Public Service
Electric and Gas
Company

Stanley LaBruna

Public Service Electric and Gas Company P.O. Box 236, Hancocks Bridge, NJ 08038 609-339-4800

Vice President - Nuclear Operations

May 4, 1990

NLR-N90094

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

GENERIC LETTER 89-19
RESOLUTION OF UNRESOLVED SAFETY ISSUE A-47
HOPE CREEK GENERATING STATION
DOCKET NO. 50-354

On September 20, 1989, the Nuclear Regulatory Commission (NRC) issued Generic Letter 89-19, concerning overfill protection for steam generators in PWRs and reactor vessels in BWRs. Public Service Electric and Gas Company (PSE&G) provided its response for Salem Units 1 and 2 in NLR-N90057, dated March 20, 1990. PSE&G hereby provides its response to Generic Letter 89-19 for the Hope Creek Generating Station.

The Hope Creek Generating Station meets the requirements for satisfactory reactor vessel overfill protection as delineated in Generic Letter 89-19. The justification for PSE&G's assessment is contained in Attachment 1.

Should you have any questions regarding this transmittal, please feel free to contact us. Thank you.

Sincerely,

Affidavit
Attachments (3)

A001
1/1

C Mr. J. C. Stone
Licensing Project Manager

Mr. C. Y. Shiraki
Licensing Project Manager

Mr. T. P. Johnson
Senior Resident Inspector

Mr. T. T. Martin
Administrator - Region 1

Mr. Kent Tosch
Chief - New Jersey Department of Environmental Protection
Division of Environmental Quality
Bureau of Nuclear Engineering
CN 415
Trenton, NJ 08625

Ref: NLR-N90094

STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

S. LaBruna, being duly sworn according to law deposes and says:

I am Vice President - Nuclear Operations of Public Service Electric and Gas Company, and as such, I find the matters set forth on our letter dated May 4, 1990, concerning the Hope Creek Generating Station, are true to the best of my knowledge, information and belief.

Subscribed and Sworn to before me this 4th day of May, 1990

Laraine Y Beard

Notary Public of New Jersey LARAINE Y. BEARD
Notary Public of New Jersey
My Commission Expires May 1, 1991

My Commission expires on ____________________

JUSTIFICATION FOR HOPE CREEK GENERATING STATION RESPONSE TO GENERIC LETTER 89-19

Enclosure 2 of Generic Letter 89-19 stated that existing designs would be acceptable if the criteria listed for the specific design are met. The Hope Creek Generating Station is a GE Boiling-Water-Reactor (BWR-4) plant that is equipped with automatic reactor vessel overfill protection. The criteria and response for the Hope Creek Generating Station are listed below:

Criterion

All BWRs provide automatic reactor overfill protection to mitigate main feedwater (MFW) overfeed events. The design of the overfill-protection system should be sufficiently separate from the MFW control system to ensure that the MFW pumps will trip on a reactor high-water-level signal when required, even if a loss of power, loss of ventilation, or a fire in the control portion of the MFW controls system should occur.

Response

PSE&G concurs with "BWROG Response to NRC GL 89-19, Enclosure 2, Hardware Change Recommendation" (Attachment 2) in that the Hope Creek Generating Station is presently equipped with adequate, automatic reactor vessel overfill protection. Any safety benefit gained by providing additional system redundancy and independence from the existing equipment would not be significant.

Criterion

All BWRs reassess operating procedures and operator training and, if necessary, modify them to ensure that operators can mitigate reactor vessel overfill events that may occur via the condensate booster pumps during reduced pressure operation of the system.

Response

The Hope Creek System Engineering, Operations and Operations Training Departments have reviewed current operating procedures and operator training programs pertaining to reactor high level conditions and overfill events and have concluded that no modifications are required. (continued)

Abnormal Operating Procedure OP-AB.ZZ-117(Q), "Reactor High Level" (Attachment 3) provides guidance to control room operators pertaining to reactor overfill events. Directions are given to recover level during conditions in which reactor level control is either on the Master Level Controller (>20% reactor power, normal operating pressure) or the Startup Level Controller (<20% reactor power, zero to normal operating pressure). Additionally, direction is given to close the MSIVs, terminate all vessel feeds and ensure the reactor has scrammed if reactor level increases to +90 inches; this corresponds to a level that is 36 inches above the high level trip setpoint and 28 inches below the bottom of the main steam line vessel penetrations. Therefore, the entire spectrum of possible reactor operating pressures is addressed.

Hope Creek Reactor Operators and Senior Reactor Operators receive training on OP-AB.ZZ-117(Q) during the Initial Licensed Operator Training Program and periodically thereafter in Licensed Operator Requalification Training.

Criterion

Plant procedures and technical specifications for all BWRs with main feedwater overfill protection include provisions to periodically verify the operability of overfill protection and ensure that automatic protection is operable to mitigate main feedwater overfill during power operation.

Response

Hope Creek Technical Specification 3/4.3.9, "FEEDWATER/MAIN TURBINE TRIP SYSTEM ACTUATION INSTRUMENTATION" delineates the limiting condition for operation and associated surveillance requirements for the automatic overfill protection system. This includes the automatic trip of the Main Turbine and Reactor Feed Pump Turbines caused by a high reactor vessel level (+54 inches).

Operability of the overfill protection system is assured by performance of: 1) Channel Checks every 12 hours in accordance with OP-DL.ZZ-026(Q); monthly Channel Functional Tests in accordance with IC-FT.BB-027(Q), IC-FT.BB-028(Q), and IC-FT.BB-029(Q); and 18 month Channel Calibration Tests in accordance with IC-CC.BB-060(Q), IC-CC.BB-061(Q), and IC-CC.BB-062(Q).

NLR-N90094
ATTACHMENT 2

BWROG RESPONSE TO NRC GL 89-19,
ENCLOSURE 2,
HARDWARE CHANGE RECOMMENDATIONS

BWR OWNERS' GROUP

Stephen D. Floyd, Chairman
(919) 546-6901

BWROG-9048

c/o Carolina Power & Light Company • 411 Fayetteville Street • Raleigh, NC 27602

April 2, 1990

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Attention: James G. Partlow
Associate Director for Projects

SUBJECT: SUBMITTAL OF BWR OWNERS' GROUP RESPONSE TO GENERIC LETTER 89-19

Reference: "Request for Action Related to Resolution of Unresolved Safety Issue A-47 'Safety Implication of Control Systems in LWR Nuclear Power Plants' Pursuant to 10 CFR 50.54(f) - Generic Letter 89-19", September 20, 1990

This letter submits to the NRC the BWR Owners' Group (BWROG) report in response to Generic Letter 89-19 (reference). The report presents the results of a study of automatic overfill protection systems currently utilized by BWRs. The report concludes that the BWRs addressed by the report provide adequate and reliable automatic overfill protection consistent with the NRC requirements for closure of Unresolved Safety Issue A-47. In NUREG-1217 and NUREG-1218, the NRC recognizes that the safety benefits gained by providing additional protection system redundancy and independence from existing main feedwater control system equipment is not significant, and that modifications costing in excess of $100,000 are not cost beneficial. The BWROG report demonstrates that the cost to make plant modifications to provide additional redundancy and independence is substantial and therefore the modifications are not cost beneficial.

9004460112 2pp

The comments/positions provided in this letter and report have been endorsed by a substantial number of the members of the BWROG; however, it should not be interpreted as a commitment of any individual member to a specific course of action. Each member must formally endorse the BWROG position in order for that position to become that member's position.

S.D. Floyd

Stephen D. Floyd, Chairman
BWR Owners' Group

Attachment: "BWROG Response to NRC Generic Letter 89-19, Enclosure 2, Hardware Change Recommendations"

cc: F. J. Miraglia, NRC
W. T. Russell, NRC
A. C. Thadani, NRC
G. J. Beck, BWROG Vice Chairman
D. N. Grace, RRG Chairman
BWROG Executive Oversight Committee
BWROG Primary Representatives
BWROG Control Systems Committee
L. S. Gifford, GE
S. J. Stark, GE

EDE 07-0390
DRF A00-03773
March 30, 1990
Revision 0

BWROG RESPONSE TO NRC GL89-19, ENCLOSURE 2, HARDWARE CHANGE RECOMMENDATIONS

BY:
D. E. BENNETT
J. Y. FUJITANI

APPROVED: S. J. Stark

S. J. Stark, Manager
BWR Owners' Group Programs
Regulatory and Analysis Services

APPROVED: A. Koslow

A. Koslow, Manager
Regulatory and Design Compliance
Application Engineering
Electrical Design Engineering (EDE)

BWROGF2.TXT

~~9004160113~~ 16pp

CONTENTS

APPENDICES

1. INTRODUCTION

The U.S Nuclear Regulatory Commission (NRC) has conducted technical evaluations of Unresolved Safety Issue (USI) A-47 "Safety Implications of Control Systems" (see references 2 and 3). As part of the resolution of USI A-47, the NRC issued Generic Letter (GL) 89-19 (see reference 1) that summarzies these evaluations and makes recommendations to implement changes which address technical evaluation concerns. Specifically, GL89-19, Enclosure 2, Section 1a recommends that all BWR nuclear power plant licensees:

1) provide an automatic reactor pressure vessel (RPV) overfill protection system to mitigate main feedwater (MFW) control system overfill events; and that adequate system logic configurations, trip channel separation, and separation from main feedwater (MFW) control system equipment be provided to prevent specific MFW control system common mode failures (loss of power or ventilation, or a fire in the MFW control system) from resulting in a RPV overfill event; and if not, at least ensure that a MFW pump trip will occur from such failures.

2) reassess their operating procedures and operator training and modify them if necessary to ensure that the operators can mitigate RPV overfill events that may occur via the condensate booster pumps during reduced reactor pressure operation of the system.

This report presents the results of a BWROG study of automatic overfill protection systems (item 1 above) related to the recommendations of GL89-19 and to the NRC assessments reported in NUREG-1217 and NUREG-1218 (see references 2 and 3).

2. SUMMARY

A review of individual BWR plant-specific drawings and high water level trip records confirms that all of the BWR plants listed in Table 1 currently provide adequate automatic RPV overfill protection. Furthermore, these overfill protection systems are believed to be consistent with the NRC requirements for closure of USI A-47. In references 2 and 3, the NRC recognized that the safety benefits gained by providing additional RPV protection system redundancy and independence from existing MFW control system equipment is not significant, and that modifications costing in excess of $100,000 are not cost beneficial. What is significant in these references is mainly that some sort of reliable automatic RPV overfill protection be provided. The BWROG concurs with this assessment.

As indicated in reference 2 (NUREG-1217), Page 13, Section 3.2.1, a review of BWR plant operating experience did not identify any MFW system RPV overfill event subsequent to the installation of an automatic RPV overfill protection system. A current GE survey of BWR high RPV water level 8 trips supports this conclusion (see Appendix A). In addition, the reviewed records did not identify the occurrence of any common-mode MFW control system failure that might have resulted in RPV overfill. If such a control system failure had occurred, because of current plant designs (described in Section 3) it is unlikely that such a failure would have actually resulted in a RPV overfill event (filling the main steam lines with water).

As discussed in this report, to fully implement the recommendations of GL89-19 requires substantial plant modifications with little safety benefit, therefore the modifications were not considered to be cost beneficial.

3. DESCRIPTION

3.1 Methodology and Analysis

The study first reviewed in detail, current plant-specific documents (mainly plant control system and some plant protection system elementary drawings) to assess and determine the existing plant RPV overfill protection and Main Feedwater (MFW) control system design configurations. These data were then reviewed and tabulated by plant into a data matrix format. This matrix identified the number of sensor lines, sensor trip units and trip relays used as well as the power source for each and the logic channel separation and type. In addition the number and location of the instrument racks and panels used by each device was identified.

Using this matrix, each plant was then grouped by logic configuration, sensor lines, sensors, and the racks and panels used by each, into one of five groups. A through E (see Table 2). These plant groups were then used as the basis for the analysis and for estimating the cost to modify the existing RPV overfill protection system consistent with the GL89-19 recommendations.

As was expected, each plant RPV overfill protection system accesses two or more independent RPV level sensor lines, using two or more sensors. This configuration supported the associated trip logic, but in many cases the device and the rack and panel served both the RPV overfill protection system and the MFW control system functions. This arrangement is not consistent with the complete channel and system separation recommendations of GL89-19.

3.1 Methodology and Analysis (continued)

Similar to most non-safety-related system arrangements, most of the plants reviewed have mixed alternate channel trip logic devices, commingled with other MFW control system equipment and installed in common racks, panels and plant locations. Many of the RPV overfill protection system devices were not only located in MFW control system equipment racks and panels, but in many cases served both RPV overfill protection system and MFW control system functions (see Table 2). This study assumed that all control system inter-panel connection cable and wiring was commingled. To fully comply with GL89-19 recommendations, substantial equipment and wiring rearrangment and additional RPV overfill protection trip channels, sensors, logic devices, wire and cabling, and even new racks and panels to house this equipment, would have to be provided.

3.2 Cost of Modifications

Where modifications would be needed for complete separation, the cost of providing additional RPV level sensor lines and multiple sensors would be prohibitively high (see reference 3, page 28).

A breakdown of the costs related to making the modifications that would be needed to comply with the minimum separation aspects of GL 89-19 is provided in Table 3 and Appendix B. From these data, a range of modification methods were considered to determine if expensive modifications could somehow be made at a more reasonable cost. Because of the major design and engineering cost associated with most changes, no cost effective solutions were found (see Table 3 and Appendix B).

3.3 Existing Systems Reliability

A review of the existing RPV overfill protection system and MFW control system power sources and logic configurations indicated that most plants incorporate some type of "fail-safe" design, where power failures, control signal failures and other credible failures would most likely result in actuating RPV overfill protection and MFW control system alarms, MFW pump trips, main turbine valve closure, a reactor scram, and in some cases MFW flow control valve lock-up. In the unlikely event that a MFW control system common mode failure did result in MFW pump overfeed, any of these occurrences would alert reactor operators to take immediate corrective action.

Appendix A provides an assessment of plant operational experience with the existing RPV overfill protection systems. Based on this assessment, and the current system designs, it is concluded that the existing systems provide adequate RPV overfill protection and that any safety benefits from modifying these systems in full accordance with GL89-19 would not be significant. This appraisal is consistent with the NRC's assessment in NUREG 1218 (see reference 3).

3.4 Conclusions

The cost involved with the design, purchase and installation of additional RPV overfill protection and MFW control system logic channel devices and separation modifications, that fully satisfy the GL89-19 recommendations, is high (see Table 3). Therefore, based on the study findings, the BWROG concludes that any RPV overfill risk-reduction provided does not justify the substantial additional cost, not to mention the outage time needed to implement these changes.

4. REFERENCES

1) Generic Letter GL89-19 "Request for Action Related to Resolution of Unresolved Safety Issue A-47, 'Safety Implication of Control Systems in LWR Nuclear Power Plants' pursuant to 10CFR50.54(f)-Generic Letter GL89-19", issued September 20, 1989.

2) NUREG-1217 "Evaluation of Safety Implication of Control Systems in LWR Nuclear Power Plants - Technical Finding Related to USI A-47", issued June 1989

3) NUREG-1218 "Regulatory Analysis for Resolution of USI A-47", issued July 1989

Table 1

PARTICIPATING BWROG NUCLEAR POWER PLANTS AND LICENSEES

Name	Licensee
Brunswick 1 & 2	Carolina Power & Light Company
Perry 1	Cleveland Electric Illuminating Company
Dresden 2 & 3	Commonwealth Edison Company
Quad Cities 1 & 2	Commonwealth Edison Company
LaSalle 1 & 2	Commonwealth Edison Company
Enrico Fermi 2	Detroit Edison Company
Hatch 1 & 2	Georgia Power Company
Clinton 1	Illinois Power Company
Duane Arnold	Iowa Electric Light & Power Company
Cooper Station	Nebraska Public Power District
James FitzPatrick	New York Power Authority
Nine Mile Point 1 & 2	Niagara Mohawk Power Company
Monticello	Northern States Power Company
Susquehanna 1 & 2	Pennsylvania Power & Light Company
Peach Bottom 2 & 3	Philadelphia Electric Company
Limerick 1 & 2	Philadelphia Electric Company
Hope Creek	Public Service Electric & Gas Company
Grand Gulf 1	Systems Energy Resources
Browns Ferry 1,2 & 3	Tennessee Valley Authority

Table 2

TYPICAL BWROG PLANT RPV OVERFILL PROTECTION SYSTEM CONFIGURATIONS

Group A Plants

Two out of three high RPV level 8 trip logic
Three or more shared sensors using independent sensor lines and one rack
Two RPV overfill protection and MFW control system panels

Group B Plants

Two out of three high RPV level 8 trip logic
Two or more shared sensors using a common sensor line and rack
One or two RPV overfill protection and MFW control system panels

Group C Plants

One out of two twice high RPV level 8 trip logic
Two or more separate sensors using a common sensor line and two racks
Two or more RPV overfill protection and MFW control system panels

Group D Plants

Two out of two high RPV level 8 trip logic
Two separate sensors using independent sensor lines and two racks
One RPV overfill protection and MFW control system panel

Group E Plants

Two out of two high RPV level 8 trip logic
Two shared sensors using a common sensor line and rack
One RPV overfill protection and MFW control system panel

Table 3

MODIFICATION COST RANGES

General Costs Associated With Modifying Each Table 2 Plant RPV Overfill Protection System For Compliance With GL89-19 (see Appendix B)

Application	Estimated Cost Range Minimum -- Maximum
1. DESIGN ENGINEERING Provide plant specific design modification drawings, hardware purchase specifications, vendor selection, delivery schedules, quality assurances etc.	$31K -- $155K
2. HARDWARE Purchase and delivery cost of hardware	16K -- 59K
3. PLANT ENGINEERING Provide site installation guidance; generate change documents; update plant design, operating, licensing, maintenance procedures and documents; equipment and system acceptance tests	45K -- 160K
4. INSTALLATION Equipment installation and testing (Craft labor and materials)	100K -- 700K
TOTAL COSTS TO IMPLEMENT CHANGES	192K - 1074K

APPENDIX A. REACTOR PRESSURE VESSEL HIGH WATER LEVEL TRIPS

Background

Several data bases were reviewed to determine the frequency of High Water Level (HWL) events in the Reactor Pessure Vessel (RPV) of U.S. BWRs. The RPV HWL trip in BWRs is often referred to as the RPV water level 8 trip, and its purposes are to prevent overfill of the RPV and to prevent the introduction of liquid water into the main steam lines.

In all BWRs listed in Table 1, a level 8 trip will trip the main turbine, the HPCI turbine or motor, the RCIC turbine, the FW pump turbines or motors, and on some plants the HPCS pump motor. In newer plants (BWR 6) the level 8 trip will also directly scram the reactor. If the plant is operating at power levels above the turbine bypass capacity (typically 15% to 35% of full power), a main turbine trip should automatically lead to a reactor scram. If not, the resulting high reactor neutron flux, high reactor pressure, or main turbine control valve fast closure will scram the reactor. In some cases the operator will manually scram the reactor in the event of HWL before the automatic trip or scram signals take effect.

COMPASS Data Base

The most complete data base for BWR scrams is GE's Comprehensive Performance Analysis and Statistics System (COMPASS), which includes all outage events for U.S. BWRs from the start of electric power generation to the present. Scrams in COMPASS that could have resulted from RPV HWL were reviewed to determine how many could be positively identified.

Three categories of trips were identified:

True HWL trips - Water level rose to Level 8 and main turbine trip occurred. There were 84 such events in COMPASS.

APPENDIX A (continued)

False HWL trips -	A false HWL signal, due to instrumentation or human error, led to turbine trip. Although this does not represent a true HWL event, the trip logic was challenged and successfully performed the trip. There were 15 such events.
Possible HWL trips -	Scram occurred, and there was a water level transient, but the description of the event was not detailed enough to assure that it resulted from a HWL trip. There were 11 such events.

In all three of these categories there were 110 events, over a period of 431 reactor years of commercial operation. This represents 0.26 high RPV water level signals per plant year. This period included the long shutdown of several BWR plants. In summary, there were,

True HWL trips -	84
False HWL trips -	15
Possible HWL trips -	11
Total HWL events -	110 = 0.26 per plant year

<u>NEWLER Data Base</u>

The NEWLER data base, maintained by INPO, reports on licensee event reports (LERs) from January 1984 to present. Unplanned reactor scrams are reported as LERs, so a search of the LERs was made to locate HWL events. Several categories were identified, as follows:

HWL trips that led to turbine trip or scram -	23
HWL trips from false signals -	7
HWL trips (HPCI/RCIC) while shutdown -	16
Possible HWL trips -	3

Possible HWL trips from false signals -	1
HWL trips from false signals, while shutdown -	4
Possible HWL trips while shutdown -	2
Possible trips from false signals, shutdown -	1
Total events:	57

Trips while shutdown appear here and not in COMPASS. Thus, the events identified here but not in COMPASS number 23, and they cover 162.7 plant years of commercial operation, so the shutdown HWL events occurred at a rate of 0.14 per plant year.

SUMMARY

A total frequency of HWL events is obtained by taking the COMPASS scram data, 0.26 HWL related scrams per plant year, plus the NEWLER data for HWL trips while the reactor was shutdown (generally following scram), 0.14 HWL trips per plant year. The total frequency of HWL trips in U.S. BWRs has been 0.4 per plant year over the history of commercial operation.

The NEWLER data indicate that the total HWL trip rate since 1984 is 0.34 per plant year, slightly lower than the rate for all years. This is consistent with the scram frequency experience that shows a decreasing scram frequency per plant year in recent years.

The total number of challenges to the overfill protection system is the sum of HWL trips occurring during reactor power operation plus HWL trips occurring during reactor shutdown. The COMPASS data base reports 110 HWL trips and the NEWLER data base reports 23 HWL trips occurring while shutdown during the 1985 thru 1989 period. Thus, there have been 133 total HWL challenges to the currently configured automatic RPV overfill protection systems with not a single recorded instance of failure.

APPENDIX B

GL 89-19 MODIFICATION COST ESTIMATES
(DOLLAR COST IN THOUSANDS)

SERVICES	PLANT GROUP									
	A		B		C		D		E	
NAME	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
DESIGN ENGINEERING										
CONCEPTUAL DESIGN	60	90	50	80	20	50	40	80	60	80
HARDWARE PROCUREMENT	20	30	20	30	5	20	20	30	20	30
QUALITY ASSURANCE	5	15	2	10	1	5	2	10	5	10
DRAFT DOCUMENTS	10	20	10	20	5	10	10	20	10	20
TOTAL	95	155	82	140	31	85	72	140	95	140
PLANT ENGINEERING										
RECEIVE EQUIPMENT	10	20	10	20	5	10	10	20	10	20
INSTALLATION GUIDANCE	30	50	30	50	10	30	20	50	30	50
CHANGE DOCUMENTS	10	20	10	20	5	10	10	20	10	30
UPDATE DOCUMENTS										
DESIGN	5	10	5	10	5	10	5	10	5	10
OPERATING	5	10	5	10	5	10	5	10	5	10
LICENSING	5	10	5	10	5	10	5	10	5	10
MAINTENANCE	5	10	5	10	5	10	5	10	5	10
ACCEPTANCE TESTING	10	30	10	20	5	10	10	20	10	20
TOTAL	80	160	80	150	45	100	70	150	80	160
HARDWARE INSTALLATION										
CRAFT INSTALLATION	150	550	100	500	90	300	100	500	150	600
TESTING	20	150	20	90	10	80	10	80	20	100
TOTAL	170	700	120	590	100	380	110	580	170	700
SERVICES TOTAL	345	1015	282	880	176	565	252	870	345	1000

APPENDIX B

GL 89-19 MODIFICATION COST ESTIMATES (cont'd)
(DOLLAR COST IN THOUSANDS)

HARDWARE		PLANT GROUP														
	PRICE		A			B			C			D			E	
ITEM NAME	EACH	QTY	MIN	MAX	QTY	MIN	MAX	QTY	MIN	MAX	QTY	MIN	MAX	QTY	MIN	MAX
DEVICE																
TRANSMITTER	1.5	2		3.0	2		3.0				2		3.0	2		3.0
POWER SOURCE	5.0	2		10.0	2		10.0	2		10.0	2		10.0	2		10.0
TRIP UNIT	3.0	2	6.0	6.0	2	6.0	6.0	2	3.0	6.0	2	6.0	6.0	2	6.0	6.0
RELAY	0.5	4	2.0	2.0	4	2.0	2.0	4	1.0	2.0	4	2.0	2.0	4	2.0	2.0
INDICATOR	0.1	1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	1	0.1	0.1
ANNUNCIATOR	0.3	1	0.3	0.3	1	0.3	0.3	1	0.3	0.3	1	0.3	0.3	1	0.3	0.3
ISOLATOR (IE)	1.0	2	2.0		2	2.0		2	2.0		2	2.0		2	2.0	
RACK	10.0	1		10.0	1		10.0	1		10.0	1		10.0	1	10.0	10.0
PANEL	10.0	1		10.0	1		10.0	1		10.0	1		10.0	1		10.0
CABINET	2.0	1	2.0		1	2.0		1	2.0		1	2.0		1	2.0	
WIRING*	0.5	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1
CABLING*	2.0	1	2.0	2.0	1	2.0	2.0	1	2.0	2.0	1	2.0	2.0	1	2.0	2.0
CONDUIT*	2.0	1	2.0	2.0	1	2.0	2.0	1	2.0	2.0	1	2.0	2.0	1	2.0	2.0
WIRE RACKS*	1.5	1	1.5	1.5	1	1.5	1.5	1	1.5	1.5	1	1.5	1.5	1	1.5	1.5
MISCELLANEOUS			7.0	12.0		5.0	10.0		2.0	5.0		5.0	10.0		5.0	10.0
HARDWARE TOTAL**			25	59		23	57		16	49		23	57		33	57
SERVICES TOTAL			345	1015		282	880		176	565		252	870		345	1000
GRAND TOTAL			370	1074		305	937		192	614		275	927		378	1057

* COST PER 1000 FEET
**ROUNDED

NLR-N90094
ATTACHMENT 3

OP-AB.Z7-117(Q)
REACTOR HIGH LEVEL

C. Farron 7/2/85 Preparer/Date | SRO/Date | OE/Date | ALARA/Date | Site Eng./Date

N/A SOAB/Date | SORC/Date 7/24/85 | 85-56 Mtg. No. | OM/Date 7/25/85

REACTOR HIGH LEVEL

1.0 SYMPTOMS

1.1 Alarms

a. RPV LEVEL 7

b. RPV LEVEL 8

1.2 Increasing reactor vessel level

1.3 Increasing reactor power

1.4 Reactor feed flow greater than steam flow

1.5 Controlling level signal fails low

1.6 Turbine Driven Reactor Feedwater Pump lock-up

2.0 AUTOMATIC ACTIONS

2.1 Reactor Feed Pump trips	(+54 inches)
2.2 Main Turbine trips	(+54 inches)
2.3 HPCI/RCIC Turbine trips	(+54 inches)

3.0 IMMEDIATE OPERATOR ACTIONS

3.1 **TRANSFER** the level controller or RFP Turbine Controller to manual and restore vessel level to between Level 4 and Level 7.

3.2 Ensure all appropriate automatic actions are complete.

3.3 **If** the Unit Scrams implement procedure OP-EO.ZZ-100.

4.0 SUBSEQUENT OPERATOR ACTIONS

4.1 Ensure that all appropriate immediate operator actions are complete

4.2 SELECT the alternate level channel (CHAN A SELECT or CHAN B SELECT) if the inservice MASTER LVL CONT level signal failed low, and return level control to auto.

4.3 If the START UP LEVEL CONTROL fails transfer valve and pump control to manual.

4.4 If a feedwater input signal fails downscale transfer level control to the START UP LEVEL CONTROL (single element) with either A or B feedpump selected for auto control.

NOTE 4.5
Main Steam Line flooding occurs at +118 inches as indicated on the upset range.

4.5 In the event that the RPV level increases to +90 inches close the MSIVs, terminate all RPV feeds and ENSURE the reactor has scrammed.

4.6 If during the transient RPV level reaches +118, ENSURE that the steam lines for the Main Turbine, RFP, HPCI, and RCIC Turbines are drained prior to operation of these components.

CAUTION 4.7
If the MSLs were flooded, delay the start of HPCI and RCIC until RPV level decreases to between Level 2 and Level 3 to maximize the draining of the steam supply lines

4.7 Start HPCI and RCIC, as necessary, to maintain vessel level between Level 4 and Level 7.

5.0 DISCUSSION

5.1 A loss of the control signal to the reactor feed pump turbine will lock the reactor feed pump at the speed level demand prior to the control signal failure. With restoration of the control signal a manual reset on C651C is necessary to restore automatic operation.

5.2 Loss of feedwater flow signal in Master Level Control.

a. The loss of a single feedwater flow input will result in an increase in the reactor vessel water level which may cause the Main Turbine and RFP Turbines to trip.

b. The total loss of the feedwater flow signal input would result in an increase in the reactor vessel water level which would cause the Main Turbine and RFP Turbines to trip.

5.3 Loss of the reactor vessel water level signal input to the master level controller would result in a reactor water level increase which will trip the Main Turbine and RFP Turbines.

5.4 A high level condition in the RCIC and HPCI steam supply drain pots will cause the respective overhead turbine trouble alarms to annunciate in the control room. When these alarms clear the steam supply lines should be free of condensate if vessel level exceeded +118 inches during the high level transient.

5.5 Following a reactor scram the SETPOINT SETDOWN logic will automatically lower the level setpoint to prevent a vessel overfeed. The logic can be reset when the scram signal is cleared.