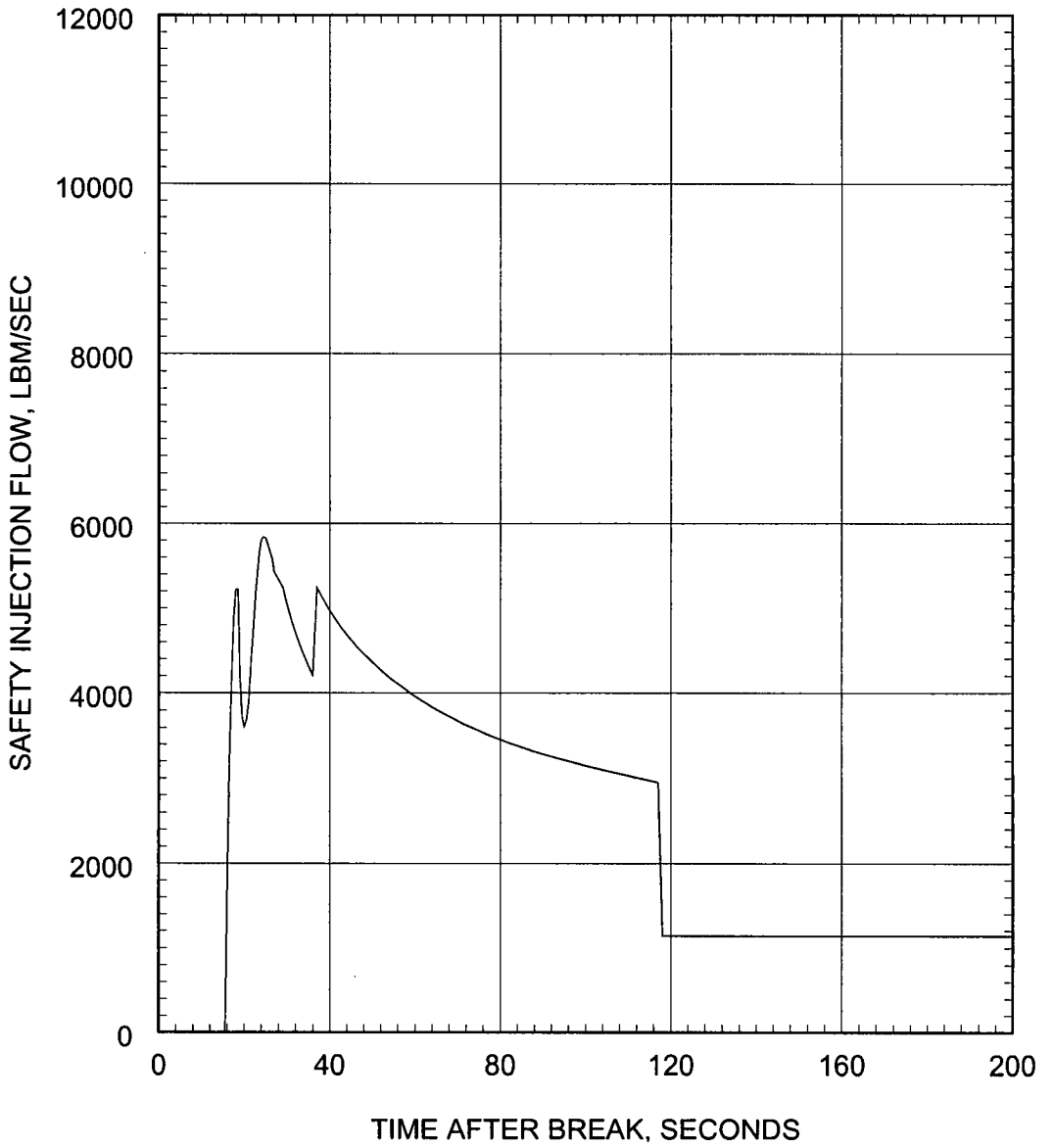

Figure-32
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Water Level in Downcomer During Reflood

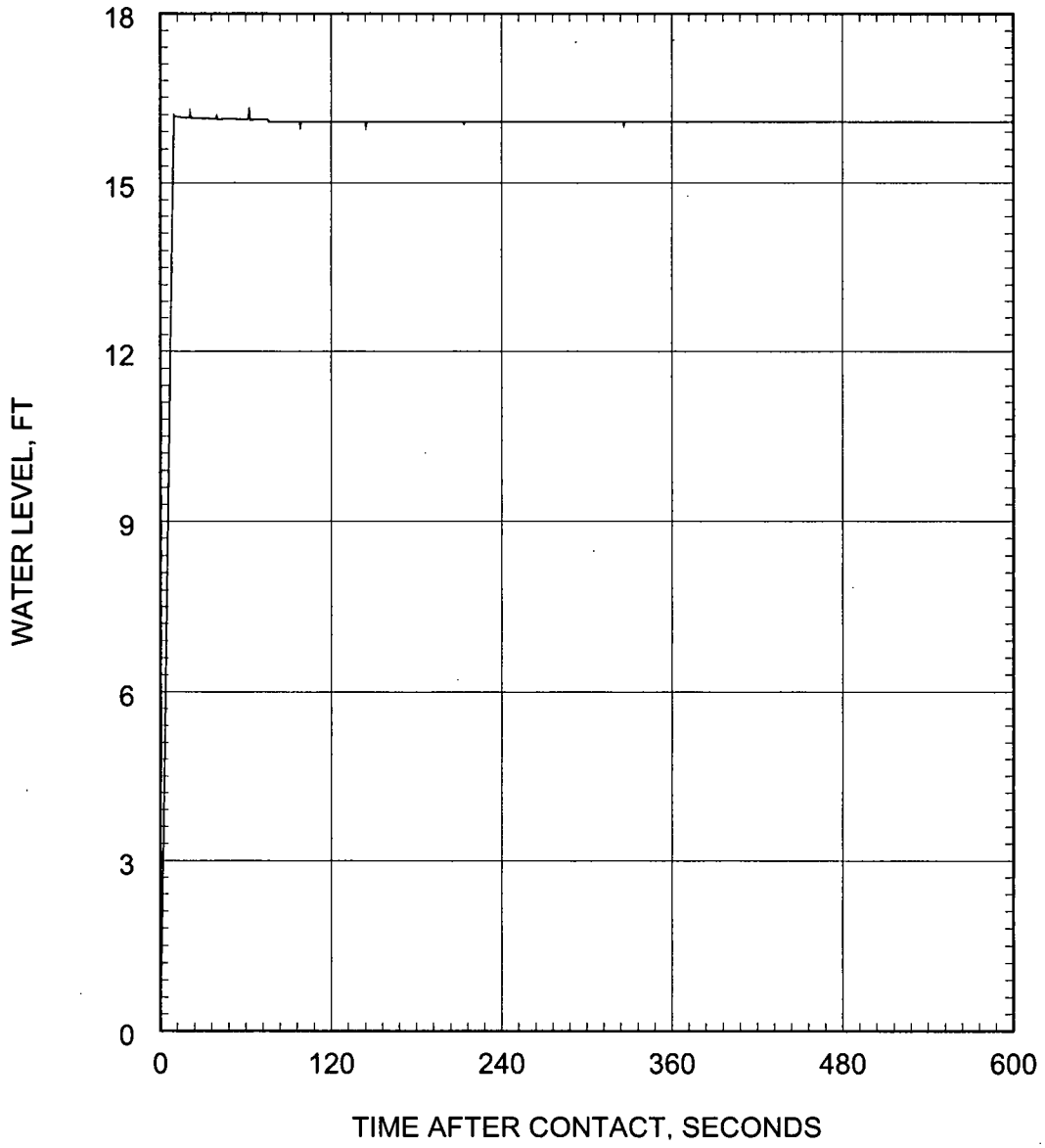

Figure-33
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Hot Spot Gap Conductance

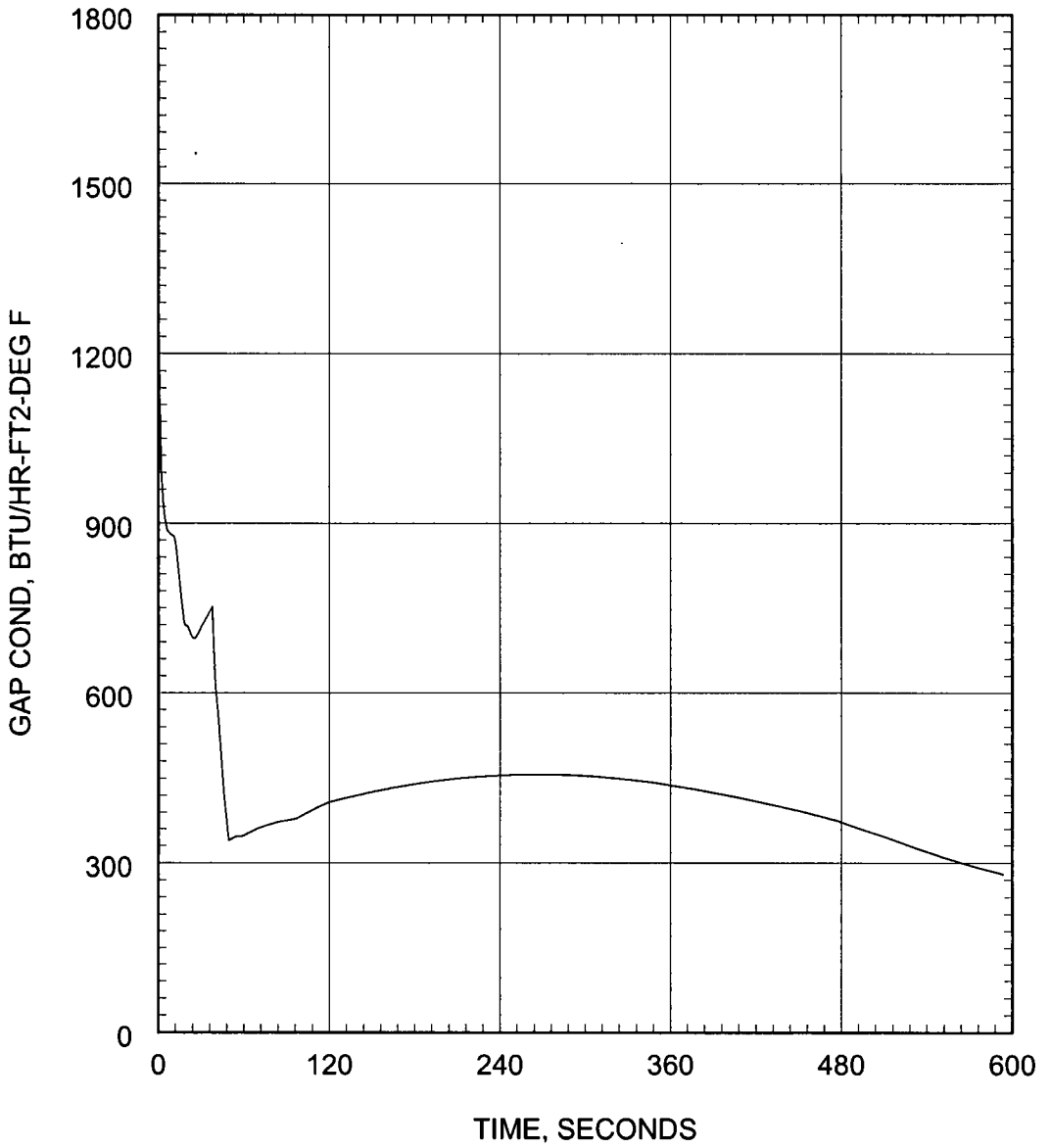

Figure-34
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Maximum Local Cladding Oxidation Percentage

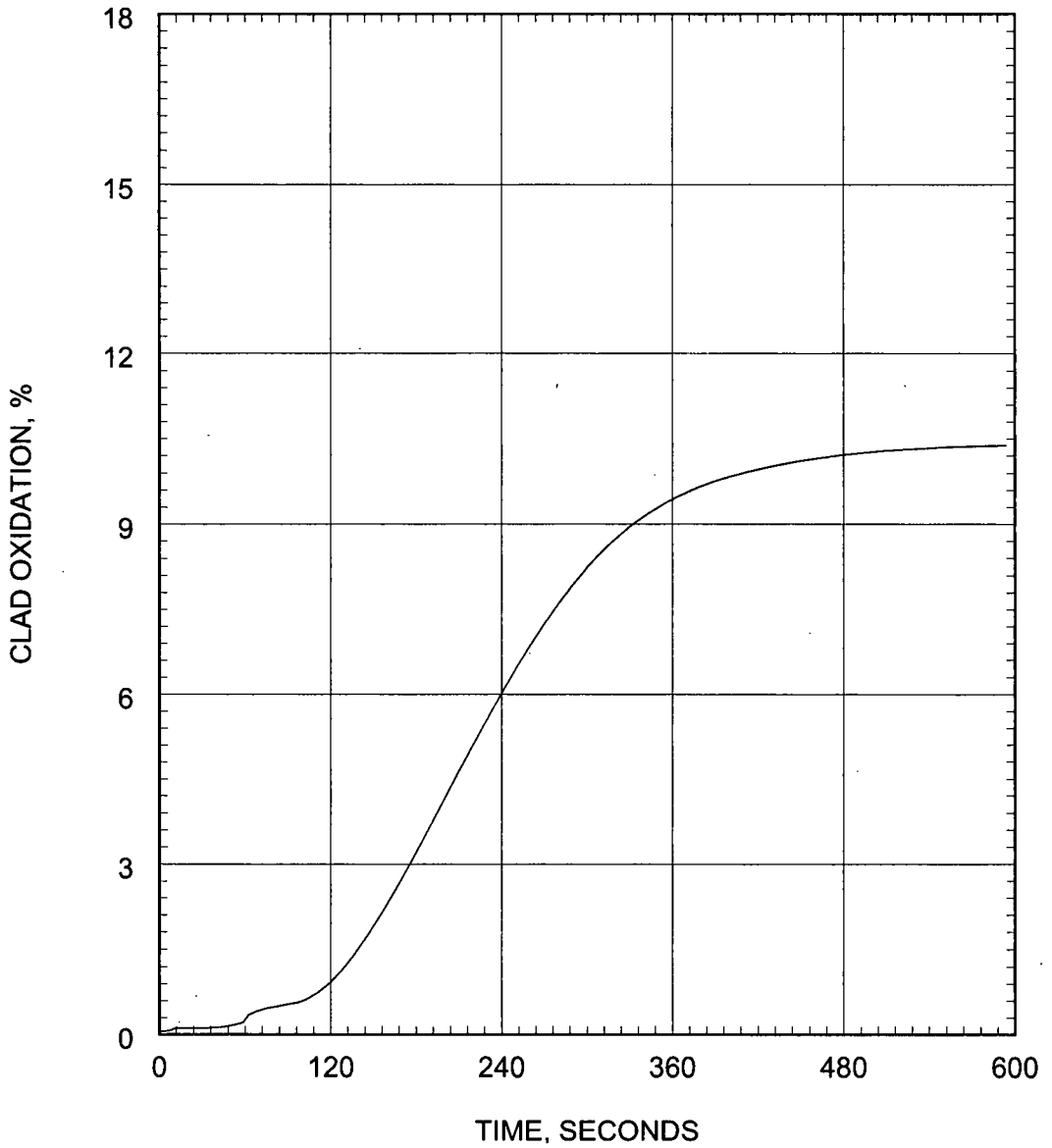

Figure-35
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Fuel Centerline, Fuel Average, Cladding, and Coolant Temperature at the Hot Spot

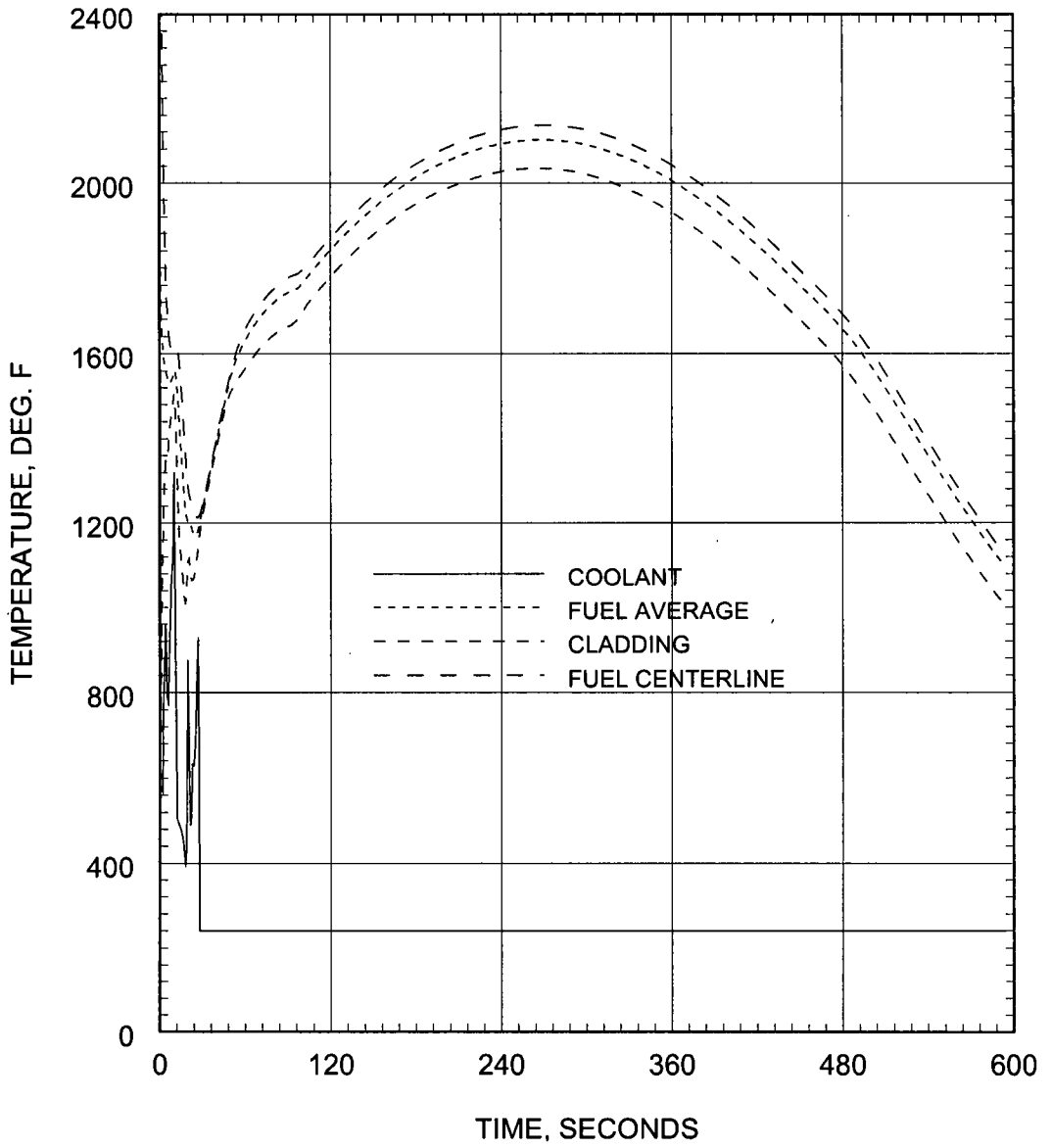

Figure-36
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Hot Spot Heat Transfer Coefficient

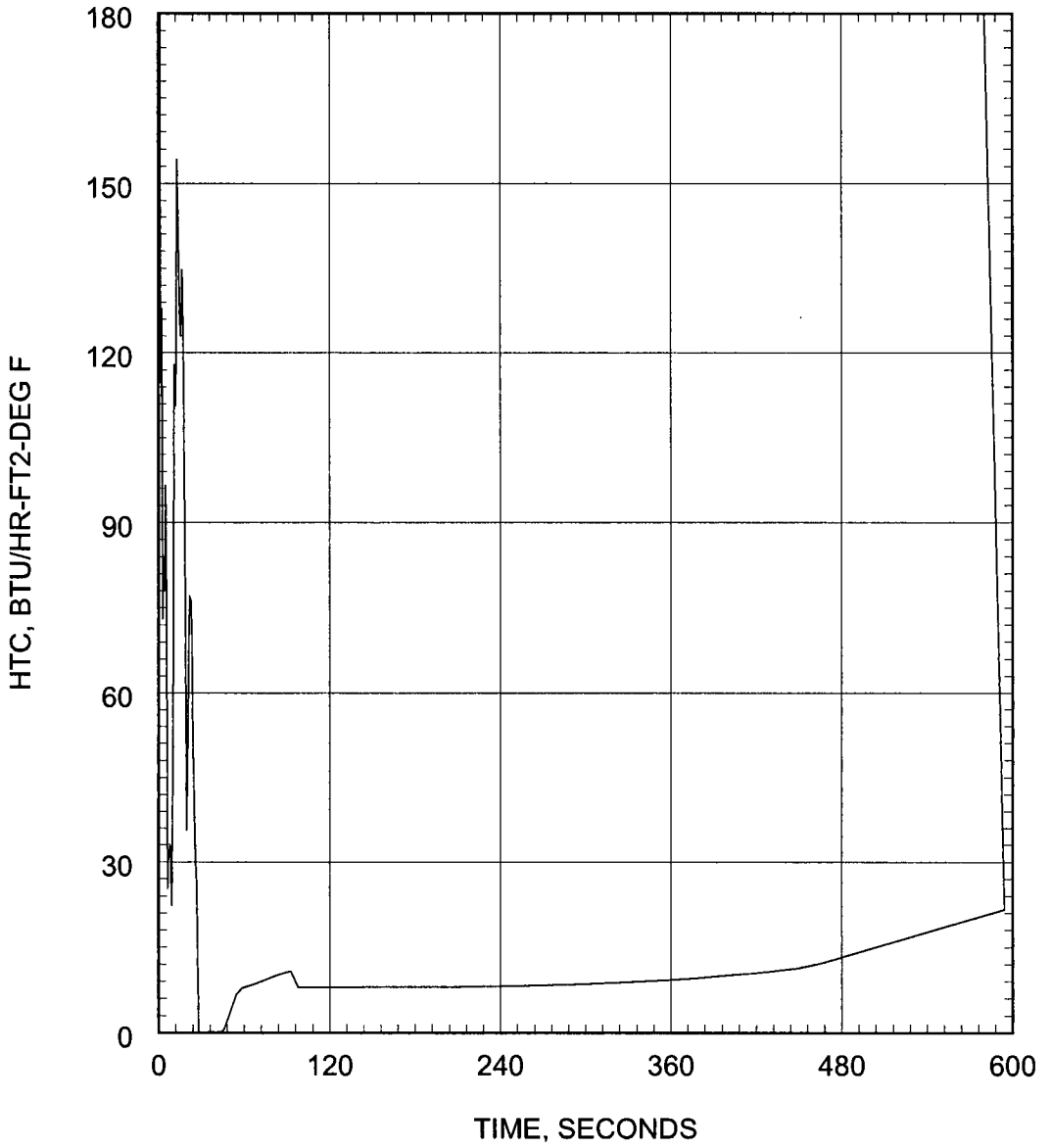

Figure-37
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Hot Rod Internal Gas Pressure

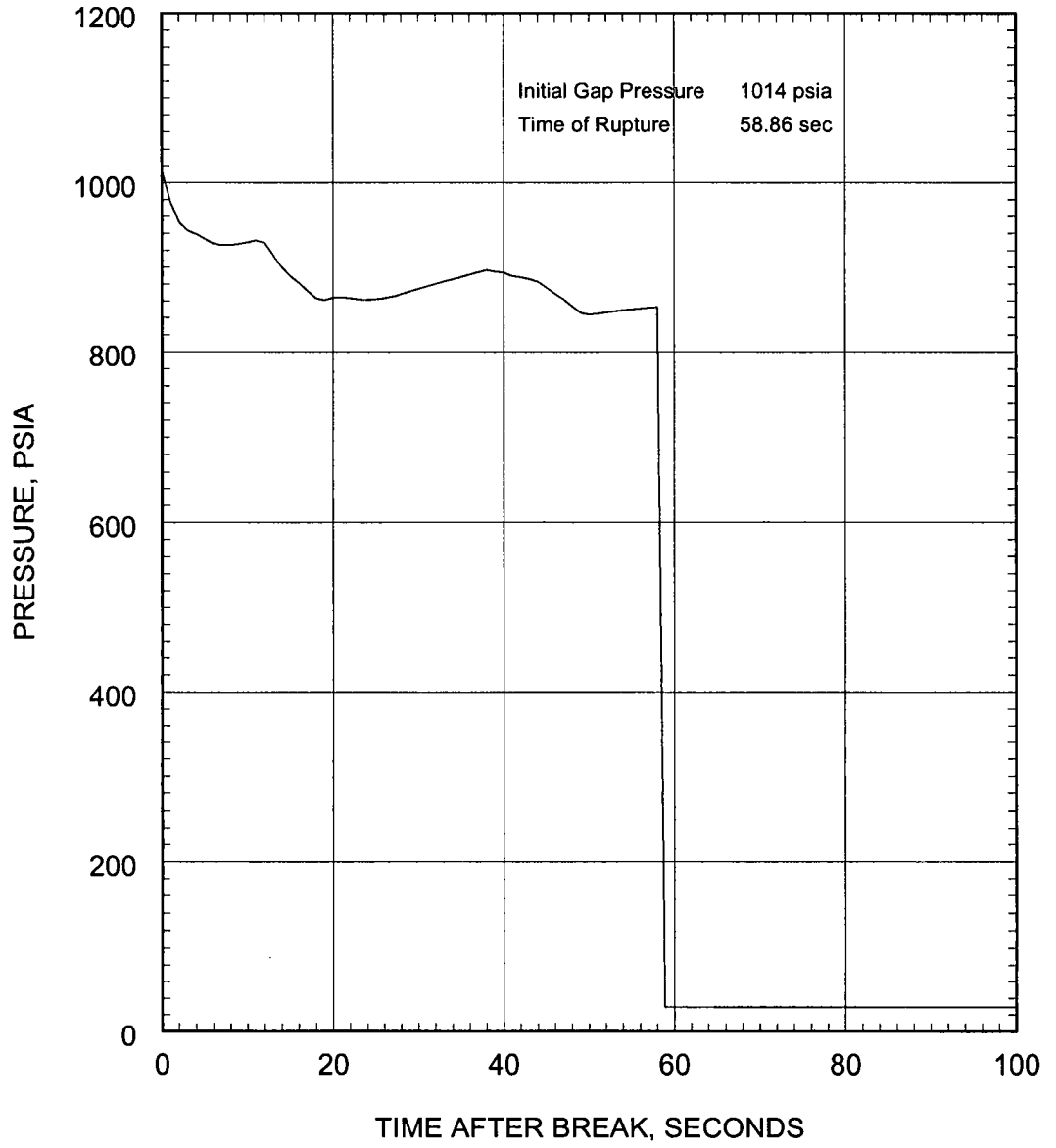

Figure-38
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.6 DEG/PD Break
Core Bulk Channel Flow Rate

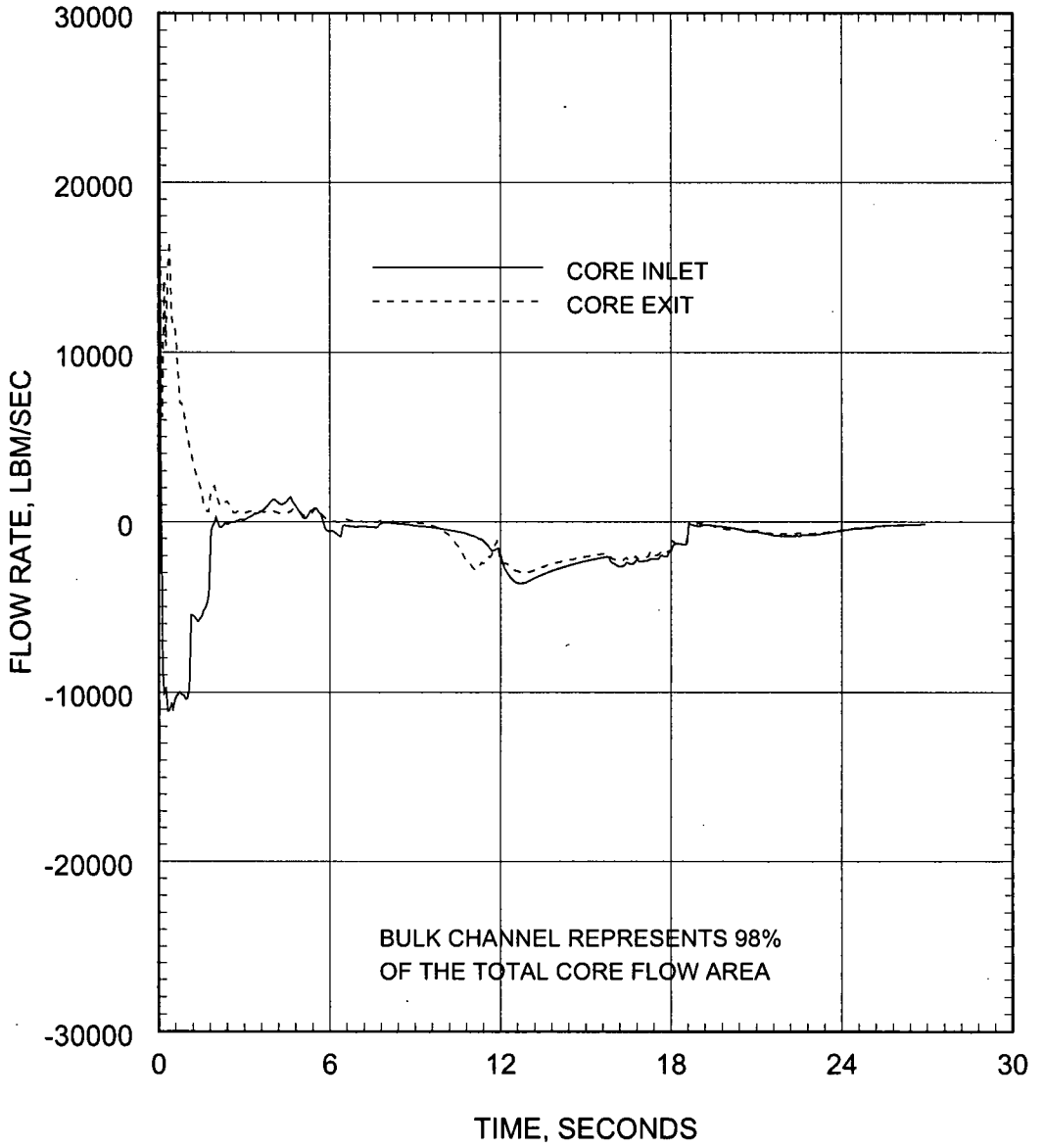

Figure-39
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Core Power

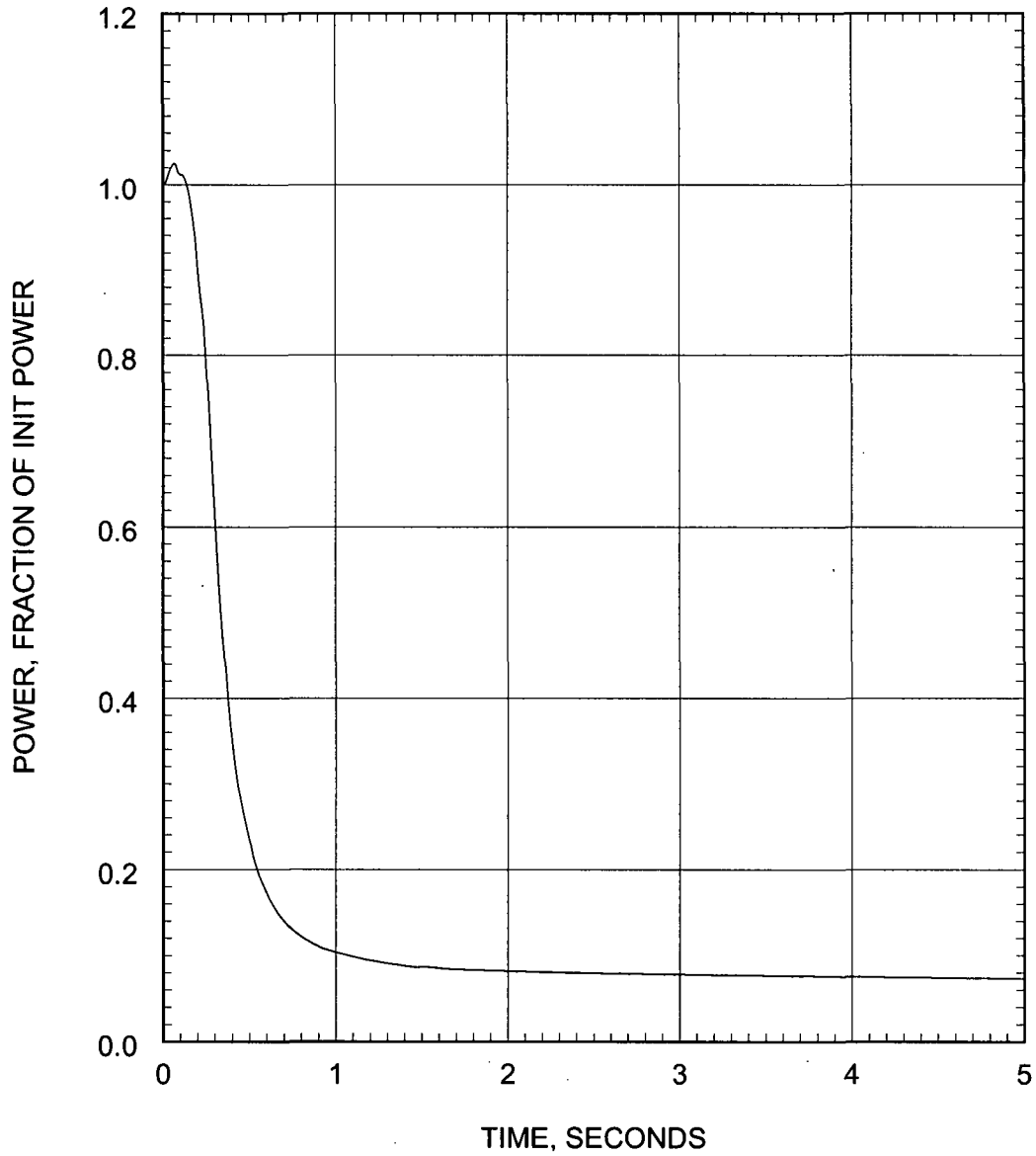

Figure-40
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Pressure in Center Hot Assembly Node

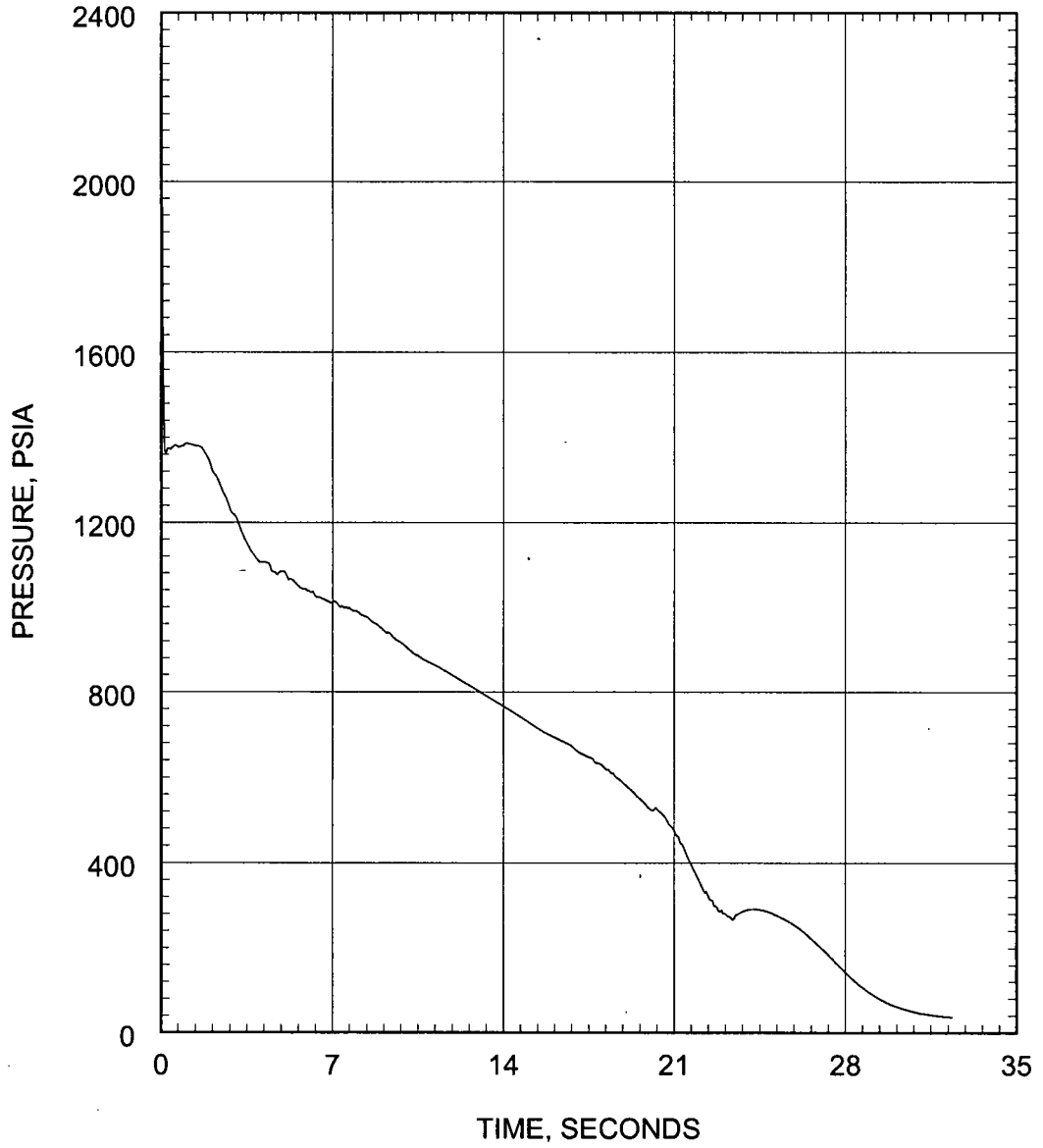

Figure-41
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Break Flow Rate

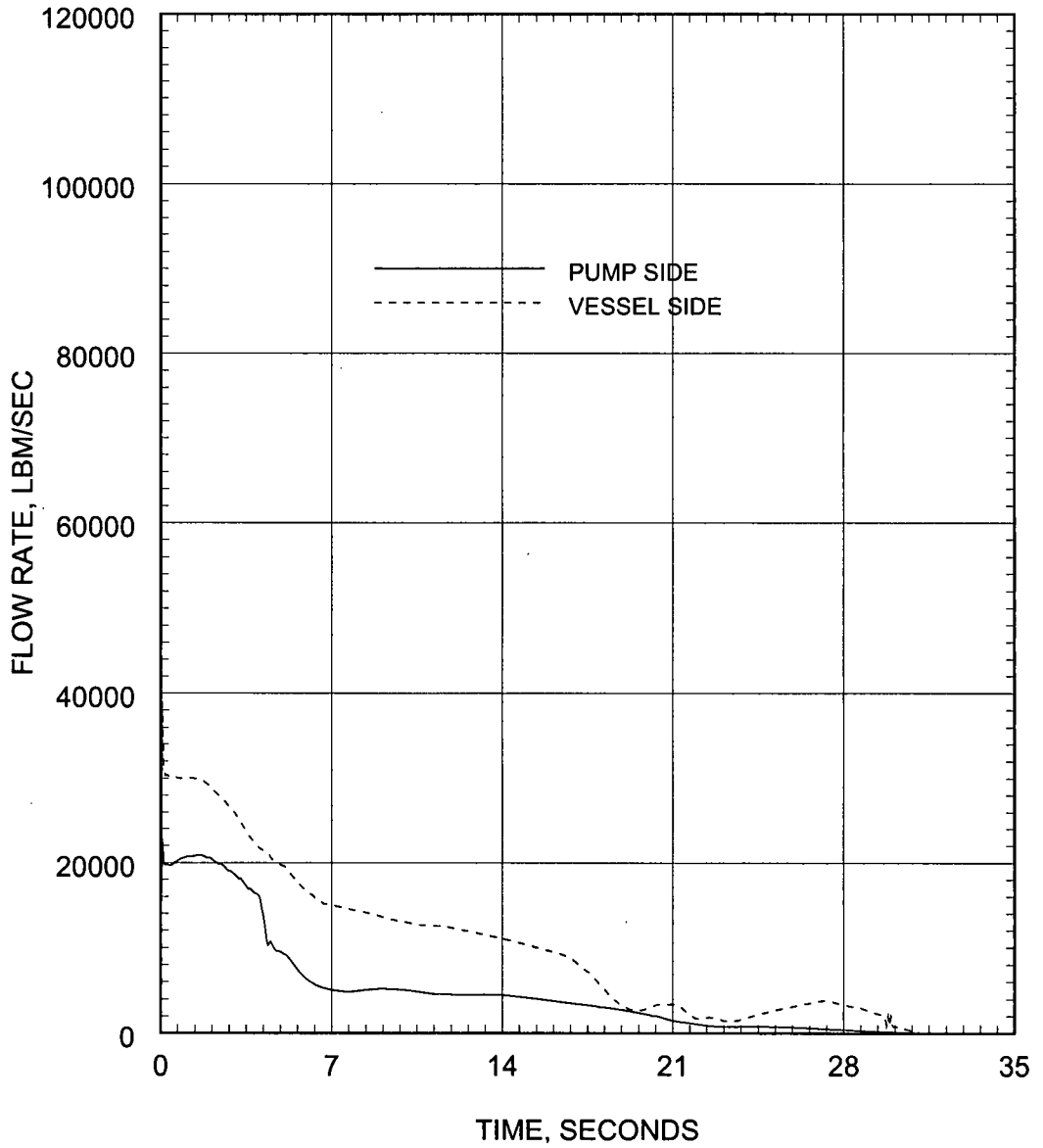

Figure-42
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Hot Assembly Flow Rate (Below Hot Spot)

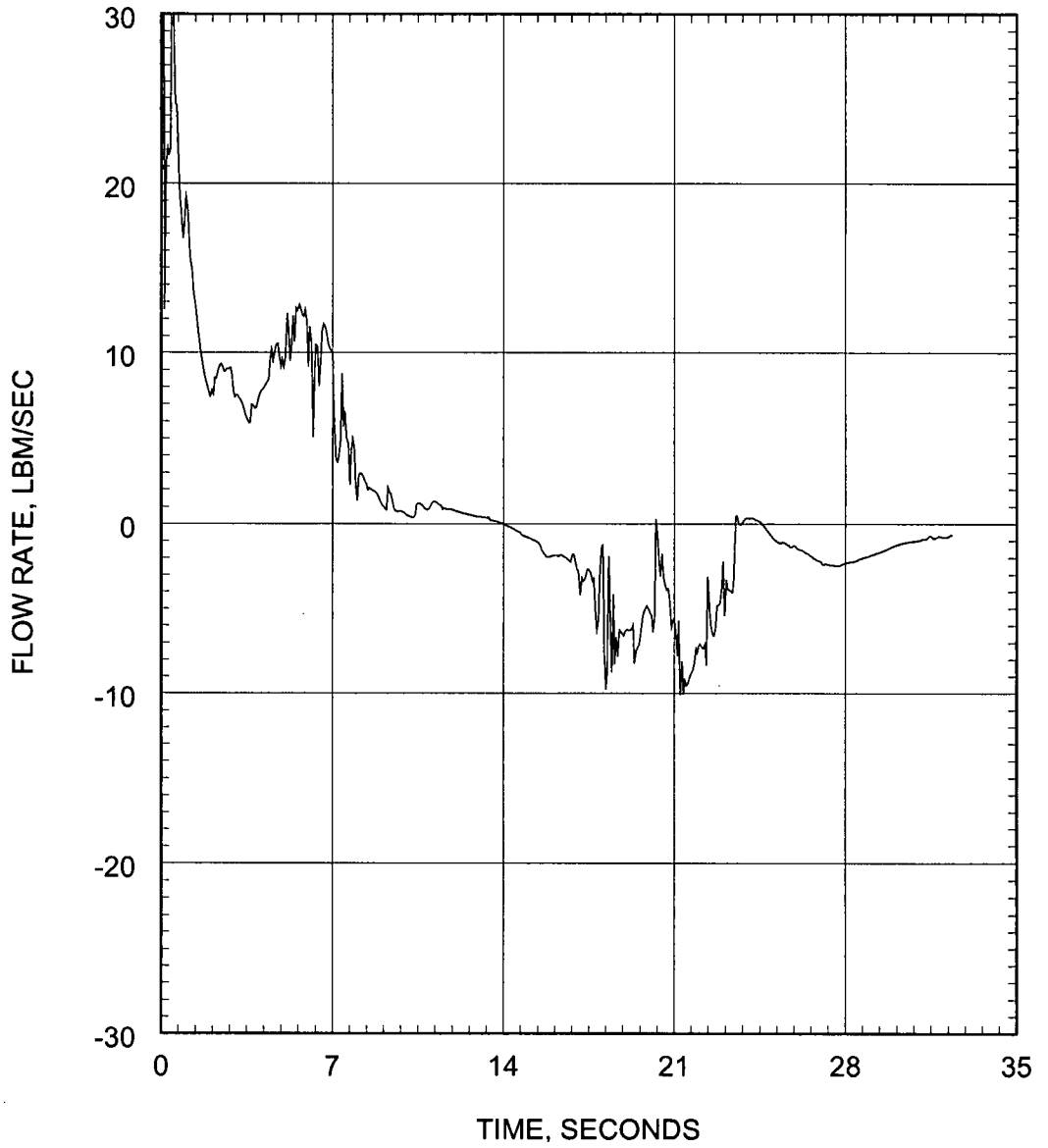

Figure-43
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Hot Assembly Flow Rate (Above Hot Spot)

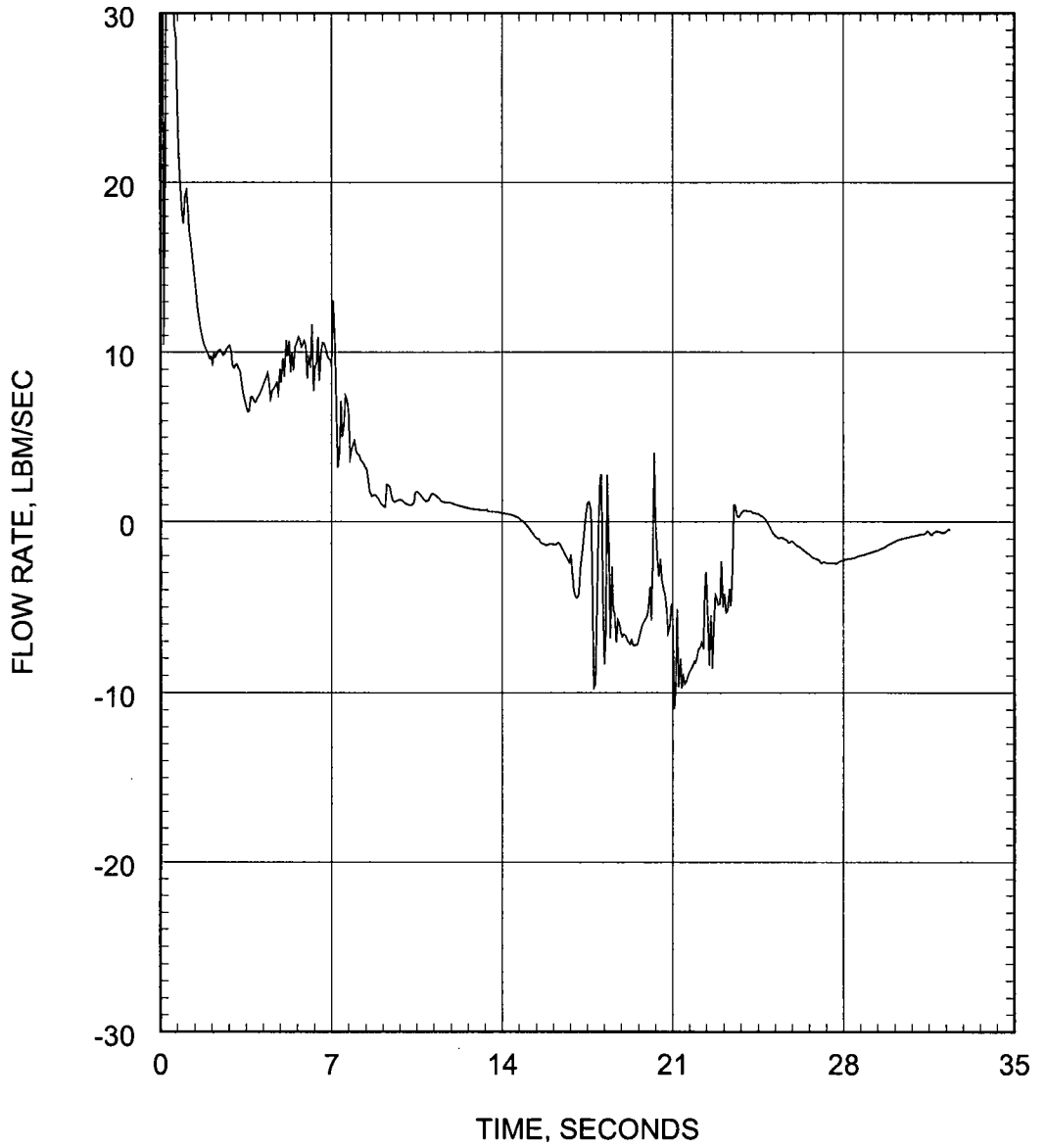

Figure-44
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Hot Assembly Quality

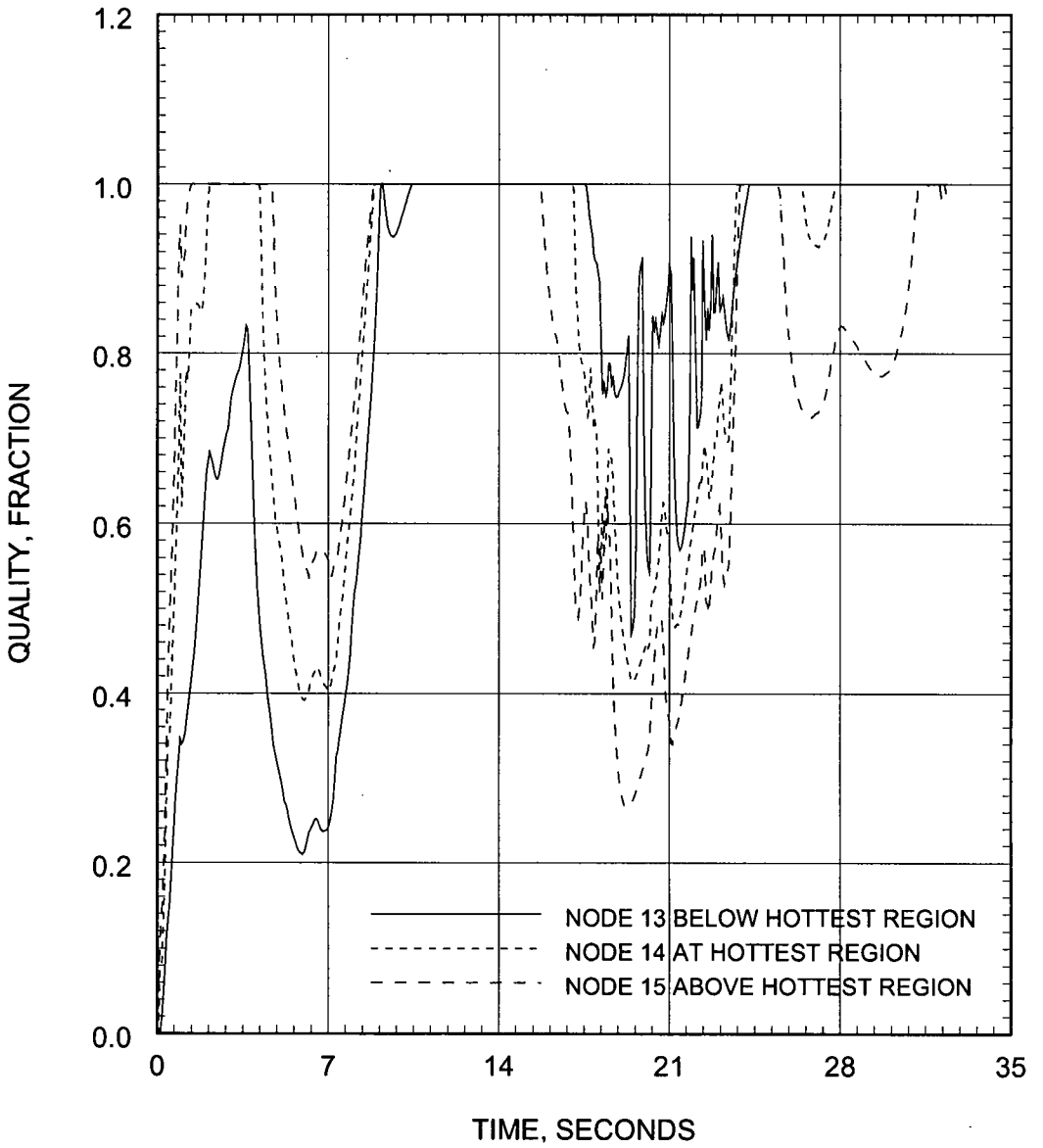

Figure-45
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Containment Pressure

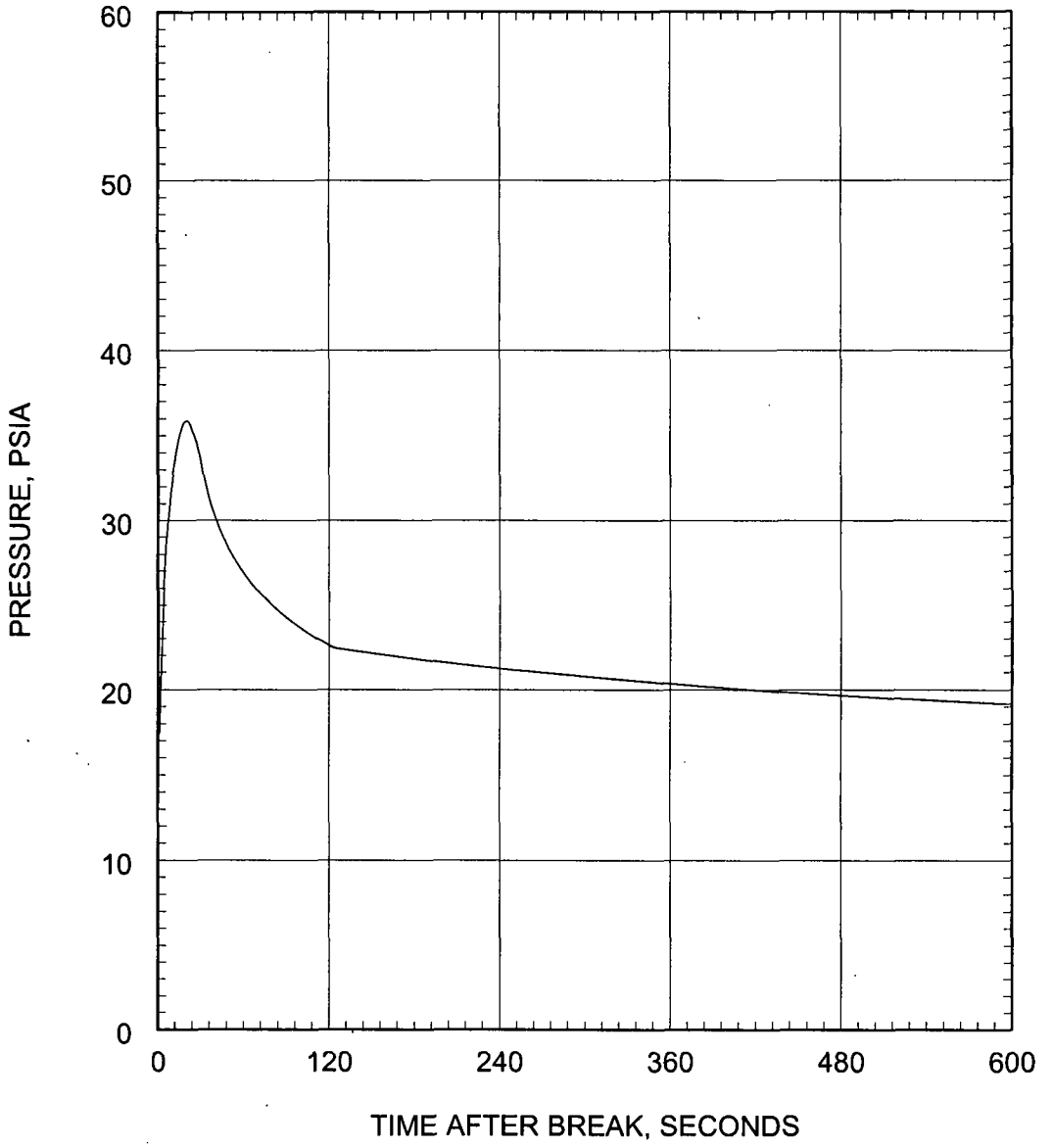

Figure-46
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Mass Added to Core During Reflood

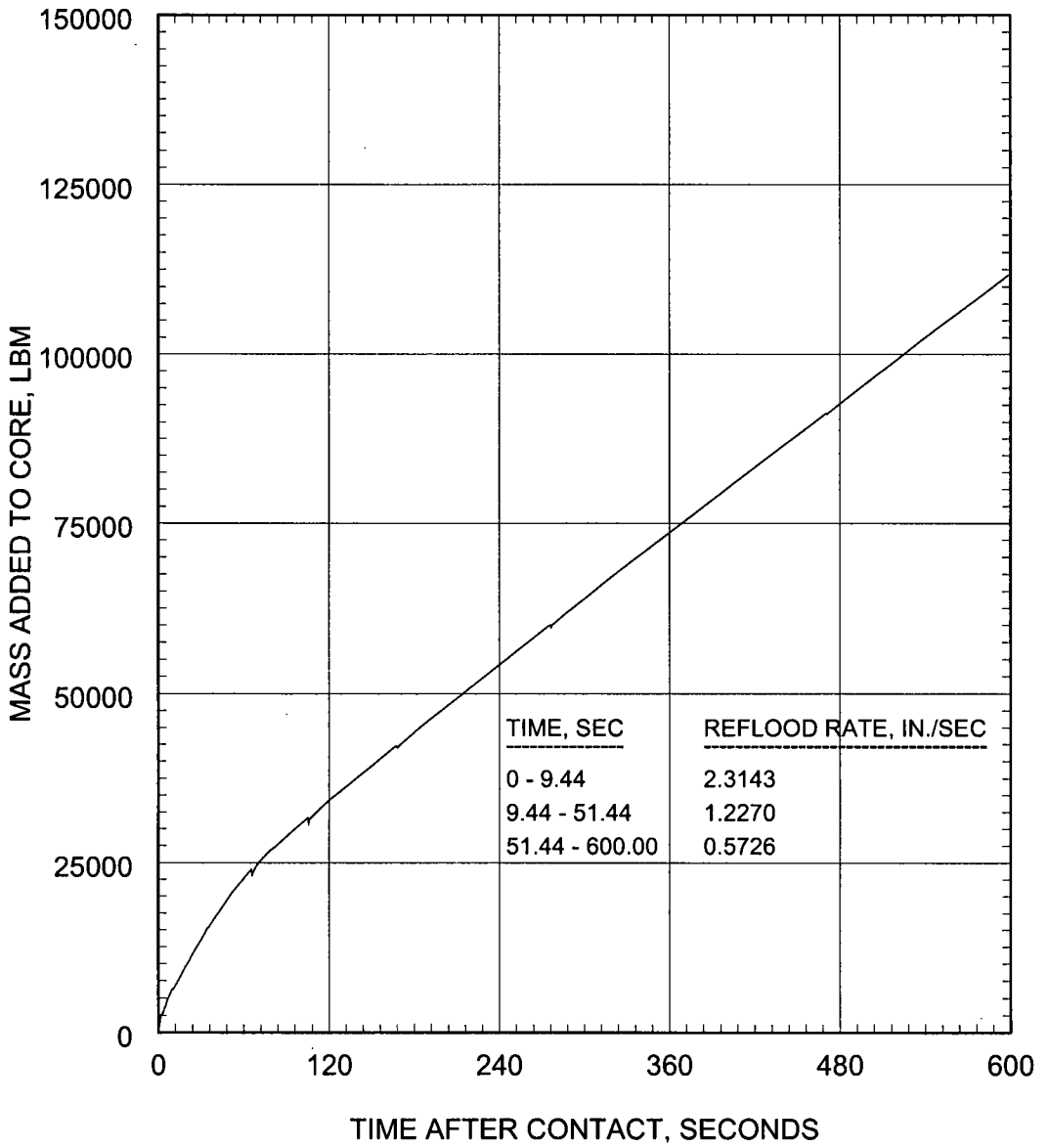

Figure-47
Large Break LOCA ECCS Performance for Limiting Seismic Loads Analysis
0.4 DEG/PD Break
Peak Cladding Temperature