FEB 29 1984

MEMORANDUM FOR: Gary M. Holahan, Chief
Operating Reactors Assessment Branch

THRU: John A. Zwolinski, Section Leader
Operating Reactors Assessment Branch

FROM: Paulette Tremblay
Operating Reactors Assessment Branch

SUBJECT: MEETING MINUTES - RESPONSE TO VENT HEADER CRACKING IN MARK I CONTAINMENTS - FEBRUARY 23, 1984

A meeting was held at the NRC offices in Bethesda, Maryland between the NRC staff and the BWR Regulatory Response Group (RRG) regarding the industry's response to the vent header cracking incident at Hatch 2. The attachments are as follows: (1) BWR RRG presentation outline; (2) BWROG info request; (3) GE SIL cover letter; (4) GE SIL; and (5) meeting attendance list.

The meeting focused on recommendations contained in the SIL, including technical issues and discussions of implementation of the recommended actions and the allowable time frame for completion. The SIL cover letter stated that each licensee must contact its NRC project manager to relay the expected completion date for each recommendation. The BWR RRG noted that INPO reported seven LERs concerning incidents of N_2 induced cracking (inerting related). Also, the concern was raised by the staff that the NDT for the Hatch 2 vent header needed to be identified; the RRG is awaiting this information. The RRG also agreed to reconsider the size of the area around N_2 penetrations to be inspected.

The RRG committed to informing the staff of any modifications to the SIL via a supplement as a result of this meeting during the week of February 27.

(S)

Paulette Tremblay
Operating Reactors Assessment Branch

Enclosures:
As stated

DISTRIBUTION
Central Files - NRC PDR
ORAB r/f
PTremblay
JZwolinski

ORAB:DL
PTemblay
2/29/84

ORAB:DL
JZwolinski
2/29/84

BWROG REGULATORY RESPONSE GROUP

FEBRUARY 23, 1983 MEETING

- INFO REQUEST FOLLOWING FEBRUARY 6TH NRC MEETING
- SERVICE INFORMATION LETTER TRANSMITTAL
- METALLURGICAL ANALYSIS RESULTS
- CONTAINMENT CAPABILITY ANALYSIS
- POTENTIAL FAILURE MODES

INFORMATION REQUEST

- LETTER TO ALL BWROWNERS 2/8/84
- REQUESTED CONFIGURATION AND TESTING PRACTICALITY INFORMATION
- ALL RESPONSES RECEIVED:
  - 10 OF 20 OPERATING MARK I's HAVE COMPLETED VISUAL INSPECTION
  - 10 OF 20 HAVE PHYSICAL ARRANGEMENT SIMILAR TO HATCH 2 (4 OF THESE HAVE COMPLETED VISUAL INSPECTION)
  - NO PROBLEMS WITH TESTING (BYPASS TEST OR DP DATA)

SERVICE INFORMATION LETTER (SIL 402)

- TRANSMITTED TO ALL BWR OWNERS BY LETTER 2/17/84
- REQUEST OWNERS TO REVIEW PROGRAM WITH NRC PROGRAM MANAGERS

SERVICE INFORMATION LETTER (SIL 402)

FEBRUARY 14, 1984

RECOMMENDATIONS:

1. EVALUATE INERTING SYSTEM DESIGN
   - ORIENTATION OF EXIT PORT
   - ADEQUACY OF SYSTEM VALVES AND INSTRUMENTATION
   - ADEQUACY OF OVERALL SYSTEM
2. EVALUATE INERTING SYSTEM OPERATION
   - REVIEW OPERATING EXPERIENCE
   - EVALUATE CALIBRATION, MAINTENANCE AND OPERATING PROCEDURES
   - ASSURE THAT COLD NITROGEN INJECTION WOULD BE DETECTED AND PREVENTED
3. TEST FOR DRYWELL/WETWELL BYPASS LEAKAGE
   - TEST AS SOON AS CONVENIENT
   - TO CONFIRM INTEGRITY OF VENT SYSTEM

4. INSPECT NITROGEN INJECTION LINE

- TEST AS SOON AS CONVENIENT
- UT N_2 INJECTION LINE WELDS FROM LAST ISOLATION VALVE TO CONTAINMENT PENETRATIONS
- UT CONTAINMENT SHELL AND PENETRATIONS WITHIN 6" OF THE PENETRATION

5. INSPECT CONTAINMENT

- DURING NEXT OUTAGE
- VISUAL INSPECTION OF EQUIPMENT AND STRUCTURES
- IN VICINITY OF N_2 INJECTION PENETRATION

METALLURGICAL ANALYSIS RESULTS

- HAVE CONFIRMED CLASSICAL LOW TEMPERATURE BRITTLE FAILURE

- STRESS ANALYSIS CONFIRMS SUSCEPTIBILITY

CONTAINMENT CAPABILITY ANALYSIS

- MAJOR CONCERN:
  - o DIRECT BYPASS FLOW OF STEAM
- GE EVALUATION OF HATCH CRACK CONCLUDES:
  - o HATCH VENT HEADER CRACK AREA IS LESS THAN ANALYZED IN FSAR
  - o DBA PEAK CONTAINMENT PRESSURE IS LESS THAN DESIGN PRESSURE
- CONTAINMENT RESPONSE BEYOND FSAR BYPASS LEAKAGE AREA:
  - o ALL FLOW FROM CRACK ASSUMED TO DIRECTLY TRANSFER TO WETWELL AIR SPACE
  - o CRACK SIZE UP TO 10 FT^2 DOES NOT RESULT IN PRESSURES EXCEEDING APPROXIMATELY SERVICE LEVEL C

POTENTIAL FAILURE MODE

- BRITTLE FAILURE OF THIN-WALLED MATERIAL EXPECTED TO BE THROUGH-WALL
- CRACKS NOT DETECTABLE BY DP TEST AND/OR VISUAL INSPECTION NOT SIGNIFICANT FOR DESIGN LOADS
- CRITICAL CRACK SIZE IS ON THE ORDER OF 40"
- DP TESTING AND VISUAL EXAM ASSESSED TO BE ADEQUATE

GENERAL ELECTRIC

NUCLEAR ENERGY BUSINESS OPERATIONS
GENERAL ELECTRIC COMPANY • 175 CURTNER AVENUE • SAN JOSE, CA 95125

OG4-148-1

U R G E N T: R E S P O N S E R E Q U E S T E D

February 8, 1984

TO: BWR Owners' Group Primary Representatives

SUBJECT: Plant Survey for Nitrogen Injection into Drywell and Wetwell

REFERENCE: Regulatory Response Group (RRG) Meeting with NRC, Monday, February 6, 1984

A survey of plant-specific details on nitrogen injection location is being requested by T.J. Dente (Chairman, Regulatory Response Group) and D.R. Helwig (Chairman, BWR Owners' Group) to assist them in preparing for the second meeting of the RRG with the NRC (week of February 13).

At the reference meeting, the details of the Hatch Unit 2 nitrogen inerting injection port were presented to NRC by the RRG, Georgia Power, and GE. The attached plan and elevation sketches show the Hatch Unit 2 details.

For each of your plants, please respond to the following requests by Friday, February 10:

1. Indicate on the attached sketches where your injection ports are located. Show distances from the end of the ports to nearest structures.

   If drywell injection is used, provide plan and elevation sketches of the location and proximity to equipment and structures.

   This information is requested for Mark I and II containment designs.

2. Specify it you use liquid or gaseous nitrogen injection.

3. If you have a Mark II containment design, when is inerting required (is there a grace period before inerting is required by NRC)?

4. Will you have difficulty in performing an on-line low pressure bypass leakage test (measuring increase in wetwell pressure when drywell pressure is increased slightly)?

The NRC is expecting survey results at the next RRG meeting. Please telecopy your sketches and responses to either Tom Craig (408) 925-6982 or Bob Mapes (408) 925-2894 at these telecopy numbers:

First choice:	(408) 925-1200	NEFAX III-S
	(408) 925-5506	NEFAX III-S
Second choice:	(408) 925-1850	NEFAX 3500
	(408) 925-1890	Rapicom
	(408) 925-1968	Dex 2100
	(408) 925-1969	Dex 2100
	(408) 925-4400	NEFAX III-C
	verify: (408) 925-1810	

Your responses are needed by Friday, February 10.

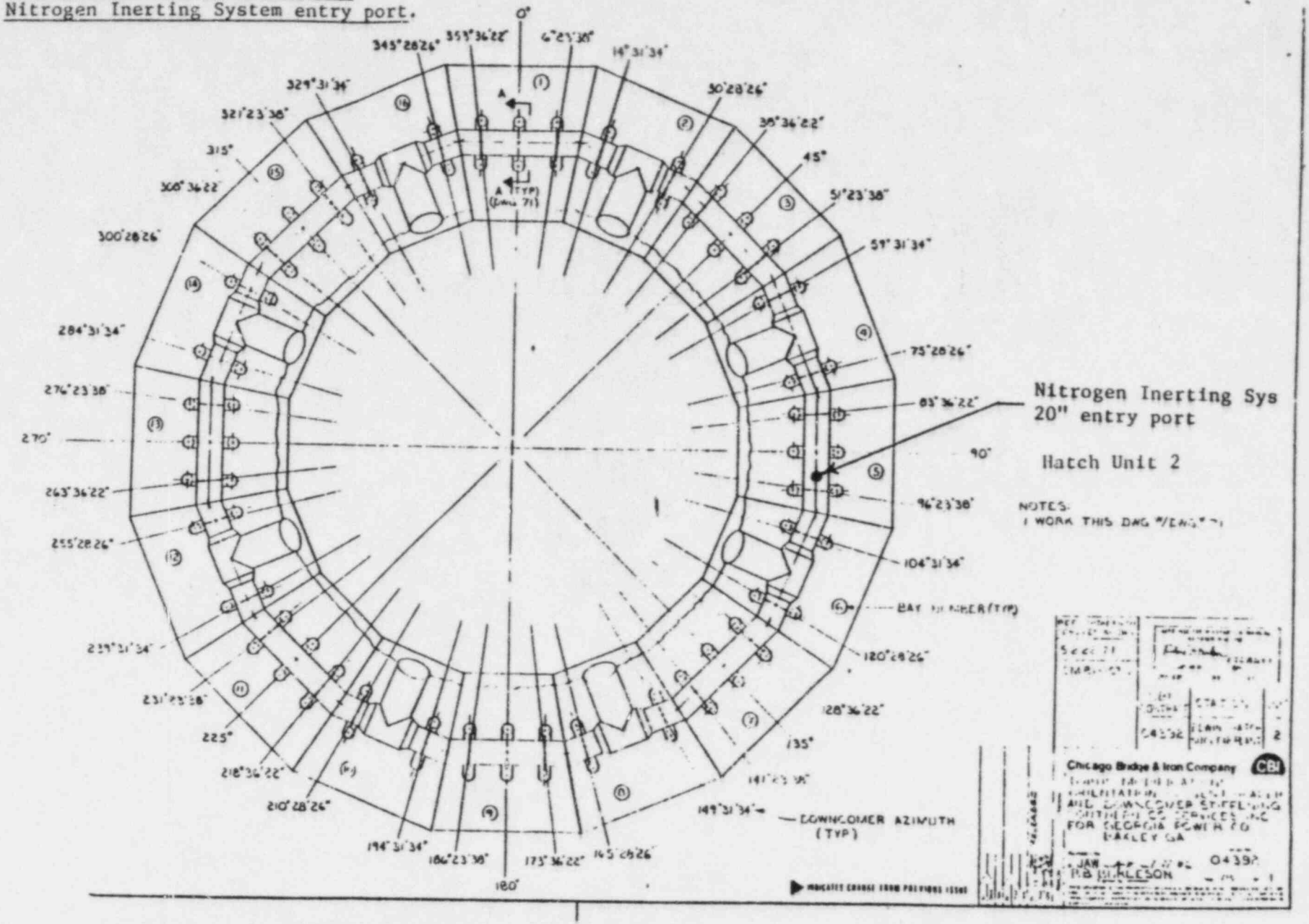
A conference report on the reference meeting, and a meeting notice of the next RRG-NRC meeting will follow shortly.

R L Mapes

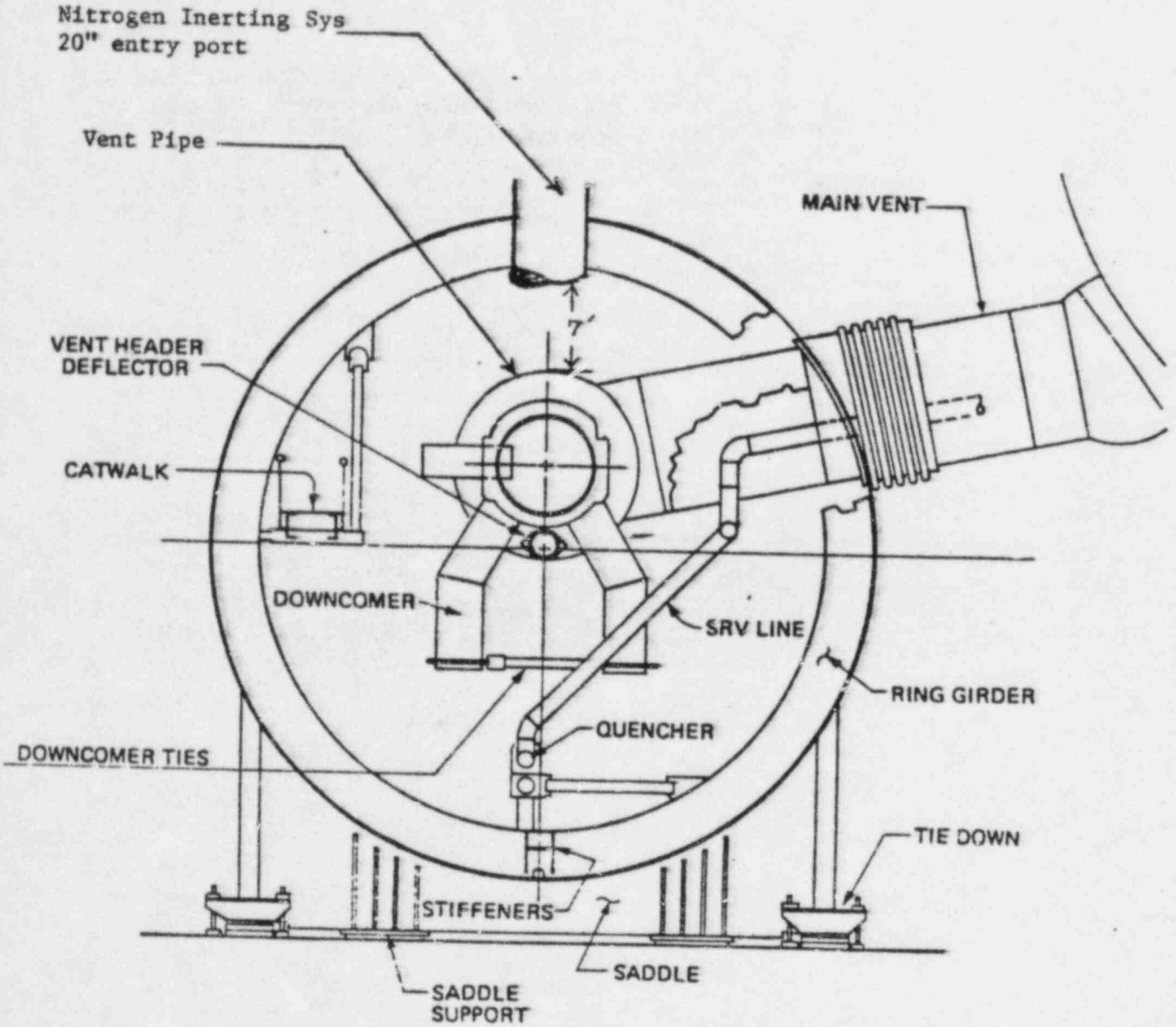
R.L. Mapes
(408) 925-2894

RLM:TWC:rma
attachments

Indicate the location of your
Nitrogen Inerting System entry port.



Indicate the location of your
Nitrogen Inerting System entry Port.



CROSS SECTION OF THE TORUS

Hatch Unit 2

BWR OWNERS' GROUP

David R. Helwig, Chairman

c/o Philadelphia Electric Company (N2-1) • 2301 Market Street • Philadelphia, Pennsylvania 19101 (215) 841-4542

BWROG-8402

February 17, 1984

TO: BWR Owners' Group Primary Representatives

SUBJECT: Regulatory Response Group Meeting, February 6, 1984

The Regulatory Response Group (RRG) was activated by me on February 3, 1984, in order to provide the NRC with a reasoned regulatory response to the vent header cracking discovery at Hatch 2.

The NRC-RRG meeting held on February 6, 1984 resulted in the agreement that the industry would take action on this issue without precipitious NRC action. The attached SIL No. 402 is the recommended action required for each Mark I and Mark II licensee to complete in order to satisfy the preliminary concerns raised by the Hatch 2 event.

In order to provide feedback to the NRC, each licensee must contact their NRC project manager and indicate the expected completion date for each of the SIL recommendations. This should take place as soon as possible.

If you have any questions, please contact me.

Very truly yours,

Thomas J. Dente

Thomas J. Dente, Chairman
Regulatory Response Group
(201) 665-5489

TJD/rma
attachment

NUCLEAR SERVICES OPERATIONS • SAN JOSE, CALIFORNIA 95125

February 14, 1984
File Tab T

SIL No. 402
Category 1

WETWELL/DRYWELL INERTING

A recent event at an operating BWR/4 resulted in a large crack in the vent header in the torus which was attributed to brittle fracture caused by the injection of cold nitrogen into the torus during inerting. Since failure of the containment's suppression system during a Loss of Coolant Accident (LOCA) could result in containment system overpressurization, this Service Information Letter is being issued to recommend actions that can be taken to prevent this type of event and to help ensure containment system integrity.

Background

The containment inerting system injects nitrogen into the torus or wetwell and/or the drywell to limit oxygen concentration to less than approximately 4% by volume. This inerting system is used at high capacity only when a plant starts up after the containment has been deinerted, ie, filled with air. Nitrogen is supplied from a liquid nitrogen storage tank, vaporized in a heat exchanger and injected into the containment through penetrations in the wetwell or in both the wetwell and drywell. There is typically at least one valve in the injection line between the vaporizer and the containment to shutoff the line in the event the nitrogen is too cold. If there are failures in the vaporizer and the shutoff valve, it is possible to inject nitrogen into the containment at low enough temperatures to cool materials below their nil ductility temperatures and potentially cause equipment or structural damage.

Discussion

During a routine visual inspection of the vent system at an operating BWR/4, a large crack was observed in the vent header within the torus. Metallographic examination of the crack indicated that it was due to brittle fracture. The cause is attributed to cooling of the carbon steel vent header by nitrogen injected through a wetwell penetration approximately seven feet directly above the area of failure.

Visual inspections of the vent headers of several other Mark I BWRs showed no indication of cracks. The cause of the failure, cold nitrogen injection, limits the concern to Mark I and II plants which use liquid nitrogen as the source for inerting. BWRs with Mark III containment systems are not affected because they are not inerted.

Recommendations

General Electric recommends, based on information available at this time, that the following actions be taken by all BWR owners with Mark I or Mark II containment systems to confirm that equipment damage has not occurred, that inerting system operation is proper, and so that damage will not occur in the future.

Recommendations 1 and 2 apply to all Mark I and II BWRs. Recommendations 3, 4, 5 apply only to those BWRs which have used their liquid-nitrogen-based inerting systems.

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.

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.

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.

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.

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.

This has been prepared in support of the BWR Regulatory Response Group (RRG) and with its concurrence.

For additional information, please contact your local General Electric Service Representative.

Prepared by: P. P. Stancavage

Approved by: _____ Issued by: _____

D.L. Allred, Manager
Customer Service Information

R.E. Bates, Specialist
Service Communications

Product Reference

T23 Containment System

T48 Inerting System

ATTENDEES

BWR-RRG-NRC STAFF

FEBRUARY 23, 1984

Name	Organization
John A. Zwolinski	NRR/DL/ORAB
Paulette Tremblay	NRR/DL/ORAB
R. Purple	NRR/DL
F. Miraglia	NRR/DL
Gary Holahan	NRR/DL
William V. Johnston	NRR/DE
G. C. Lainas	NRR/DL
C. E. Rossi	IE/DEPER
Rabi Singh	IE/DEPER/EAB
D. B. Vassallo	NRR/DL
W. Minners	NRR/DST/SPEB
B. D. Liaw	NRR/DE/MTEB
K. R. Wichman	NRR/DE/MTEB
Farouk Eltawil	NRR/DSI/CSB
G. W. Rivenbark	NRR/DL
Horace Shaw	NRR/DE/MEB
T. A. Ippolito	AEOD/NRR
R. Gridley	GE
L. S. Gifford	GE (Bethesda, MD)
H. F. Conrad	NRC/NRR
L. Connor	NRC Calendar
T. Tsutsumi	TEPCO
M. Kamimura	MITI
M. Herrera	GE
P. Stancavage	GE
R. L. Mapes	GE
Bryon Siegel	NRR/DL
M. Takahashi	OEISI
Mohan Thadani	NRR/DL
James McLeod	Southern State Serv.
D. R. Heling	PECo (BWROG)
T. J. Dente	Northeast Utilities (RRG Chairman)