FEB 12 1985

MEMORANDUM FOR: Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response, IE

FROM: Darrell G. Eisenhut
Division of Licensing, NRR

SUBJECT: BWR VENT HEADER CRACKING

Enclosed is a report prepared by ORAB detailing the industry's response to the GE SIL No. 402 of February 1984. It is evident that the approach we took including the attempt to get voluntary responses from the industry was not as successful as initially envisioned. We anticipate that this experience will provide useufl insight into how to handle similar issues in the future.

We believe that there is a need to conduct follow-up inspections at each facility to verify completion of the recommended SIL actions. Therefore, we recommend that an inspection procedure be developed based on the information in the enclosed report. We are prepared to assist in developing this procedure, as necessary. Inspections should be conducted at all affected Mark I and II BWRs during FY'85 to close-out the staff's action on this issue. A copy of each of the licensees' letters relative to activities and commitments on this subject is also enclosed for your use.

Original signed by
Frank J. Miraglia

Darrell G. Eisenhut, Director
Division of Licensing, NRR

Enclosures:
1. Close-out of Vent Header Cracking
2. Licensees' Responses

DISTRIBUTION
Central File
ORAB Rdg
GHolahan
JHannon
PTremblay
NRC PDR

RD-10-1
BWR

*PREVIOUS CONCURRENCE SEE DATE

ORAB:DL*	ORAB:DL*	C:ORAB:DL	AD:SA:DL	D:DL
PTremblay:dm	JHannon	GHolahan	DCrutchfield	DEisenhut
11/26/84	11/26/84	11/27/84	11/26/84	12/12/84

CLOSE-OUT OF DIVISION OF LICENSING TASK

ON VENT HEADER CRACKING IN MARK I AND II

BOILING WATER REACTORS

I. Background

On February 3, 1984, Georgia Power Company reported a through-wall crack almost completely around the vent header within the containment torus of Hatch Unit 2. Later that day IE Bulletin 84-01, "Cracks in Boiling Water Reactor Mark I Containment Vent Headers," was issued for action to the licensees of BWR facilities with Mark I containments that were in cold shutdown. The bulletin required inspection for cracks in the containment vent header and in the main vents in the region near the intersection with the vent header. The inspections by the licensees revealed no cracks. The bulletin also suggested that the operating BWR plants with Mark I containments should review their plant data on differential pressure between the wetwell and drywell for anomalies that could be indicative of cracks. The licensees who performed the review reported no anomalies.

The Regulatory Response Group (RRG) of the BWR Owner's Group (BWROG) met with the NRC on February 6, 1984, and presented the preliminary results of their investigation into the cause of the Hatch 2 crack. The RRG discussed recommended actions for each Mark I and II licensee to complete in order to satisfy the concerns raised by this event. The meeting resulted in the agreement that the industry would voluntarily perform the necessary measures to present this type of event, therefore precluding NRC action.

On February 23, 1984, the RRG met again with the NRC and presented additional results of the Hatch 2 investigation and details of GE SIL No. 402 that was transmitted to the BWROG representatives on February 17, 1984. The large crack in the Hatch 2 vent header was confirmed to be the result of brittle fracture caused by the injection of cold nitrogen into the torus during inerting. The crack represented a failure of the containment suppression system which could cause containment overpressurization during a loss-of-coolant accident (LOCA). The SIL contained recommended actions to prevent this type of event and to help ensure containment system integrity. The recommended actions for all Mark I and II BWRs, included evaluation of inerting system designs and operation, drywell/wetwell bypass leakage testing, and nitrogen line and containment inspections for BWRs which have used their liquid nitrogen-based inerting systems. The cover letter contained the direction that the licensees should contact their NRC project managers to indicate the expected completion date for each SIL recommendation. It was agreed on during the meeting that this communication would take place within the following two weeks.

On March 5, 1984, IE Information Notice 84-17, "Problems with Liquid Nitrogen Cooling Components Below NIL Ductility Temperature," was issued to all holders of OLs and CPs. The notice advised the licensees and applicants of potentially significant problems with the use of liquid nitrogen that could cool vital components below the nil ductility temperature (NDT) of associated materials susceptible to brittle fracture. The Notice suggested that licensees who have used liquid nitrogen or other potentially very cold fluids in applications where the fluid could come in contact with safety-related components subject to brittle fracture should consider inspecting these components for possible indication of cracks.

By March 20, 1984, the NRC had not been contacted by the licensees. Therefore, the Director of the Division of Licensing provided guidance to all Project Managers on surveying their licensees by March 23, 1984 on their plans for responding to the GE-SIL. By March 29, 1984, of the 32 requested responses, 7 facilities committed to respond in writing; 11 stated they did not intend to respond, and the rest either were uncertain about their type of submittal or committed to respond orally. Ten facilities responded in writing; five responded orally by June. On August 9, 1984, the Deputy Director of the Division of Licensing informed the Chairman of the BWR Owners Group on the industry's response to the SIL. The Chairman suggested that a requirement from the NRC would be the most effective measure to resolve this issue in a timely manner.

II. CRGR Review

The NRR and IE offices worked together throughout this period of time in developing an IE Bulletin on this matter. Management decided to move forward and meet with CRGR on sending the bulletin. Representatives from the Division of Licensing and IE presented their position to the CRGR on September 5, 1984. CRGR recommended that the staff make another effort in contacting those licensees that had not responded to the SIL to elicit a response. NRR orally communicated with these licensees. Each utility was advised of the need to respond to the GE SIL by COB September 14, 1984. CRGR recommended that those utilities not responding within 10 days after being contacted by the NRC should be sent an IE Bulletin. By September 24, 1984, the following facilities had not responded: Brunswick 1 and 2; Fitzpatrick; Susquehanna 1 and 2; Limerick 1; and Fermi 2. Senior management of each of these facilities were contacted by the appropriate Division of Licensing management on September 25, 1984. By October 1, 1984, all of the affected facilities responded to their respective Project Managers that they had implemented the recommendations contained in the GE SIL. Therefore, NRR and IE concurred that the IE Bulletin not be issued.

III. Industry Response to GE SIL

Tables 1, 2, 3, 4 and 5 show in matrix form the industry responses to the GE SIL recommendations. Table 1 lists each facility showing its type of response for each recommendation; Table 2 shows for each recommendation the plants which responded adequately; Table 3 shows future commitments; Table 4 shows inadequate responses; Table 5 shows responses of nonapplicability of the recommendation with justification. The SIL recommendations 3, 4, and 5 were not applicable to those units which had not used their inerting equipment. Those units are shown in the tables with a double asterisk (**). However, some facilities chose to address those recommendations; their reporting is included for information only. A number of facilities did not believe that ultrasonic testing of the nitrogen injection line was an applicable measure for them to follow. They did inspect their lines using other means; this is denoted by a single asterisk (*) in Tables 1 and 5.

In order to provide a more complete evaluation of the licensee's responses to the GE SIL, specific actions for each recommendation were identified and reviewed as shown below. The responses were characterized as: (1) adequate response to the recommendation, (2) commitment to future response to the recommendation, (3) inadequate response to the recommendation, and (4) not applicable including justification. An inadequate response was determined if it did not include sufficient information, or contained only a general statement, or was not addressed.

1. Evaluate Inerting System Design

   a. Evaluate inerting system design: 19 facilities either adequately responded or committed to implement the recommendation; 15 facilities submitted an inadequate response.

   b. Investigate potential for cold nitrogen injection and orientation of injection port relative to components in drywell/wetwell: 18 facilities either adequately responded or committed to implement the recommendation; 16 facilities submitted an inadequate response.

   c. Evaluate adequacy of temperature control system: 22 facilities either adequately responded or committed to implement the recommendation; 12 facilities submitted an inadequate response.

2. Evaluate Inerting System Operation

   a. Review operating experience of temperature control system: 17 facilities either adequately responded or committed to implement the recommendation; 13 inadequately responded; 4 provided justification that the recommendation was nonapplicable.

   b. Evaluate maintenance and operating procedures for inerting system: 26 facilities either adequately responded or committed to implementing the recommendation; 8 submitted inadequate responses.

3. Perform Drywell/Wetwell Bypass Leakage Test

   Nineteen facilities either submitted an adequate response or committed to implement the recommendation; one facility inadequately responded; five provided justification for nonapplicability of the recommendation.

4. Inspect Nitrogen Injection Line

   Six facilities either submitted an adequate response or committed to implement the recommendation; three inadequately responded; 16 provided justification for nonapplicability of recommendation and 9 of these used other measures than those recommended.

5. Inspect Containment

   a. Perform visual inspection of components which could be affected by injection of cold nitrogen: 16 either provided an adequate response or committed to implement the recommendation; 6 inadequately responded; 3 provided justification for nonapplicability of the recommendation.

   b. Inspect inside and outside of vent header and nitrogen penetration: 15 provided either an adequate response or a commitment to implement the recommendation; 7 inadequately responded; 3 provided justification for nonapplicability of the recommendation.

IV. Conclusions

We believe that there are no further reporting requirements by the industry since the CRGR recommended that an IE Bulletin requiring a response to the GE SIL be sent only to those utilities that had not provided a formal response by a specific time. All affected licensees had submitted a formal response by October 1, 1984. Therefore, this review closes out the responsibilities in this matter by the Division of Licensing. However, we recommend that these facilities be inspected to ensure actions were performed as reported. It is especially important to do an indepth inspection of all those facilities submitting either a commitment to future implementation or insufficient information or only a general statement on the issue. Those that provided a response that the recommendation was not applicable to the facility should be uniquely inspected as to meeting the intent of the recommendation.

TABLE 1

Plant	Adequate Response to Recommendation	Commitment to Future Response to Recommendation	Inadequate Response to Recommendation: Insufficient Information	Inadequate Response to Recommendation: General Statement	Inadequate Response to Recommendation: Not Addressed	Not Applicable with Justification
Browns Ferry 1	1. a, b, c 2. a, b 3					4 5. a, b
Browns Ferry 2	1. a, b, c 2. a, b 3					4 5. a, b
Browns Ferry 3	1. a, b, c 2. a, b 5. a				5. b	3 4
Brunswick 1	1. a, b 2. a, b 3	1. c	5. a	5. b		4

LEGEND

1. Evaluate Inerting System Design
   a. Evaluate inerting system design
   b. Investigate potential for cold nitrogen injection and orientation of injection port relative to components in drywell/wetwell
   c. Evaluate adequacy of temperature control system
2. Evaluate Inerting System Operation
   a. Review operating experience of temperature control system
   b. Evaluate maintenance and operating procedures for inerting system
3. Perform Drywell/Wetwell Bypass Leakage Test
4. Inspect Nitrogen Injection Line
5. Inspect Containment
   a. Perform visual inspection of components which could be affected by injection of cold nitrogen
   b. Inspect inside and outside of vent header and nitrogen penetration

Plant	Adequate Response to Recommendation	Commitment to Future Response to Recommendation	Inadequate Response to Recommendation: Insufficient Information	General Statement	Not Addressed	Not Applicable with Justification
Brunswick 2	1.a, b 2.a, b 3	1.c	5.a	5.b		4
Cooper	3		2.b 4	1.b, c 5.a, b	1.a 2.a	
Dresden 2	2.a, b	3 4 5.a, b	1.a, b		1.c	
Dresden 3	2.a, b 3 5.a, b	4	1.a, b		1.c	

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Plant	Adequate Response to Recommendation	Commitment to Future Response to Recommendation	Inadequate Response to Recommendation: Insufficient Information	General Statement	Not Addressed	Not Applicable with Justification
Quad Cities 1	1.a, b 2.b	3 5.b	1.c	2.a	4 5.a	
Quad Cities 2	1.a, b 2.b 3 5.b		1.c	2.a	4 5.a	
Duane Arnold	3	2.a, b 5.a, b		1.a, b, c		4*
Fermi 2**	1.a, b, c 2. b					2.a

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5. Inspect Containment
   - a. Perform visual inspection of components which could be affected by injection of cold nitrogen
   - b. Inspect inside and outside of vent header and nitrogen penetration

*Method of inspection prescribed by SIL was not performed, but another type of inspection was.

**Licensee did not have to implement Recommendations 3, 4, 5 since it did not use inerting system yet, but chose to report

Plant	Adequate Response to Recommendation	Commitment to Future Response to Recommendation	Inadequate Response to Recommendation: Insufficient Information	Inadequate Response to Recommendation: General Statement	Inadequate Response to Recommendation: Not Addressed	Not Applicable with Justification
FitzPatrick	5.a	1.c 2.b 3		1.a, b	2.a 5.b	4*
Hatch 1	1.a, c 2.a 3 5.a, b	1.b 2.b				4*
Hatch 2	1.a, c 2.a 5.a, b	1.b 2.b 3				4*
Millstone 1		1.a, b, c 2.a, b 5. a, b	3			4*

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Monticello	1.a, b 2.a 4 5.a	1.c 2.b	5.b			3
Nine Mi. Pt. 1	1.a, c 4 5.b		1.b	2.a, b	5.a	3
Oyster Creek	2.a 4 5.a, b	1.b 3	1.a, c 2.b			
Peach Bottom 2	1.a, b, c 2.a 3 5.a, b	2.b				4*

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Peach Bottom 3	1.a, b, c 2.a 3	2.b 5.a, b				4*
Pilgrim 1	2.b 3 4 5.a		1.b 2.a	1.a, c		5.b
Vermont Yankee	1.b 3		1.a, c 5.b	2.a, b		4* 5.a
Hope Creek 1**	1.a, b, c	2.b				2.a
Hope Creek 2**	1.a, b, c	2.b				2.a

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Plant	Adequate Response to Recommendation	Commitment to Future Response to Recommendation	Inadequate Response to Recommendation: Insufficient Information	General Statement	Not Addressed	Not Applicable with Justification
LaSalle 1		2.b 5.a, b	1.b, c	2.a	1.a	3 4
LaSalle 2		2.b 5.a, b	1.b, c	2.a	1.a	3 4
Nine Mi. Pt. 2**	1.c	2.a, b 3	1.b		1.a	4 5.a, b
Susquehanna 1	1.a, c 5.a, b	3		1.b 2.a, b		4*
Susquehanna 2**	1.a, c			1.b	2.a, b	4*

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Plant	Adequate Response to Recommendation	Commitment to Future Response to Recommendation	Inadequate Response to Recommendation: Insufficient Information	General Statement	Not Addressed	Not Applicable with Justification
Limerick 1**		1.c	2.b	1.a	1.b 2.a	
Limerick 2**		1.c	2.b	1.a	1.b 2.a	
Shoreham**		1.c 2.b 3		1.a	1.b	2.a 4 5.a, b
WNP 2**	2.a	2.b		1.a	1.b, c	

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TABLE 2

ADEQUATE RESPONSE TO RECOMMENDATION

1. EVALUATE INERTING SYS. DESIGN			2. EVALUATE INERTING SYS. OPERATN.		3. PERFORM DRYWELL/ BYPASS LEAKAGE TEST	4. INSPECT N_2 INJECTION LINE	5. INSPECT CONTAINMENT	
a. Inerting Sys. Design	b. Cold N_2 Inject./ Port Locatn.	c. Temp. Contrl Sys Adequacy	a. Temp. Contrl Experience	b. Maint./Opertn. Procedures			a. Visual Insp. of Components	b. Inside/Outside of Vent Header
Browns Ferry-1	Browns Ferry-1	Browns Ferry-1	Browns Ferry-1	Browns Ferry-1	Browns Ferry-1	Monticello	Browns Ferry 3	Dresden 3
Browns Ferry-2	Browns Ferry-2	Browns Ferry-2	Browns Ferry-2	Browns Ferry-2	Browns Ferry-2	Nn. Mi. Pt. 1	Dresden 3	Quad Cit. 1
Browns Ferry-3	Browns Ferry-3	Browns Ferry-3	Browns Ferry-3	Browns Ferry-3	Brunswick-1	Oyster Creek	FitzPatrick	Hatch-1
Brunswick-1	Brunswick-1	Fermi-2	Brunswick-1	Brunwsick-1	Brunwsick-2	Pilgrim-1	Hatch-1	Hatch-2
Brunswick-2	Brunwsick-2	Hatch-1	Brunswick-2	Brunswick-2	Cooper		Hatch-2	Nn. Mi. Pt.-1
Quad Cit. 1	Quad Cit. 1	Hatch-2	Dresden-2	Dresden-2	Dresden-3		Monticello	Oyster Creek
Quad Cit. 2	Quad Cit. 2	N. Mi. Pt. 1	Dresden-3	Dresden-3	Quad Cit. 2		Oyster Creek	Peach Btm. 2
Fermi-2	Fermi-2	Peach Btm. 2	Hatch 1	Quad Cit. 1	Duane Arnold		Peach Btm. 2	Susque. 1
Hatch 1	Monticello	Peach Btm. 3	Hatch 2	Quad Cit. 2	Hatch 1		Pilgrim 1	
Hatch 2	Peach Btm. 2	Hope Creek 1	Monticello	Fermi-2	Peach Btm. 2		Susquehanna 1	
Monticello	Peach Btm 3	Hope Creek 2	Oyster Creek	Pilgrim-1	Peach Btm. 3			
Nn. Mi. Pt. 1	Vermont Yankee	Nn. Mi. Pt. 2	Peach Btm. 2		Pilgrim-1			
Peach Btm. 2	Hope Creek 1	Susque. 1	Peach Btm. 3		Vermont Yankee			
Peach Btm. 3	Hope Creek 2	Susque. 2	WNP-2					
Hope Creek 1								
Hope Creek 2								
Susquehanna 1								
Susquehanna 2								
18 Units	14 Units	14 Units	14 Units	11 Units	13 Units	4 Units	10 Units	8 Units

TABLE 3

COMMITMENT TO FUTURE RESPONSE TO RECOMMENDATION

1. EVALUATE INERTING SYS. DESIGN			2. EVALUATE INERTING SYS. OPERATN.		3. PERFORM DRYWELL/ BYPASS LEAKAGE TEST	4. INSPECT N_2 INJECTION LINE	5. INSPECT CONTAINMENT	
a. Inerting Sys. Design	b. Cold N_2 Inject./ Port Locatn.	c. Temp. Contrl Sys. Adequacy	a. Temp. Contrl Experience	b. Maint./Opertn. Procedures			a. Visual Insp. of Components	b. Inside/Outside of Vent Header
Millstone-1	Hatch 1	Brunswick-1	Duane Arnold	Duane Arnold	Dresden 1	Dresden 2	Dresden 2	Dresden 2
	Hatch 2	Brunswick-2	Millstone-1	FitzPatrick	Quad Cit. 1	Dresden 3	Duane Arnold	Quad Cit. 1
	Millstone-1	FitzPatrick	Nn. Mi. Pt. 2	Hatch 1	FitzPatrick		Millstone-1	Duane Arnold
	Oyster Creek	Millstone-1		Hatch 2	Hatch 2		Peach Btm. 3	Millstone-1
		Monticello		Millstone-1	Oyster Creek		LaSalle 1	LaSalle 1
		Limerick-1		Monticello	Nn. Mi. Pt. 2**		LaSalle 2	LaSalle 2
		Limerick-2		Peach Btm. 2	Susquehanna 1			Peach Btm. 3
		Shoreham		Peach Btm. 3	Shoreham**			
				Hope Creek 1				
				Hope Creek 2				
				LaSalle-1				
				LaSalle-2				
				Nn. Mi. Pt. 2				
				Shoreham				
				WNP-2				
1 Unit	4 Units	8 Units	3 Units	15 Units	6 Units	2 Units	6 Units	7 Units

LEGEND

**Licensee did not have to implement Recommendations 3, 4, and 5 since it did not use inerting system yet, but chose to report. (Not included in unit totals).

TABLE 4

INADEQUATE RESPONSE TO RECOMMENDATION

1. EVALUATE INERTING SYS. DESIGN			2. EVALUATE INERTING SYS. OPERATN.		3. PERFORM DRYWELL/ BYPASS LEAKAGE TEST	4. INSPECT N_2 INJECTION LINE	5. INSPECT CONTAINMENT	
a. Inerting Sys. Design	b. Cold N_2 Inject./ Port Locatn.	c. Temp. Contrl Sys. Adequacy	a. Temp. Contrl Experience	b. Maint./Opertn. Procedures			a. Visual Insp. of Components	b. Inside/Outside of Vent Header
Cooper	Cooper	Cooper	Cooper	Cooper	Millstone 1	Cooper	Brunswick 1	Browns Ferry 3
Dresden 2	Dresden 2	Dresden 2	Quad Cit. 1	Nn. Mi. Pt. 1		Quad Cit. 1	Brunswick 2	Brunswick 1
Dresden 3	Dresden 3	Dresden 3	Quad Cit. 2	Oyster Creek		Quad Cit. 2	Cooper	Brunswick 2
Duane Arnold	Duane Arnold	Quad Cit. 1	FitzPatrick	Vermont Yankee			Quad Cit. 1	Cooper
FitzPatrick	FitzPatrick	Quad Cit. 2	Nn. Mi. Pt. 1	Susquehanna 1			Quad Cit. 2	FitzPatrick
Oyster Creek	Nn. Mi. Pt. 1	Duane Arnold	Pilgrim 1	Susquehanna 2			Nn. Mi. Pt. 1	Monticello
Pilgrim 1	Pilgrim 1	Oyster Creek	Vermont Yan.	Limerick 1				Vermont Yan.
Vermont Yankee	LaSalle 1	Pilgrim 1	LaSalle 1	Limerick 2				
LaSalle 1	LaSalle 2	Vermont Yankee	LaSalle 2					
LaSalle 2	Nn. Mi. Pt. 2	LaSalle 1	Susque. 1					
Nn. Mi. Pt. 2	Susquehanna 1	LaSalle 2	Susque. 2					
Limerick 1	Susquehanna 2	WNP-2	Limerick 1					
Limerick 2	Limerick 1		Limerick 2					
Shoreham	Limerick 2							
WNP-2	Shoreham							
	WNP-2							
15 Units	16 Units	12 Units	13 Units	8 Units	1 Unit	3 Units	6 Units	7 Units

TABLE 5

NOT APPLICABLE INCLUDING JUSTIFICATION

1. EVALUATE INERTING SYS. DESIGN			2. EVALUATE INERTING SYS. OPERATN.		3. PERFORM DRYWELL/ BYPASS LEAKAGE TEST	4. INSPECT N_2 INJECTION LINE	5. INSPECT CONTAINMENT	
a. Inerting Sys. Design	b. Cold N_2 Inject./ Port Locatn.	c. Temp. Contrl Sys. Adequacy	a. Temp. Contrl Experience	b. Maint./Opertn. Procedures			a. Visual Insp. of Components	b. Inside/Outside of Vent Header
			Fermi 2		Browns Ferry 3	Browns Ferry 1	Browns Ferry 1	Browns Ferry 1
			Hope Creek 1		Monticello	Browns Ferry 2	Browns Ferry 2	Browns Ferry 2
			Hope Creek 2		Nn. Mi. Pt. 1	Browns Ferry 3	Vermont Yank.	Pilgrim 1
			Shoreham		LaSalle 1	Brunswick 1	Nn. Mi. Pt. 2**	Nn. Mi. Pt. 2**
					LaSalle 2	Brunswick 2	Shoreham**	Shoreham**
						Duane Arnold*		
						FitzPatrick*		
						Hatch 1*		
						Hatch 2*		
						Millstone 1*		
						Peach Btm. 2*		
						Peach Btm. 3*		
						Vermont Yank.*		
						LaSalle 1		
						LaSalle 2		
						Nn. Mi. Pt. 2		
						Susquehanna 1*		
						Susquehanna 2**		
						Shoreham**		
			4 Units		5 Units	16 Units	3 Units	3 Units

LEGEND
*Method of inspection prescribed by SIL was not performed, but another type of inspection was.
**Licensee did not have to implement Recommendations 3, 4, and 5 since it did not use inerting system yet, but chose to report. (Not included in unit totals).

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

October 5, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

In the Matter of the	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
		50-296

By my letter to you dated September 14, 1984, we provided general information regarding implementation of General Electric Service Information Letter (SIL) 402 at the Browns Ferry Nuclear Plant. As committed to in that letter, we are submitting as an enclosure a more detailed discussion of the SIL 402 implementation.

If you have any questions, please get in touch with us through the Browns Ferry Project Manager.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Licensing

Subscribed and sworn to before
me this 5 day of Oct. 1984.

[illegible] Clark

Notary Public
My Commission Expires [illegible]

Enclosure
cc (Enclosure):
U.S. Nuclear Regulatory Commission
Region II
ATTN: James P. O'Reilly, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. R. J. Clark
Browns Ferry Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

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ENCLOSURE
IMPLEMENTATION OF GENERAL ELECTRIC
SERVICE INFORMATION LETTER 402
"WETWELL/DRYWELL INERTING"
BROWNS FERRY NUCLEAR PLANT

SIL 402 ITEM 1

Evaluate Inerting System Design

Evaluate the design of the nitrogen inerting system. Investigate the potential for introducing cold (less than 40°F) nitrogen and the orientation of the nitrogen port relative to the vent header, downcomers, or other equipment in the wetwell and drywell which may be in the path of the injected nitrogen. Assure that the temperature monitoring devices, the low temperature shutoff valve, and overall system design are adequate to prevent the injection of cold nitrogen into the containment.

TVA RESPONSE

We have reviewed the system design of the Browns Ferry containment inerting system. The current system design has multiple controls and indications which are sufficient to prevent cold nitrogen (<50°F) from flowing into the primary containment. During purging operations, nitrogen flow and temperature is monitored in the control room to maintain ≥50°F nitrogen temperature. If nitrogen temperature decreases to <50°F, the low temperature shutoff valve will close and prevent injecting cold nitrogen into the primary containment. During makeup operations, the makeup vaporizer electric heater will energize if nitrogen temperature decreases to <70°F and the low temperature shutoff valve will close if nitrogen temperature decreases to <50°F. The continued use of these low temperature setpoints will preclude any low temperature problems. It should be noted that the configuration of the nitrogen injection piping into the wetwell at Browns Ferry is different from the configuration at Hatch Nuclear Plant as shown in figures 1 and 2. As such, the liquid nitrogen and/or cold gases would not impinge directly on any downcomer or the vent header.

SIL 402 ITEM 2

Evaluate Inerting System Operation

Review the operating experience of the inerting system to assure that the vaporizer, the low temperature shutoff valve and the temperature indicators have functioned properly. Evaluate the plant calibration, maintenance and operating procedures for the inerting system. Assure that cold nitrogen injection would be detected and prevented.

TVA RESPONSE

We have reviewed the operating experience of the containment inerting system at Browns Ferry. Our review indicates that the vaporizers, system controls, and temperature indicators have been functioning properly.

We have reviewed the maintenance history from January 1, 1984 to present. The only maintenance item found that could affect the low temperature controls for the inerting system was that the purge line low temperature shutoff valve calibration was checked on February 17, 1984. The temperature controller and the low temperature shutoff valve have been added to the system instrument and maintenance instruction to ensure that the temperature controller receives required periodic calibration or maintenance.

To further ensure proper operation of the inerting system, we have revised the Operating Instructions (OI) for the Containment Inerting System (OI 76) and Primary Containment System (OI 64). OI 76 ensures that cold nitrogen ($<50^{o}F$) will not be injected into the primary containment during purging operations. OI 64 now monitors run time of the drywell Delta P air compressor to detect possible cracking of internal containment piping.

SIL 402 ITEM 3

Test for Drywell/Wetwell Bypass Leakage

Perform a bypass leakage test as soon as convenient to confirm the integrity of the vent system. This test should be conducted during plant operation following normal plant procedures. If no procedures exist, the following is a general guide for preparing your prócedure: pressurize the drywell to approximately 0.75 psi above the wetwell pressure, maintain this drywell pressure and measure the pressure buildup in the wetwell. Any bypass leak area can then be calculated (and is limited by Technical Specifications on many plants) from the wetwell pressure and the drywell-wetwell pressure difference. This will provide an indication that the vent system integrity is intact and that no gross failure exists.

TVA RESPONSE

A drywell/wetwell bypass leakage test was performed on Browns Ferry unit 1 and unit 2 to ensure the integrity of the vent system as requested by NRC IE Bulletin 84-01 for plants that were currently operating. The results of the test indicate from the long drywell/wetwell Delta P compressor idle times and the relatively low leakage flow rates, that there are no anomalies that are indicative of cracks in either unit 1 or unit 2 vent headers. Based on the visual inspection (Item 5) and procedural changes (Item 2), the bypass leakage test will not be performed on unit 3, which is currently in a refueling outage.

SIL 402 ITEM 4

Inspect Nitrogen Injection Line

Conduct an ultrasonic test (UT) as soon as convenient of all accessible welds in the nitrogen injection line from the last isolation valve to the wetwell and drywell penetrations. Also UT the containment penetrations and the containment shell within 6 inches of the penetration. UT is recommended because cracks would be most likely to initiate on the inside of the pipe or on the side of the metal in contact with cold nitrogen.

TVA RESPONSE

Satisfactory operating experience, multiple controls and indications, and procedural controls make the introduction of cold nitrogen (<50°F) unlikely in either the past or future. Therefore, we do not plan to perform ultrasonic examinations on the nitrogen injection lines penetrating the drywell and wetwell or the containment penetrations and containment shell within six inches of the penetration.

SIL 402 ITEM 5

Inspect Containment

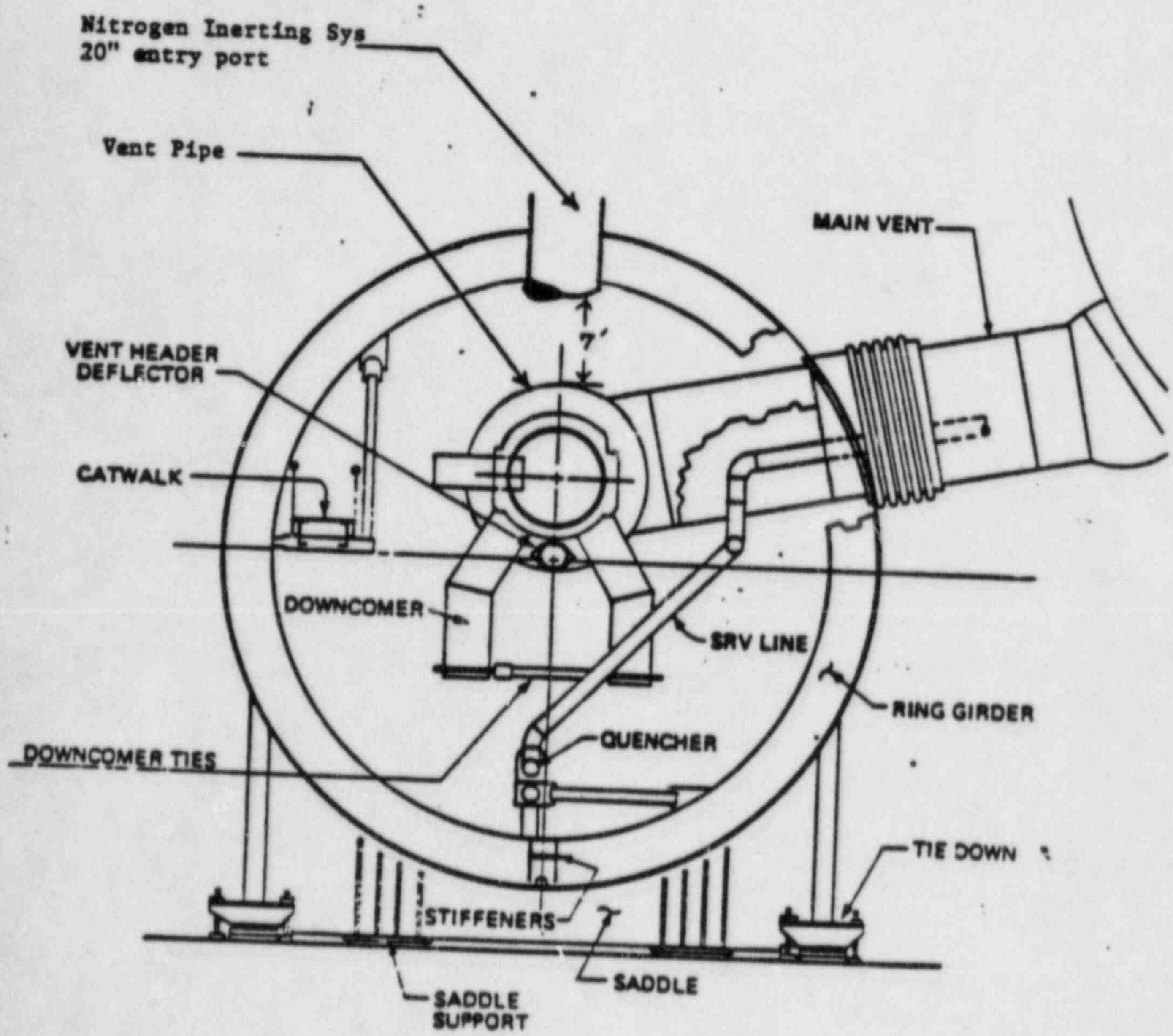
During the next planned outage, perform a visual inspection of the vent header, downcomers and other equipment in the containment which might be expected to be affected by the injection of cold nitrogen. The vent header should be inspected on the outside and the inside. Also inspect the containment shell or steel liner for at least 6 inches around the nitrogen penetration.

TVA RESPONSE

As requested by IE Bulletin 84-01, a visual inspection was performed on unit 3, which is in a refueling outage. No cracks were found; however, four pinholes were discovered in the downcomer to vent header weld in bay 6 on unit 3. All four pinholes in this construction weld were porosity holes, which have been ground out and repaired. For the same reasons listed in Item 4, we do not plan to perform the additional visual inspections specified in GE SIL 402 for unit 3.

We do not plan to perform any visual inspections per GE SIL 402 on units 1 and 2 based on the reasons listed in item 4.

Indicate the location of your Nitrogen Inerting System entry Port.



CROSS SECTION OF THE TORUS

Hatch Unit 2

FIGURE 1

Cross Section of Torus - Brown Ferry Units 1, 2, & 3

Rom 2·10·84

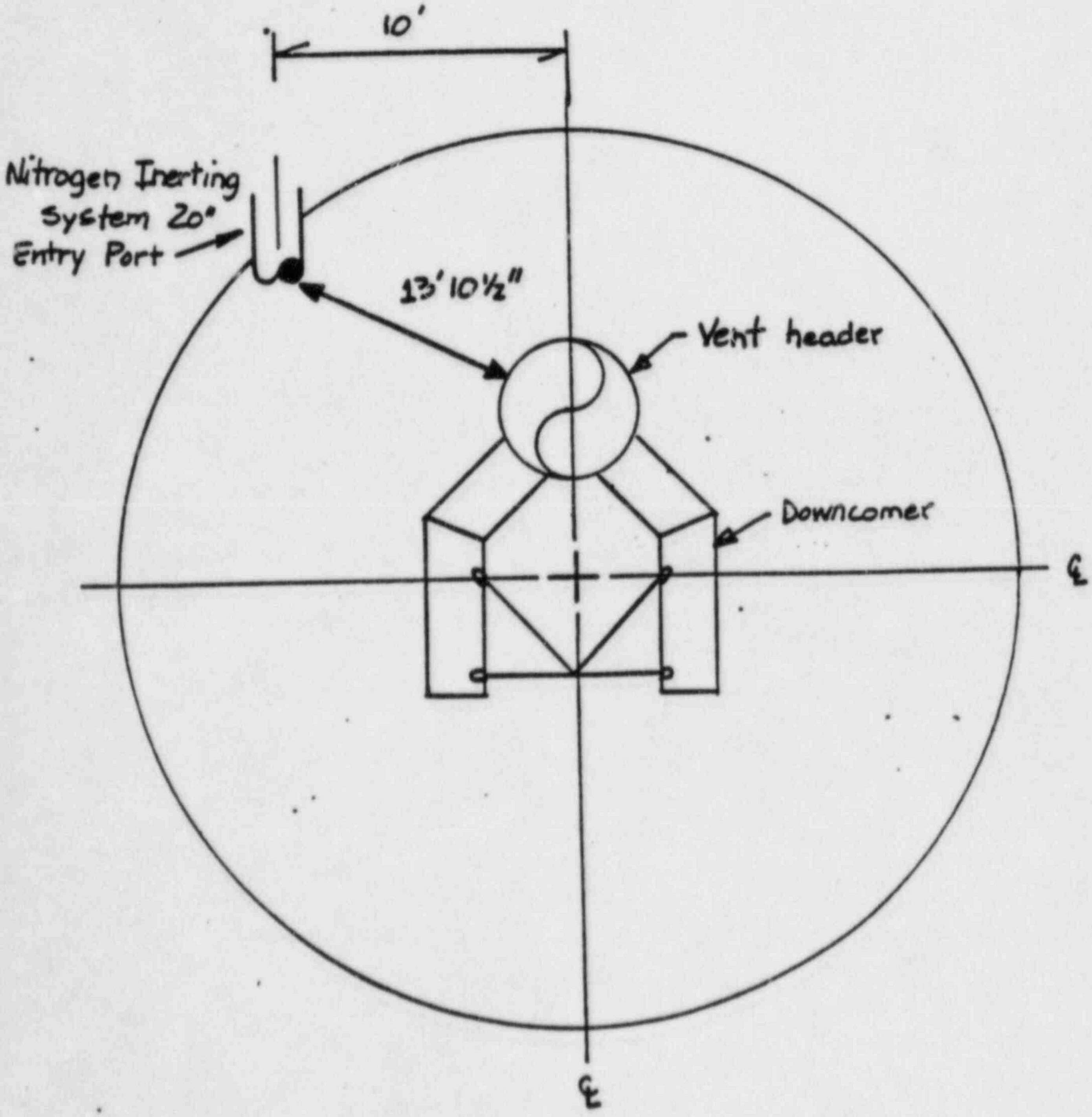


Figure 2

CP&L

Carolina Power & Light Company

OCT 01 1984

SERIAL: NLS-84-431

Director of Nuclear Reactor Regulation
Attention: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
ACTIONS IN RESPONSE TO GE SERVICE INFORMATION LETTER (SIL 402)
CONTAINMENT INERTING

Dear Mr. Vassallo:

SUMMARY

The purpose of this letter is to provide a response to verbal questions from members of your staff concerning Carolina Power & Light Company's (CP&L) implementation of the recommendations of General Electric Service Information Letter (SIL) No. 402 for the Brunswick Steam Electric Plant, Units 1 and 2.

DISCUSSION

On February 3, 1984, the NRC issued IE Bulletin (IEB) No. 84-01, Cracks In Boiling Water Reactor Mark I Containment Vent Headers in response to a through-wall crack being found in the torus vent header of Hatch Unit 2. Only those plants that were currently in cold shutdown were requested to formally respond to this IE Bulletin.

Subsequently, GE SIL No. 402 was issued on February 14, 1984. This letter provided five recommendations for action by those BWRs that use liquid-nitrogen-based inerting systems. At the time SIL 402 was issued, CP&L reviewed the recommendations made for their applicability to the Brunswick Plant. A summary of the recommendations and the results of Company's review are provided in Attachment 1 of this letter.

CONCLUSION

The Company has taken positive steps to evaluate and implement, where appropriate, the recommendations of GE SIL No. 402 for our Brunswick Plant.

411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

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If you have any further questions concerning this subject, please contact Mr. S. R. Zimmerman at (919) 836-6242.

Yours very truly,

S. R. Zimmerman
Manager
Nuclear Licensing Section

WRM/cfr (669MAT)

Attachment

cc: Mr. D. O. Myers (NRC-BNP)
Mr. J. P. O'Reilly (NRC-RII)
Mr. M. Grotenhuis (NRC)

ATTACHMENT 1

SUMMARY OF THE RECOMMENDATIONS
OF GE SERVICE INFORMATION LETTER NO. 402

RECOMMENDATION 1: Evaluate Inerting System Design

Evaluate the design of the nitrogen inerting system. Investigate the potential for introducting cold (less than 40°F) nitrogen and the orientation of the nitrogen port relative to the vent header, downcomers, or other equipment in the wetwell and drywell which may be in the path of the injected nitrogen. Assure that the temperature monitoring devices, the low temperature shutoff valve, and overall system design are adequate to prevent the injection of cold nitrogen into the containment.

CAROLINA POWER & LIGHT COMPANY'S RESPONSE

The design of the Brunswick nitrogen inerting system will prevent the injection of cold nitrogen into the primary containment. The inerting system contains a steam fired vaporizer and a low temperature shut-off valve whose function is to stop flow from the vaporizer when the nitrogen outlet temperature from the vaporizer falls below 50°F. There is approximately 300 feet of 8-inch diameter pipe which runs from the vaporizer to the reactor building. After the line penetrates the reactor building, the line enlarges to a 20-inch diameter. There is a low point in the nitrogen line before it reaches the reactor building. This low point will tend to trap any liquid nitrogen in the unlikely event it should pass the vaporizer. The 20-inch nitrogen line for the torus is located at azimuth 135 degrees and elevation 1 foot 6 inches. The injection line penetrates horizontally and is approximately 11 feet from the vent header. The 18-inch diameter drywell injection port is located at azimuth 175 degrees and elevation 23 feet 6 inches. The structure closest to this penetration is the residual heat removal shutdown cooling line. This line is approximately 3 feet horizontally from the injection port and is covered with 2 to 3 inches of mirror insulation. A heating-ventilation-air conditioning (HVAC) return air duct runs along the grating and is approximately 5 feet below the injection port. Any cold (liquid or gaseous) nitrogen coming from either the drywell or torus injection port should not come into contact with any safety-related equipment. The probability of any liquid nitrogen reaching either the drywell or torus is negligible for the reason stated later in this response.

A plant modification (PM 78-003) is being implemented to install a control valve on the vaporizer discharge to control the nitrogen temperature between 90 and 120°F. At 120°F, the valve will be full open (4000 scfm). At 90°F, the valve will limit flow to 1000 scfm.

The low temperature shut-off valve is presently inoperable, but is being evaluated as to return it to operability. Due to operating procedures, however, manual valve HV-44 will be closed at 90°F to stop nitrogen flow to the vaporizer by the operator stationed at the vaporizer.

(669MAT/cfr)

RECOMMENDATION 2: Evaluate Inerting System Operation

Review the operating experience of the inerting system to assure that the vaporizer, the low temperature shutoff valve, and the temperature indicators have functioned properly. Evaluate the plant calibration, maintenance, and operating procedures for the inerting system. Assure that cold nitrogen injection would be detected and prevented.

CAROLINA POWER & LIGHT COMPANY'S RESPONSE

In the past, the Brunswick Plant has had problems with liquid nitrogen passing the vaporizer. This liquid nitrogen collected in a low point in the pipe outside the reactor building and caused failures of the pipe due to the combined thermal stresses and rapid expansion of the nitrogen upon vaporization. These failures occurred over a hundred feet from primary containment. In response to these events, which last occurred in 1982, the operating procedure for inerting and the setpoint for the low temperature shut-off valve have been revised. The low temperature shut-off valve is now set to close at 50°F vaporizer discharge temperature. The operating procedure for inerting now requires that steam be introduced to the vaporizer before nitrogen. The procedure also requires that during inerting an operator must remain at the vaporizer and stop flow to the vaporizer if the discharge temperature of the nitrogen falls below 90°F. There is local temperature indication at the vaporizer. During inerting there is a frost line on the vaporizer which is indicative of discharge temperature. As the frost line rises above the midpoint, liquid nitrogen is released to the discharge.

RECOMMENDATION 3: Test for Drywell/Wetwell Bypass Leakage

Perform a bypass leakage test as soon as convenient to confirm the integrity of the vent system. This test should be conducted during plant operation following normal plant procedures. If no procedures exist, the following is a general guide for preparing your procedure: pressurize the drywell to approximately 0.75 psi above the wetwell pressure, maintain this drywell pressure and measure the pressure buildup in the wetwell. Any bypass leak area can then be calculated (and is limited by Technical Specifications on many plants) from the wetwell pressure and the drywell-wetwell pressure difference. This will provide an indication that the vent system integrity is intact and that no gross failure exists.

CAROLINA POWER & LIGHT COMPANY'S RESPONSE:

Immediately following the discovery of the torus vent header crack in the Hatch Plant, an on-line drywell/torus bypass leakage test on each Brunswick unit was conducted. However, the test was not performed as described in GE SIL No. 402 because the Brunswick Plant has only wide-range torus pressure indication which would not detect a small change in torus pressure. The test used consists of pressurizing the drywell to approximately 1 psig and observing the pressure decay over a one-hour period. Both Brunswick units have been tested with very good results. Brunswick-1 showed a pressure decay of 0.05 psig; Brunswick-2 showed a pressure decay of 0.06 psig. A pressure decay of less than one half the initial test pressure (1 psig) was judged to be acceptable.

RECOMMENDATION 4: Inspect Nitrogen Injection Line

Conduct an ultrasonic test (UT) as soon as convenient of all accessible welds in the nitrogen injection line from the last isolation valve to the wetwell and drywell penetrations. Also UT the containment penetrations and the containment shell within 6 inches of the penetration. An ultrasonic test is recommended because cracks would be most likely to initiate on the inside of the pipe or on the side of the metal in contact with cold nitrogen.

CAROLINA POWER & LIGHT COMPANY'S RESPONSE:

It is believed that ultrasonic testing of the nitrogen injection lines is unwarranted for the Brunswick Plant. This conclusion is based on the following reasons:

1. In order for liquid nitrogen to reach either drywell, the liquid nitrogen would have to make a vertical climb of approximately 37 feet in 20-inch piping. At a flow of 4000 scfm, this is not practical.

2. There is 269 feet of horizontal 8-inch pipe prior to any tap-off to Brunswick-1. This run includes 2-foot rise, an 8-foot drop, and a 1.5-foot rise. The pipe reaches a minimum of 4 feet below ground. At this depth, the ground maintains nearly a constant temperature year round. This is the furthest point at which any damage has occurred.

3. There is a section of pipe 101 feet long that is 1.5 feet lower than the rest of the piping. This section tends to trap any liquid nitrogen that gets past the vaporizer. This is where most damage has occurred.

4. Since the Brunswick-1 tap-off is on the bottom of the 8-inch pipe, most of the liquid nitrogen that reaches this point will flow into the tap-off.

5. Any liquid nitrogen which may get past the Brunswick-1 tap must then make a 4.5-foot vertical climb, followed by a 2-foot vertical climb. The section of piping with these two inclines is in the pipe tunnel and reactor building and is approximately 70-feet long. The temperatures seen here would also help to vaporize any remaining liquid.

6. If any liquid were to get into the Brunswick-1 line, it would have to make a 1 foot 3 inch rise and then a 5 foot 6 inch rise. The pipe with the 1 foot 3 inch rise is in the pipe tunnel. The other rise is in the reactor building. This section also includes a 150-foot section of horizontal pipe. The runs of pipe in the pipe tunnel and the reactor building would tend to vaporize the liquid if it were to make it that far. Also, the 5 foot 6 inch rise would tend to trap any remaining liquid that passed the 1 foot 3 inch rise.

7. The piping discussed is outside the last isolation valve.

8. With the attention given the vaporizer discharge temperature by the auxiliary operator stationed at the vaporizer, it is believed that only a small amount of liquid, if any, would exit the vaporizer. Operating procedures require this temperature (90°F) to be maintained.

RECOMMENDATION 5: Inspect Containment

During the next planned outage, perform a visual inspection of the vent header, downcomers, and other equipment in the containment which might be expected to be affected by the injection of cold nitrogen. The vent header should be inspected on the outside and the inside. Also inspect the containment shell or steel liner for at least 6 inches around the nitrogen penetration.

CAROLINA POWER & LIGHT COMPANY'S RESPONSE:

A special procedure (SP 84-0014) now exists for the inspection of the torus and drywell in areas adjacent to the nitrogen injection ports. Inspections of both Brunswick-1 and Brunswick-2 have been performed and no problems were observed in the vent header or in the configuration of the nitrogen discharge into the torus.

(669MAT/cfr)