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M. S. Tuckman
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November 10, 1999

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

ATTENTION: Document Control Desk

Subject: McGuire Nuclear Station
Docket Numbers 50-369 and 50-370

Catawba Nuclear Station
Docket Numbers 50-413 and 50-414

Topical Report DPC-NE-3004P, Revision 1
TAC Nos. MA5511, MA5512, MA5517, M15518

By letter to the NRC dated May 20, 1999 Duke Energy Corporation submitted Topical Report DPC-NE-3004P, "Mass and Energy Release and Containment Response Methodology," Revision 1 for NRC review and approval. In a telephone conference call held on October 14, 1999 the NRC asked two questions that had been identified during the review of this topical report. These questions are stated and answered in the attachments to this letter. Attachment 1 contains a proprietary version of the Duke response. Attachment 2 contains a non-proprietary version.

Some of the information in Attachment 1 is considered proprietary. The proprietary information is that which is indicated by the bold brackets. In accordance with 10CFR 2.790, Duke Energy Corporation requests that this information be considered proprietary. An affidavit supporting this request is included with this letter.

APOI

If there are any questions or if additional information is needed on this matter, please call J. S. Warren at (704) 382-4986.

M. S. Tuckman

Attachments

xc w/Attachment 2:

L. A. Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30303

Mr. S. M. Shaeffer
NRC Senior Resident Inspector
McGuire Nuclear Station

Mr. D. J. Roberts
NRC Senior Resident Inspector
Catawba Nuclear Station

xc w/Attachments 1 and 2:

Mr. F. Rinaldi, Senior Project Manager
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8 H12
Washington, D. C. 20555-0001

Mr. P. S. Tam, Senior Project Manager
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
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AFFIDAVIT

1. I am Executive Vice President of Duke Energy Corporation; and as such have the responsibility for reviewing information sought to be withheld from public disclosure in connection with nuclear power plant licensing; and am authorized on the part of said Corporation (Duke) to apply for this withholding.

2. I am making this affidavit in conformance with the provisions of 10CFR 2.790 of the regulations of the Nuclear Regulatory Commission (NRC) and in conjunction with Duke's application for withholding, which accompanies this affidavit.

3. I have knowledge of the criteria used by Duke in designating information as proprietary or confidential.

4. Pursuant to the provisions of paragraph (b)(4) of 10CFR 2.790, the following is furnished for consideration by the NRC in determining whether the information sought to be withheld from public disclosure should be withheld.

   (i) The information sought to be withheld from public disclosure is owned by Duke and has been held in confidence by Duke and its consultants.

   (ii) The information is of a type that would customarily be held in confidence by Duke. The information consists of analysis methodology details, analysis results, supporting data, and aspects of development programs relative to a method of analysis that provides a competitive advantage to Duke.

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(Continued)

(iii) The information was transmitted to the NRC in confidence and under the provisions of 10CFR 2.790, it is to be received in confidence by the NRC.

(iv) The information sought to be protected is not available in public to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this November 10, 1999 submittal is that which is marked in the proprietary version of the response to NRC questions on Duke Topical Report DPC-NE-3004, Revision 1, "Mass and Energy Release and Containment Response Methodology." The information contained in this topical report enables Duke to simulate the response of an ice condenser containment design to a high-energy line break inside containment.

(vi) The proprietary information sought to be withheld from public disclosure has substantial commercial value to Duke.

(a) It allows Duke to reduce vendor and consultant expenses associated with supporting the operation and licensing of nuclear power plants.

(b) Duke intends to sell the information to nuclear utilities, vendors, and consultants for the purpose of supporting the operation and licensing of nuclear power plants.

(c) The subject information could only be duplicated by competitors at similar expense to that incurred by Duke.

M. S. Tuckman

(Continued)

5. Public disclosure of this information is likely to cause harm to Duke because it would allow competitors in the nuclear industry to benefit from the results of a significant development program without requiring commensurate expense or allowing Duke to recoup a portion of its expenditures or benefit from the sale of the information.

M. S. Tuckman

(Continued)

M. S. Tuckman, being duly sworn, states that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth within are true and correct to the best of his knowledge.

M. S. Tuck
M. S. Tuckman, Executive Vice President

Subscribed and sworn to before me this 10TH day of November, 1999

Mary P. Nelms
Notary Public

My Commission Expires:
JAN 22, 2001

SEAL

bxc:

<u>w/Attachments 1 and 2:</u>
G. B. Swindlehurst
L. B. Jones
M. T. Cash
K. L. Crane
G. D. Gilbert
K. E. Nicholson
T. K. Pasour (2)
J. S. Warren
ELL

Attachment 2

Non-Proprietary Version

Response to NRC Questions Regarding DPC-NE-3004, Revision 1

1. Regarding the language in the final paragraph of pg. A-1 of the DPC-NE-3004 revision:

   "This separation provides for finer nodalization detail within the ice condenser region without the addition of <u>excessive</u> lower inlet door or drain junctions."

   It is not clear from the wording if the intended meaning is an excessive number of junctions, or if it is in reference to some other attribute of a junction.

<u>Response</u>

The intent of the word "excessive" is in reference to the number of junctions used to model the ice condenser lower inlet doors and drains. It is judged that the current number of junctions modeling the lower inlet doors and drains is sufficient to capture the thermal-hydraulic behavior following a high energy line break in this region of containment.

2. The proposed renodalization could affect the code's ability to estimate the thermal-hydraulic response of the ice condenser. In order to conclude that the potential effects of renodalization are acceptably small, it would be useful to have a comparison of the pressure / temperature response of the ice condenser / containment system for selected DBA scenarios.

<u>Response</u>

The following figures show the effects of the renodalization in the ice condenser region. The transient analyzed is a cold leg pump discharge large break LOCA, the same event that is described in the peak containment pressure analysis of Section 6.2.1 of the McGuire UFSAR. The magnitude of the effect of the differences of the nodalization shown in the following figures is expected to be typical of other applications of the model.

- Figure 2-1: Lower containment pressure
- Figure 2-2: Sump temperature (RHR heat exchanger inlet)
- Figure 2-3: Lower containment temperature
- Figure 2-4: Ice condenser lower inlet doors – total flow
- Figure 2-5: Total ice melt
- Figures 2-6, 2-7, 2-8: Ice volume fractions above break location

The containment pressure prediction (Figure 2-1) demonstrates that there is very little difference in the pressure response between the GOTHIC analyses with the original model and the model with the finer nodalization in the ice condenser region. The model with the finer nodalization in [ ] of the ice condenser region gives a containment peak pressure that is about 0.3 psi higher than the original model. Both models result in peak pressures below the containment design pressure of 15 psig.

The sump (residual heat removal heat exchanger inlet) temperature (Figure 2-2) illustrates very similar profiles between the two models. It should be noted that the model with finer nodalization gives a sump temperature about 0.5°F lower than the original model.

The lower containment temperature (Figure 2-3) again demonstrates that there are no substantial differences between the GOTHIC models. The model with the finer nodalization gives an average lower containment temperature which is about 5–10°F warmer than the original model from the period from about 1000 – 3000 seconds. However, this temperature difference decreases to 0–2°F at about the time of ice meltout.

The ice condenser lower inlet door flow (Figure 2-4) is shown to examine the reason for the difference in lower containment average temperature. This figure illustrates the total vapor flows [ ]

The plot of total ice mass (Figure 2-5) shows that there is no significant difference in this parameter for the analyses performed with the two GOTHIC models. The largest difference between the two cases for the total ice mass at any point in the transient is about 15,000 lbm, or about 1.4% at that particular point in time. For most of the transient, the difference is less than 1%. It is apparent that the differences in lower containment temperatures and ice condenser door flows illustrated in the previous two figures have no significant impact on the overall prediction of ice melt.

The next three figures (Figures 2-6, 2-7, 2-8) illustrate the ice volume fraction for the lowest three elevations in the ice condenser, for the channel located directly above the assumed break location. In these figures, the ice volume fraction for [ ] in the original ice condenser model (shown with a heavy black line) is compared with the ice volume fraction for the corresponding nodes [ ] in the model with the finer nodalization. These locations are the exact spots where the finer nodalization is introduced in the ice condenser calculational mesh. Refer to Figure 2.3.2-1 and Figure A-1 from the proposed Appendix A to DPC-NE-3004-PA for the exact locations of these nodes within the ice condenser model. In Figures 2-6, 2-7, and 2-8, the ice volume fraction starts at [ ] for all nodes. This value represents a fully loaded ice basket, with a total analyzed ice mass for the entire ice condenser that is consistent with the minimum allowable ice mass per the McGuire technical specifications.

As shown in Figure 2-6, for the lowest nodes locating directly above the assumed break location, the ice melts [ ]

[ ]

It is concluded that there may be variations in localized ice melt patterns between the models due to different flow patterns prevailing at various times in the transient, but that the total ice mass and overall pressure / temperature response for the ice condenser containment is nearly identical for the original GOTHIC model and the finely nodalized model.

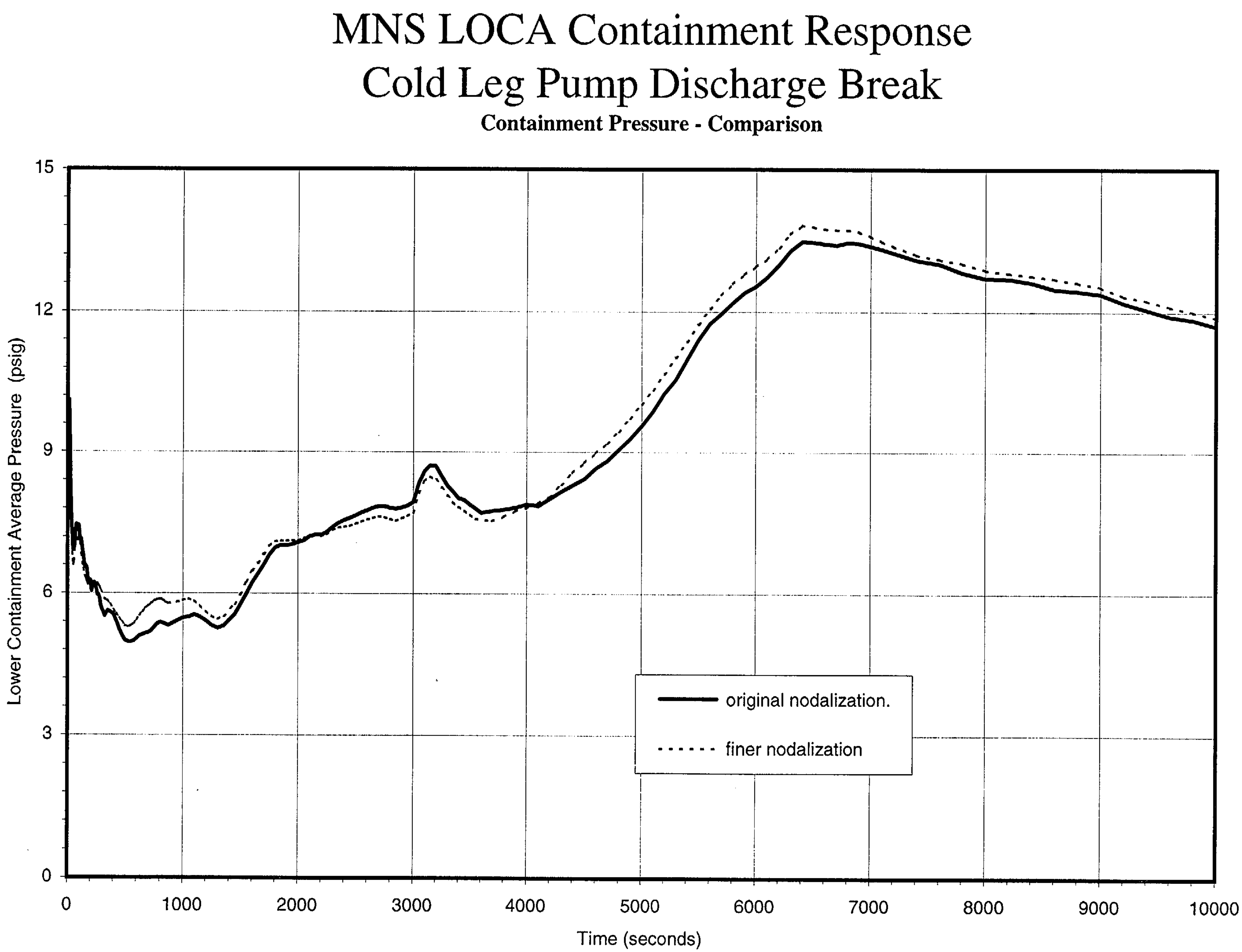
MNS LOCA Containment Response
Cold Leg Pump Discharge Break
Containment Pressure - Comparison
Lower Containment Average Pressure (psig)
0
3
6
9
12
15
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Time (seconds)
original nodalization.
finer nodalization

FIGURE 2-1

MNS LOCA Containment Response
Cold Leg Pump Discharge Break

Sump (NDHX Inlet) Temperature - Comparison

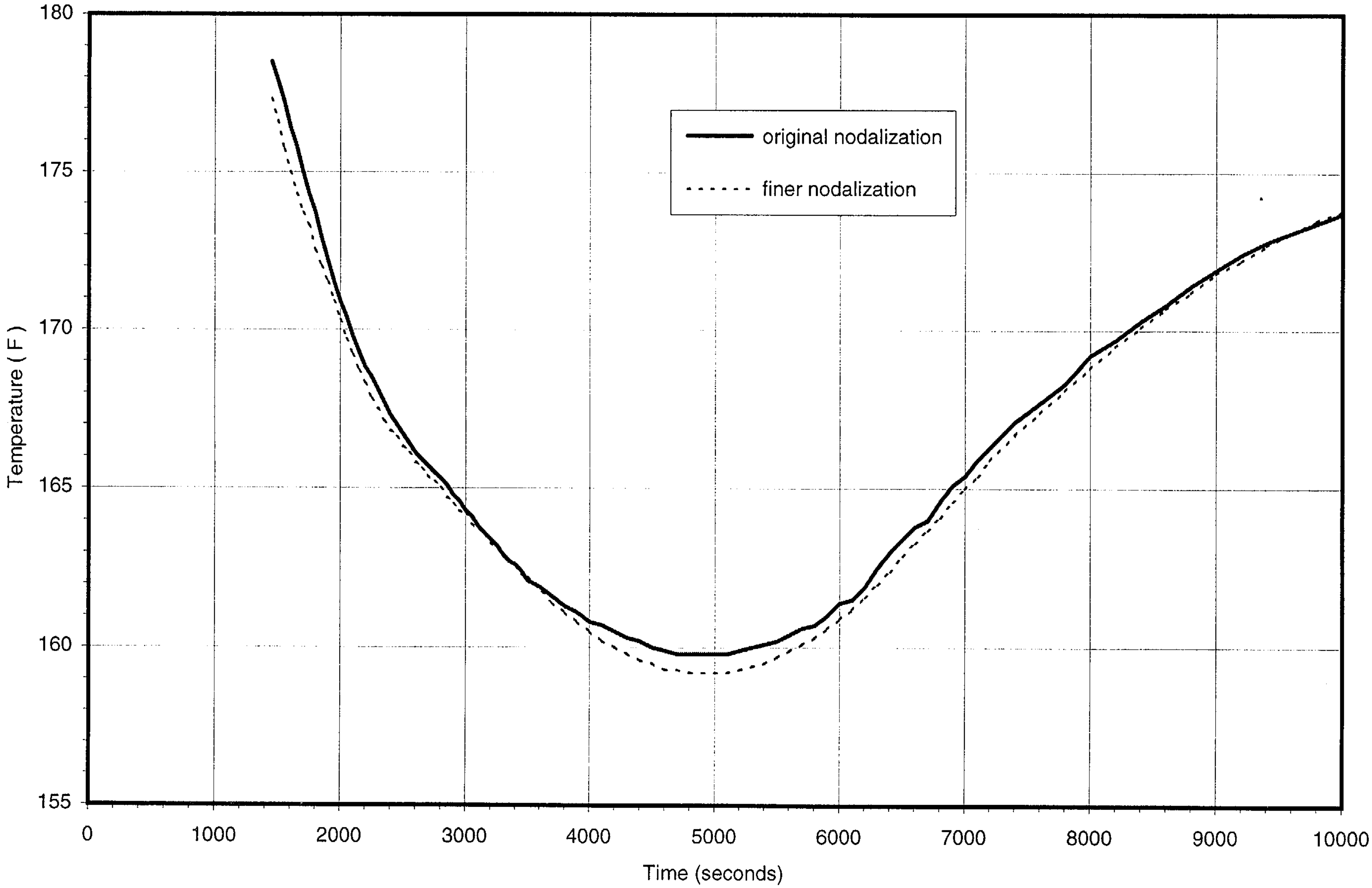

FIGURE 2-2

MNS LOCA Containment Response
Cold Leg Pump Discharge Break
Lower Containment Temperature - Comparison

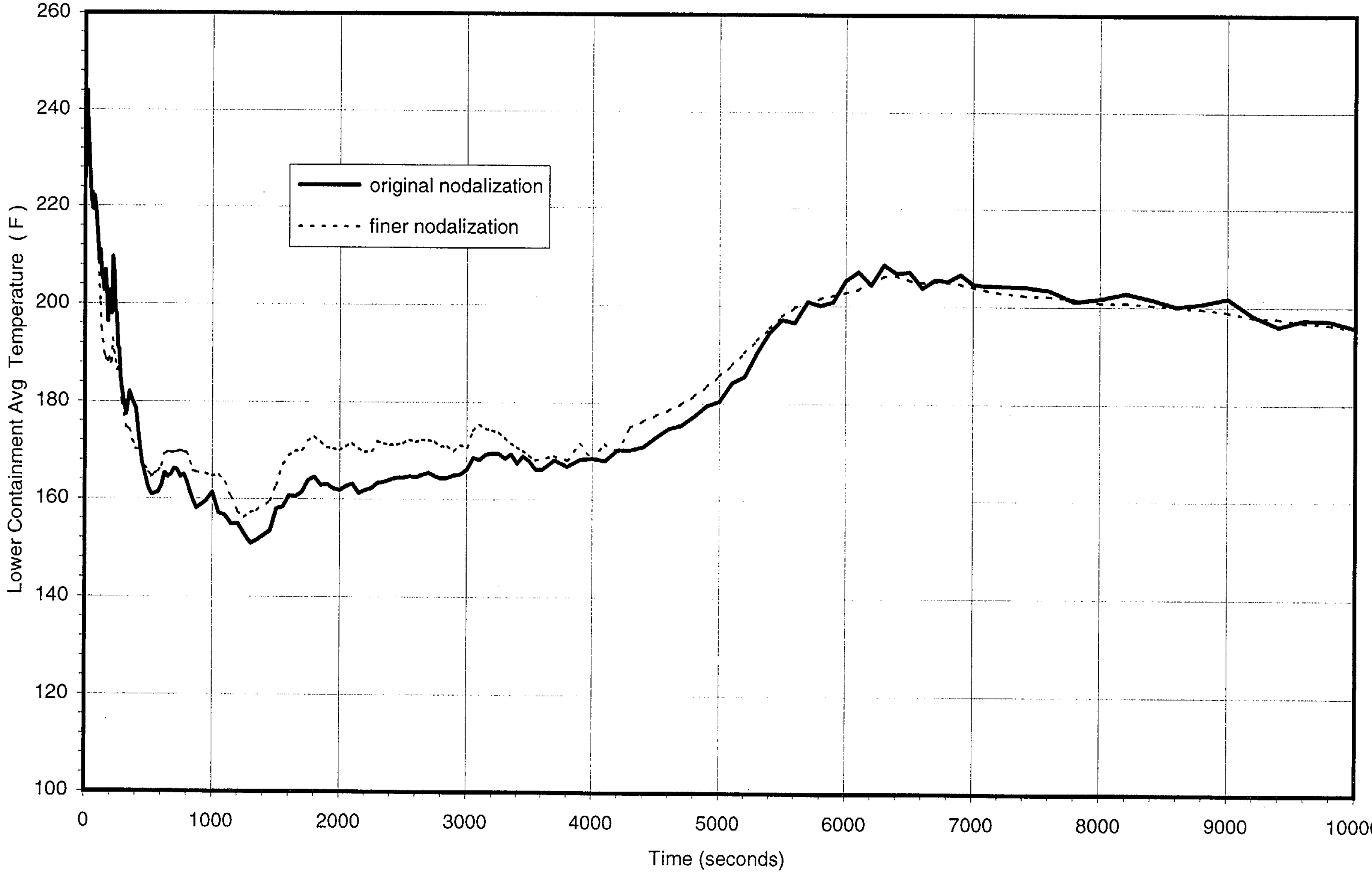

FIGURE 2-3

MNS LOCA Containment Response
Cold Leg Pump Discharge Break

[

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FIGURE 2-4

MNS LOCA Containment Response
Cold Leg Pump Discharge Break

Ice Mass Melted - Comparison

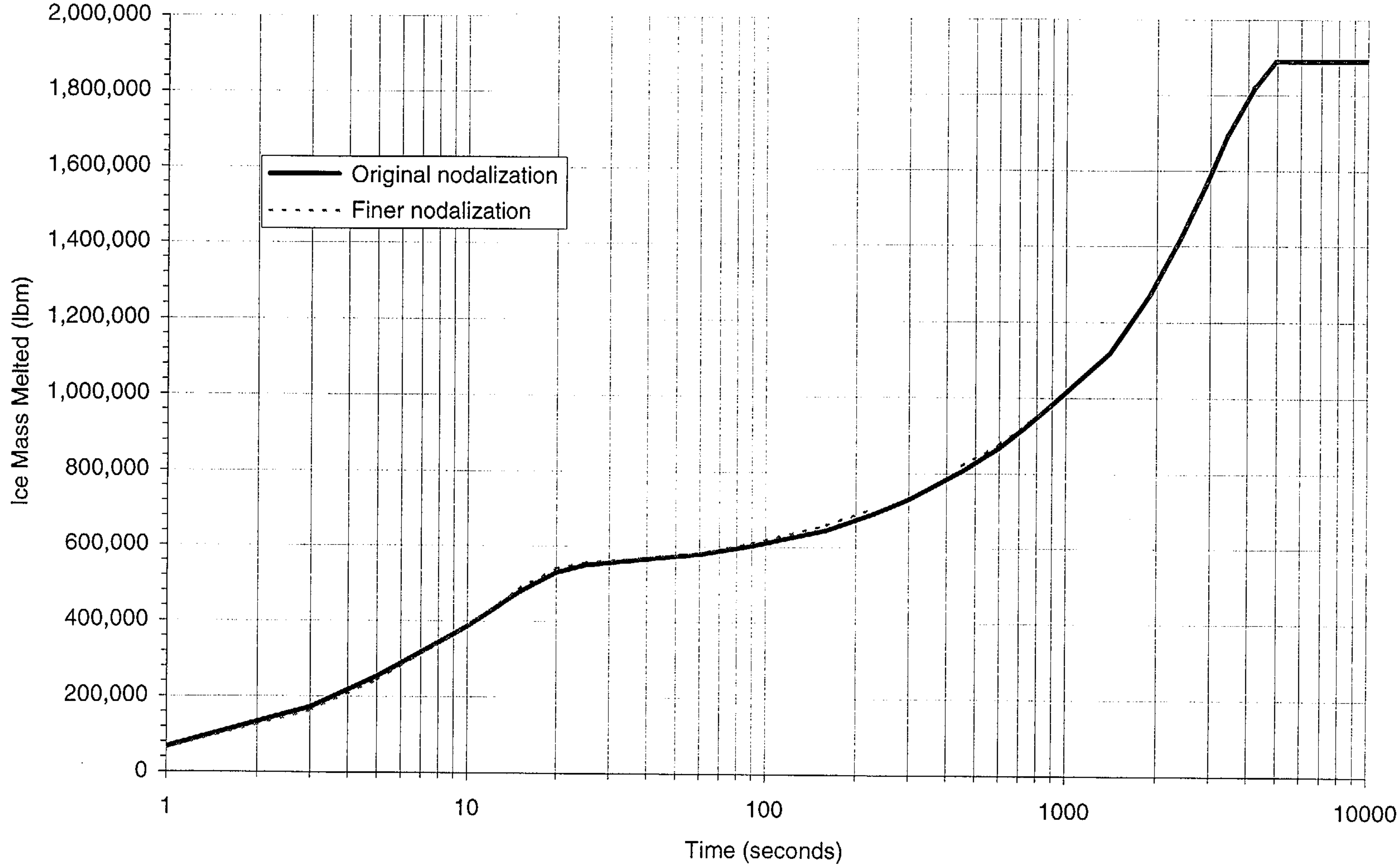

FIGURE 2-5

MNS LBLOCA
Ice Volume Fractions in sector above break

FIGURE 2-6

MNS LBLOCA
Ice Volume Fractions in sector above break

FIGURE 2-7

MNS LBLOCA
Ice Volume Fractions in sector above break

[ ]

FIGURE 2-8