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ComEd

March 22, 1996

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: LaSalle County Nuclear Power Station Units 1 and 2
Submittal of Additional Information discussed during Conference Calls Regarding Modifying the Main Steamline Tunnel Automatic Isolations
NRC Docket Nos. 50-373 and 50-374

References:

1. G. Benes letter to U. S. NRC, dated January 18, 1996, LaSalle Submittal Regarding Main Steamline Tunnel Leak Detection Isolations

2. G. Benes letter to U. S. NRC, dated March 1, 1996, ComEd Response to NRC Staff Request for Additional Information

Reference (a) provided LaSalle Station's proposal for revising the Technical Specification requirements for the Main Steamline Tunnel Automatic Isolations. Reference (b) provided ComEd's response to the NRC staff request for additional information. The purpose of this letter is to provide additional information that was discussed during conference calls between NRR and ComEd on March 14, 1996, March 20, 1996 and March 22, 1996.

The original Significant Hazards Consideration, that was included in the Reference (a) submittal, remains valid.

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If there are any further questions or comments concerning this letter, please refer them to me at (815) 357-6761, extension 3600.

Respectfully,

for R E. Querio
Site Vice President
LaSalle County Station

cc: H. J. Miller, NRC Region III Administrator
P. G. Brochman, NRC Senior Resident Inspector - LaSalle
D. M. Skay, Project Manager - NRR
Office of Nuclear Facility Safety - IDNS
Central file

Attachment A

During the 3/14/96 Telecon with the NRC, ComEd was asked to address two areas of concern. (1) Is it possible to keep the high temperature automatic isolation function, based on the 100 gpm leak value, without requiring heroic operator actions on loss of Reactor Building Ventilation (VR), to prevent a Group 1 Main Steam Line Isolation and unit SCRAM? (2) Will the changed Technical Specification values jeopardize the environmental qualification of any equipment in the MST?

With respect to the use of a high temperature isolation signal we had reviewed many alternatives and we have revisited the issue. The following is a summary of our findings.

- The VR system provides ventilation to the entire reactor building and exhausts through the MST. During normal operation with VR running, the upper MST temperature sensors will have initial temperatures between 93°F and 137°F with design inlet temperatures of 65°F and 110°F respectively (Attachment 1). A 100 gpm leak would produce temperatures of 151°F and 183°F for the winter and summer design inlet cases respectively (Attachment 1). The temperature error band for the temperature instruments is approximately ± 15°F. This is based on the following factors: reference accuracy of the thermocouples, reference accuracy of the Riley temperature modules, resistance drop of the thermocouple extension wire, calibration errors of the measuring and test equipment and of the standard reference that they are calibrated against, setting tolerance, power supply effects, and drift error. This would cause a conservative set point for the High Temp to be 136°F during the winter (low VR design inlet temperature) condition and a set point of 168°F during the summer (high design VR inlet temperature) condition.

- Using different setpoints in the summer and winter has been considered but found to be undesirable. The reason for this is that the units rarely operate at either extreme of inlet temperatures and that operating at any point in between the extremes would require resetting of the setpoints. This would challenge the operators and would increase the opportunity for failure. Based on this we evaluated using a single setpoint based on either the winter condition, the summer condition or an average condition.

- <u>Winter Condition Setting</u>
  A winter setting would be based on a 100 gpm leak, 151°F (Attachment 1) minus 15°F (instrument error band) for a 136°F setpoint. If VR is lost (assuming no leakage) a 136°F setpoint is reached in about 2½ minutes (Attachment 2) on a summer day (95°F inlet temperature.) On a winter day (81°F

inlet) the operators would have about 6 minutes (Attachment 3) to respond. These times would still require heroic operator actions. It should also be noted that the 136°F setpoint is less than the 137°F caused by a 110°F design inlet temperature. Thus operation in extreme summer conditions, even with VR operable, would not be possible.

- <u>Summer Condition Setting</u>
  A summer setting, based on a 100 gpm leak, would be 183°F (Attachment 1) minus 15°F (instrument error band) for a 168°F setpoint. If VR is lost during the summer, the operator would have about 7 minutes) for operator action (Attachment 2 adjusted by +15°F for the 110°F design VR inlet condition.) This would still require heroic operator actions. During the winter, this setpoint may not detect leaks until they were in the range of 140 gpm to 175 gpm depending on the instrument error band. This would not be conservative with respect to the 100 gpm criterion.

- <u>Average Condition Setting</u>
  An average condition setting (based on 95°F VR inlet) would start with 174°F (Attachment 1) minus 15°F (instrument error band) for a 159°F setpoint. If VR is lost during an average day (95°F VR inlet) the operators would have to take actions within 15 minutes to prevent an unnecessary plant SCRAM. This is still considered too short of a time for this event since situation analysis, as well as other activities associated with the loss of VR, are occurring at the same time. More importantly, for the design 110°F VR inlet condition, the operators would have only about 3 minutes to take action. This is based on adding 15°F (the difference between the 95°F VR inlet condition and the 110°F VR inlet condition) to the Attachment 2 curve. For the 65°F design VR inlet condition, a leak of about 115 gpm (Attachment 4) could exist before an automatic isolation occurred. This would not be conservative with respect to the 100 gpm criterion.

- <u>30 Minute Condition</u>
  We also considered a setpoint based on ensuring the operators have a minimum of 30 minutes before taking required action after a loss of VR. This setpoint would start with 166°F (from Attachment 2) add 15°F for the instrument error band and add another 15°F for the 110°F design inlet condition. This would give a setpoint of 196°F. During the winter design conditions no isolation would occur until the leak was greater than 200 gpm (Attachment 4 extrapolation). Again, this would not be conservative with respect to the 100 gpm criterion.

- Given the above summary of our evaluations, we determined that the high temperature setpoints that could be implemented would be either too high to be meaningful, or too low to preclude heroic actions. Therefore, our analysis resulted in utilization of only a high Differential Temperature (ΔT) isolation. Overall safety is improved by not challenging the unit with the pressure and reactivity transient resulting from spurious MSIV closure with the resulting SCRAM that may be caused by not having a "redundant" temperature based system.

- While we are proposing that the High Temperature automatic isolation be eliminated, that does not mean there is no practical upper limit to the temperature in the MST. Since our upper design basis VR inlet temperature is 110°F, and we are requesting a 65°F ΔT isolation, we do not expect to operate above 175°F in the MST with the VR system operable.

- Even though we are proposing the elimination of the High Temperature as an automatic isolation, High Temperature setpoints will be used as alarms and will enhance the existing procedure to search for a leak during normal VR system operation. In addition to monitoring MST temperature and ΔT, Operators monitor MST sump activity indications, Main Condenser Makeup flowrates and radiation monitors for "redundant" indications of MST steam leakage.

With respect to effects on the Environmental Qualification (EQ) of equipment in the MST, we have the following findings.

- Although there will be no trip for the condition of MST high temperature, a control room alarm will be initiated on the high temperature which will initiate Operator action to monitor the MST for steam leakage. Evaluation of impact to EQ life on equipment is made by Engineering based on the MST temperature profile over time.

- Since our upper design basis VR inlet temperature is 110°F, and we are requesting a 65°F ΔT isolation, we do not expect to operate above 175°F in the MST with the VR system operable. This is below our current EQ evaluation temperature of 200°F for the MST. On loss of VR we monitor MST temperatures and engineering evaluation will be made as required.

Attachment B

The following are responses to the questions presented by the NRC during the 3/20/96 telecon.

Question 1

Describe the 8/25/95 and 12/15/95 events.

Response 1

Attachment 2 and 3 indicate the upper MST temperature response following a loss of VR for the subject dates. VR was manually secured on both of these dates for planned surveillance testing. The data was collected for use on this project.

Question 2

Why did the 8/16/95 event result in a SCRAM even though the operators installed jumpers?

Response 2

The root cause of the MSIV isolation and subsequent SCRAM is believed to have been caused by the operator not fully depressing the Division 2 isolation reset pushbutton. This resulted in not resetting the Division 2 isolation logic following installation of the bypass jumpers. When the Division 1 signal was received due to high MST temperature, the MSIV's isolated resulting in the SCRAM. Extensive testing ensured the isolation logic had performed as designed. The loss of VR for this event was caused by the loss of the B RPS bus. The MST temperature reached the setpoint of 140°F within seven minutes of the loss of VR. Loss of the B RPS bus requires operator actions on several other systems in addition to responding to the loss of VR.

Question 3

Provide clarification of the VR inlet temperature for the 'Summer Condition Setting' as discussed in the 3/14/96 Telecon.

Response 3

The summer setting would be based on a VR inlet temperature of 110°F. Two different inlet air temperature values, 65°F and 110°F are used to bound the conditions expected year-round. If VR is lost with this inlet temperature, the operator would have about seven minutes to bypass the isolation signal.

Question 4

How was the data from the 8/25/95 event extrapolated?

Response 4

The 8/25/95 data was extrapolated following VR system restart by projecting the response curve from the 12/15/95 event onto the 8/25/95 data curve. This extrapolation should be reasonable for estimating required operator response times. Note that the shape of the 8/25/95 curve and the 12/15/95 curves are identical from the time of initiation until the 8/25/95 event was terminated at the 10 minute mark. The only difference between the two curves is that the 8/25/95 curve is raised by 14°F which corresponds to the difference in VR inlet temperature on those two days.

Question 5

Provide a history of all previous SCRAMS due to MST temperature-high or MST delta-T high isolations for both units. There appears to be some SCRAMS around the time the plants were licensed, and the SCRAM in 1995. Were there others in between?

Response 5

There have been five SCRAMS due to MST temperature or MST delta-T high isolations.

The first event occurred on 7/24/82. The scram was the result of a delta-T high isolation caused by two Main Steam Line drain valves being left open in the MST tunnel following surveillance testing.

The second event occurred on 8/17/82. The scram was the result of a delta-T high isolation caused when the VR system was restarted following maintenance.

The third event occurred on 3/12/83. The scram was the result of a delta-T high isolation caused by running the Primary Containment Ventilation and Purge system with the VR system shutdown. Although the Ventilation and Purge system has its suction at the top of the MST, the capacity of the system was incapable of removing the heat load from the main steam lines. The heat generated from the main steam lines rose to the top of the MST causing a delta-T high isolation.

The fourth event occurred on 2/2/85. The scram was the result of a MST temperature-high isolation caused by the shutdown of the VR system for maintenance on the isolation dampers. Following shutdown of the VR system, the MST temperatures increased to the isolation setpoint.

The last event occurred on 8/16/95. The scram was the result of a MST temperature-high isolation caused by the loss of the VR system and failure to reset the half isolation signal following bypass jumper installation.

Attachment 5 documents seventeen events where the VR system isolated with the affected unit in operation. Although none of these VR isolations were planned, none of the events resulted in a MSIV isolation and SCRAM. (Heroic actions were typically the reason for SCRAM avoidence.)

Question 6.(a)

Discuss the engineering solutions (changes in design) that were considered to resolve the problem vs. removing the MST temperature-high isolation.

Response 6.(a)
Many changes in the design were considered in addition to the elimination of the MST temperature-high isolation. Some of them are total solutions, while others only help ameliorate the problem.

Response 9 to the ComEd RAI, G. Benes letter to the USNRC dated 3/1/96, discusses the design changes that are being made in conjunction with the elimination of the temperature-high isolation.

Other design changes that were considered, but rejected include:

- Reroute the Reactor Building Ventilation (VR) around the MST. This would make the MST a low flow area where local cooling could be used with only a small ventilation flow through the MST.

  Reject Reasons
  1) No physical room available to route a duct large enough to handle current MST flow (64,000 CFM.)
  2) VR fans would need to be replaced or modified.
  3) Existing plant configuration not conducive to adding enough local cooling for the MST

- Relocate (lower) the temperature-high detectors to an area that is not affected by the stratification following a loss of VR.

  Reject Reason
  1) A location sufficiently low to be unaffected by the stratification after loss of VR would put it below some of the steam lines. With this configuration, and with the VR flow going up, there is a possibility that a steam leak would not be detected by the temperature-high detector.

- Add local cooling to the steam tunnel without changing the VR configuration and measure either the temperature-high in the MST or measure a delta-T across the cooling coils or between the MST and the Reactor Building.

  Reject Reasons
  1) The amount of cooling required for the 64,000 CFM flow was impractical from the space limitation aspect.
  2) Loss of cooling in the tunnel would cause the same operator problems that currently exist with loss of VR.

- Provide a logic that automatically does the following:
  1) Bypasses delta-T isolation when VR shuts down
  2) Adds a timer for VR restart to allow the MST to equalize temperatures after VR restart
  3) Bypasses the temperature-high isolation when VR is shutdown
  4) Alarm/notify the operator when the bypass is in effect.

  Reject Reasons
  1) The logic would need too many signals to be sure to catch all VR shutdowns.
  2) Some of these signals would be from non-safety related sources.
  3) A false sense of security could be established.

- Develop a logic that uses humidity indication with temperature to determine enthalpy at select locations in the MST. Differential enthalpy could then be used to cause isolation.

  Reject Reason
  1) Measurement of humidity would be unreliable in MST environment.
  2) Unavailability of qualified Safety-Related humidity detectors.
  3) Safety related software to determine enthalpies, compare them to a differential enthalpy setpoint and provide a isolation trip signal could not be located.

Question 6.(b)

In the 1/18/96 submittal, Attachment F, Page F-1, the following statement is made:

> The high temperature channels did not cause much of a problem due to their location in the steam tunnel. VR could be shutdown for several hours without tripping the temperature sensors.

On page F-2 is the statement:

> Since the temperature sensors were relocated, the temperature channels have been a problem on Unit 1.

Why wouldn't restoration of the sensors to their original locations, together with some adjustment of setpoints, solve the problem without removal of the MST temperature-high isolation?

Response 6.(b)

Figure 1 of the the ComEd response to the RAI, G. Benes letter to the USNRC dated 3/1/96, shows the current location of the temperature elements in the U1 MST. Restoring elements 31A and 31D (upper elevation) to the original location in the middle of the MST vertical riser section would reduce the effects temperature stratification has on the elements. This would resolve some of the MST temperature-high isolation problems. However, it would create the problem of these elements not being able to detect all Main Steam line leakage at the elevations above the elements. In order to detect leakage throughout the MST, the MST temperature-high elements have been placed at the upper MST near the exhaust air riser.

Question 7

What is the mass of water in the reactor coolant system?

Response 7

The mass of water in the Reactor coolant system is 6.7E05 lbm as determined from Figure 5.1-2 of the LaSalle UFSAR.

Question 8

What is the flow rate through the reactor water cleanup system?

Response 8

RT system flow is 1.33E05 lbm/hr (UFSAR 5.4.3.1)

Question 9

Is 100% of the condensate passed through CPs?

Response 9

No, CP Flow is 63% of total condensate flow. (CP Flow is ~8.9E06 lbm/hr - UFSAR Figure 10.1-2)

Question 10

What is the main steam mass flow rate?

Response 10

MS system flow is 14.2E06 lbm/hr (UFSAR Figure 10.1-2)

Question 11

Explain the assumptions used for Section 3.3, Iodine 131 Release, of Calculation BSA-L-96-03, Rev. 0.

Response 11

NEDO-10871 was cited in the original calculation as the source for the 700 uCi/sec release of I-131 from the reactor fuel to the reactor water and 2% carry-over to steam; this discussion is also included in the LaSalle UFSAR. (See section 11.1.1.2 and Figure 11.1-3).

The inclusion of ground level release calculations for the postulated steam leak was questioned. These were included by the preparer for information and comparison only. The releases are all via the station stack, an elevated release point.

The UFSAR, Table 11.1-2, lists the LaSalle-specific I-131 design basis concentration of 1.3E-2 uCi/gm in the reactor water; applying the 2% relationship between the concentration of I-131 in reactor water and steam (UFSAR 11.1.1.2) results in an I-131 steam concentration of 2.6E-4 uCi/gm. Using these LaSalle concentrations and the methodology (Equation A-28) of the ComEd Offsite Dose Calculation Manual (ODCM), if a 100 gpm leak persists for an entire year, the resulting thyroid dose rate is 0.16 mrem/year. This is well below the 10CFR20 limit of 100 mrem/year TEDE.

Using the LaSalle concentration of I-131 in steam (2.6E-4 uCi/gm) and the X/Q from ODCM Table F.5a (8.00E-9 s/m**3), results in an offsite concentration of 1.3E-14uCi/ml. This may be compared to the 10CFR20 App. B Table 2 Col. 1 limit of 2.0E-10uCi/ml. The ratio of the concentration calculated to the limit is 6.6E-5.

This alternate assessment is consistent with the previous calculations and shows that a persistent 100 gpm steam leak in the main steam tunnel would result in offsite radiological doses which are well within applicable regulatory limits.

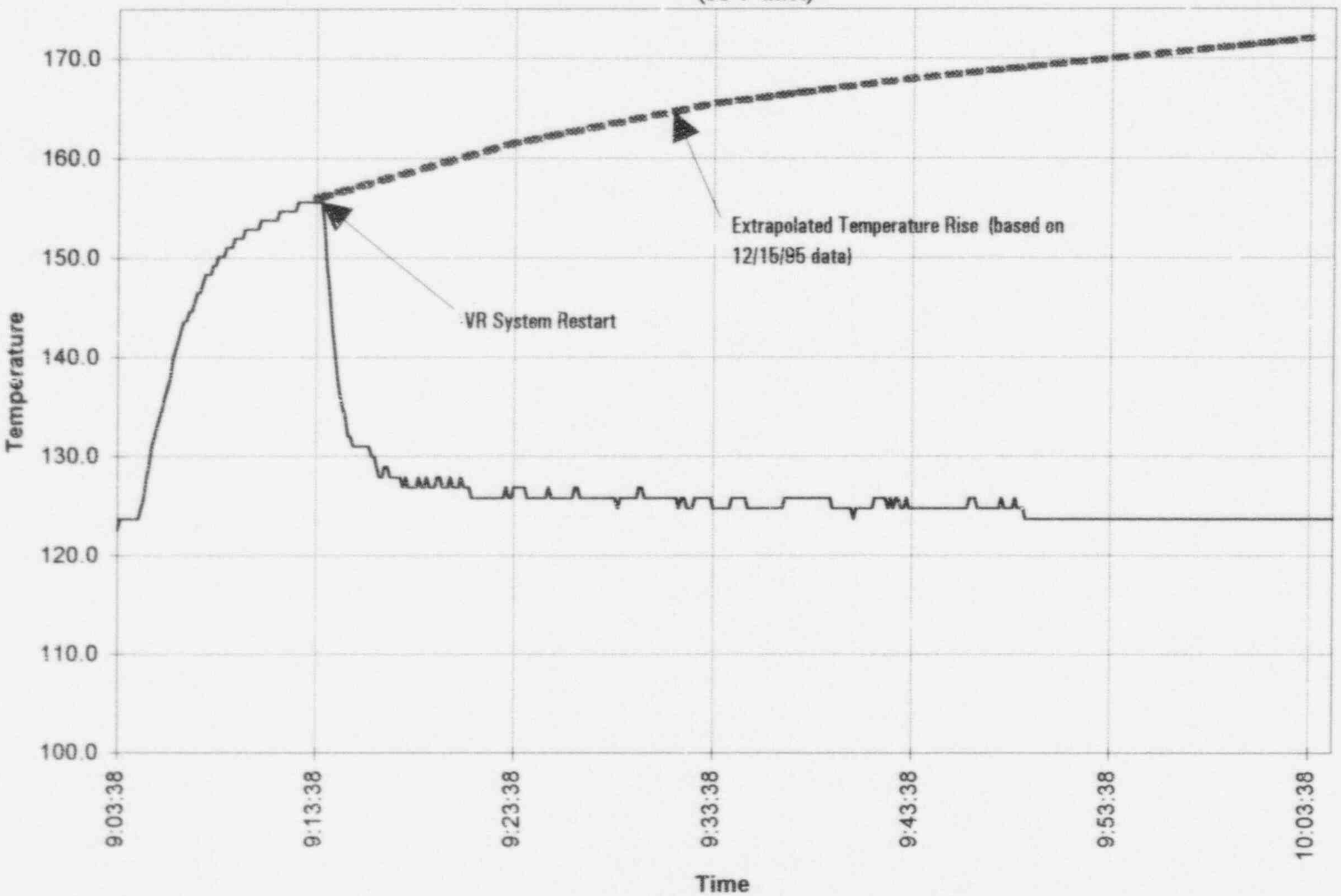
Attachments

1. Table 1 from Calculation BSA-L-95-05, Revision 0, previously submitted with G. Benes to USNRC letter dated 3/1/96
2. Upper MST Temperature following loss of VR on 8/25/95 (95°F VR inlet temperature)
3. Upper MST Temperature following loss of VR on 12/15/95 (81°F VR inlet temperature)
4. Figure 5 from Calculation BSA-L-95-05, Revision 0, previously submitted with G. Benes to USNRC letter dated 3/1/96
5. Table of VR Isolation Events during Candition 1, not resulting in a SCRAM

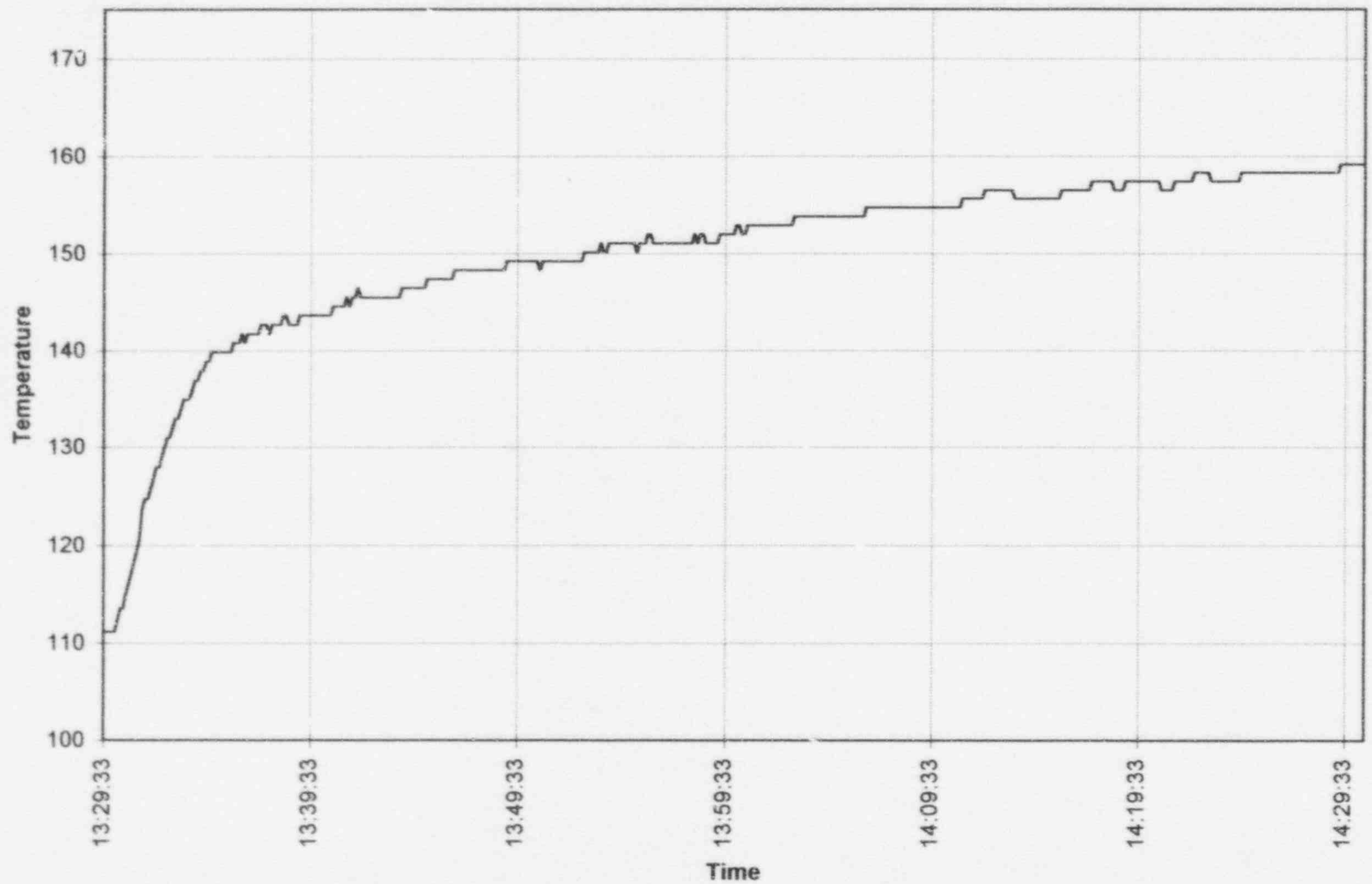
gpm	65 F VR inlet	95 F VR inlet	110 F VR inlet
0	93.2	122.9	137.4
25	104.6	135.7	148.0
75	137.3	161.8	171.8
100	151.3	173.5	182.5
125	164.4	181.9	190.0
175	183.7	201.5	206.4

Table 1: Upper MST Temperature due to Steam Leakage

Attachment 2
Upper MST Temperature
following loss of VR on
8/25/95
(95°F inlet)



Attachment 3
Upper MST Temperature
following loss of VR on
12/15/95
(81°F inlet)



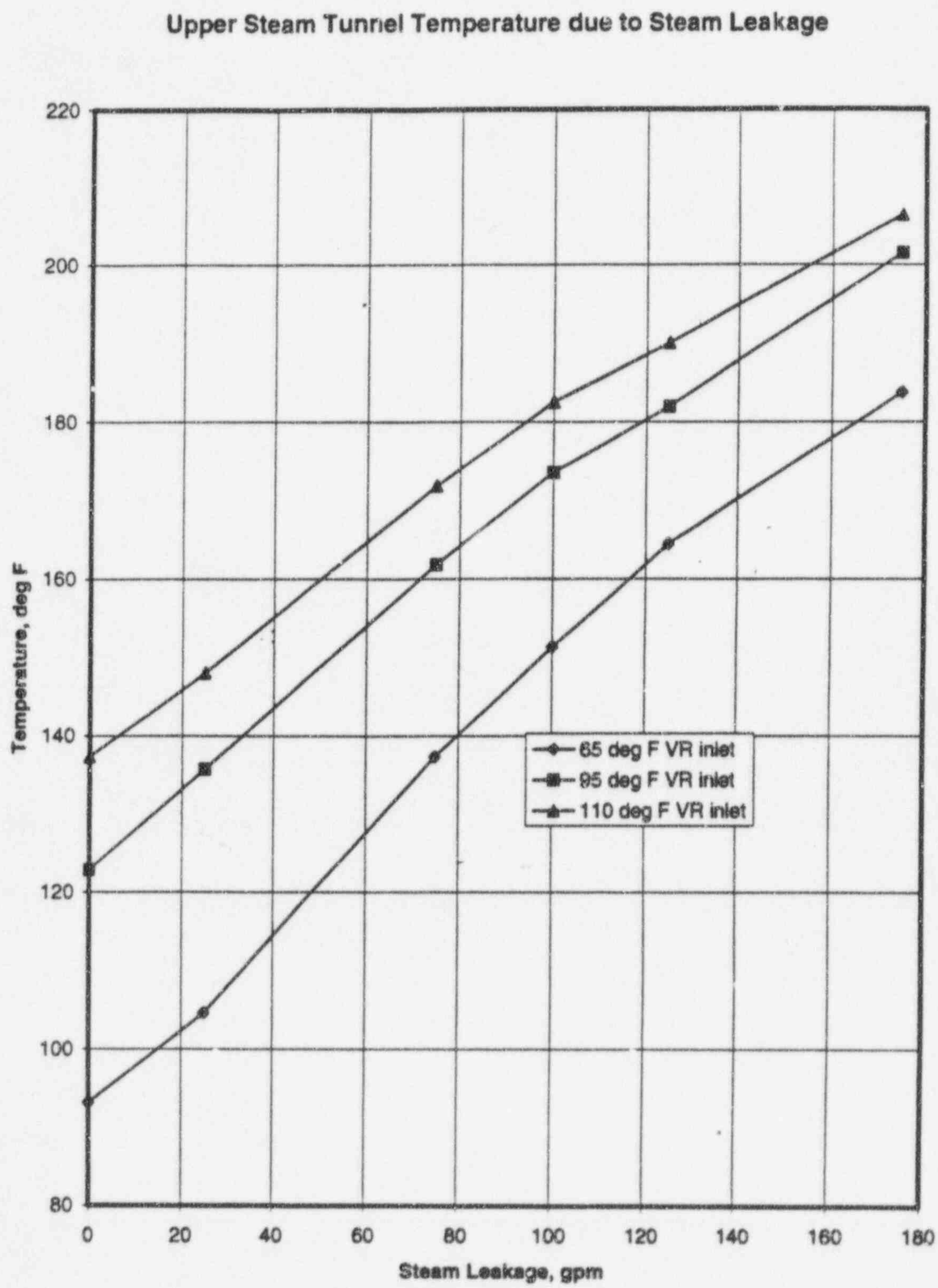


Figure 5: Upper MST Temperature due to Steam Leakage

Attachment 5

Documented isolations of reactor building ventilation (VR) with a unit in Operation Condition 1 (Run) due to unplanned causes which did not result in a reactor scram.

Unit at power	Event Date	Event Description	LER number
2	10/29/84	VR isolated on wrong unit due to operator error.	374-84-072
2	11/11/84	Loss of RPS bus due to Reactor Recirc pump start while RPS bus was on alternate feed (design problem)	373-84-076
2	11/12/84	Loss of RPS bus due to incorrect meter usage (surveillance procedure error)	374-84-075
1	1/7/85	Loss of control power to VR outboard isolation valves causing them to close on loss of power	none
1	2/17/87	VR isolation due to a surveillance procedure problem where jumper was removed prior to resetting the logic.	373-87-009
2	5/3/88	Jumper, installed to bypass isolation logic in unit 1 during shutdown, fell off and shorted causing logic actuation in unit 2	373-88-007
1	10/17/88	Jumper fell off during surveillance testing causing isolation	373-88-023
2	10/20/89	Inadvertent VR isolation during DC ground isolation procedure	374-89-014
1	1/23/91	VR isolation damper closure due to logic relay failure	373-91-001
2	3/18/91	Spurious trip of isolation logic during surveillance testing	374-91-002
2	3/28/91	VR isolation due to personnel error in restoring system to service.	374-91-003
2	6/17/91	VR isolation due to inadvertent mechanical shock to control switch (no isolation signal). Panel bumped by working next to panel.	374-91-004
1	11/29/93	VR isolation due to loss of RPS bus in unit 2 (alternate feed trip)	373-93-020
1	12/5/93	VR isolation due to loss of RPS bus in unit 1 (EPMA card failure)	373-93-018
1	1/17/94	VR isolation due to loss of RPS bus in unit 1 (M/G set trip)	373-94-001
1/2	10/3/94	Blown fuse in isolation logic.	374-94-007
1/2	11/28/95	Loss of the 1B RPS M/G set due to relay failure	373-95-018