GENERAL ELECTRIC COMPANY

CLASS I

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March 2000

TECHNICAL SPECIFICATION IMPROVEMENT ANALYSIS FOR THE EMERGENCY CORE COOLING SYSTEM ACTUATION INSTRUMENTATION FOR QUAD CITIES NUCLEAR POWER STATION, UNITS 1 & 2

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CONTENTS OF THIS REPORT

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TABLE OF CONTENTS

	Page
1. INTRODUCTION	1
2. EVALUATION METHOD	2
3. RESULTS OF ECCS EVALUATION	4
4. SUMMARY AND CONCLUSIONS	7
5. REFERENCES	8
APPENDIX A: ECCS ACTUATION INSTRUMENTATION EVALUATION FOR THE QUAD CITIES NUCLEAR POWER STATION, UNITS 1 & 2	A-1

1. INTRODUCTION

This report extends the generic study of modifying the technical specification requirements of the emergency core cooling system (ECCS) on a plant specific basis for Quad Cities Nuclear Power Station, Units 1 & 2 (QC 1 & 2), BWR 3s. The generic study (References 1 and 2) provides a technical basis to modify the surveillance test intervals and allowable out-of-service times of the ECCS actuation instrumentation from those of the generic technical specifications. The generic study also provides additional analyses of various known different ECCS configurations to support the application of the generic basis on a plant specific basis. The generic basis and the supporting analyses were utilized in this plant specific evaluation. The results of the plant specific evaluation for QC 1 & 2 are presented herein.

2. EVALUATION METHOD

The plant specific evaluation of the modification of the surveillance test frequencies and allowable out-of-service times of the ECCS actuation instrumentation was performed in the following steps:

a. Gather plant specific information on the ECCS from Commonwealth Edison Company (ComEd). The information includes the following:

   (1) Piping and Instrumentation Diagrams (P&IDs) of ECCS, reactor core isolation cooling (RCIC) system, emergency service water systems, and air systems to ADS valves.
   (2) Elementary Diagrams of the ECCS, RCIC, and related systems.
   (3) ECCS, RCIC and electric power distribution system descriptions such as those in the plant Final Safety Analysis Report (FSAR).
   (4) Technical specifications on the ECCS, RCIC, the suppression chamber, and the electrical systems.
   (5) Information on ECCS surveillance test procedures.
   (6) Dependency matrices showing dependence of ECCS and RCIC systems on support systems and on actuation instrumentation.
   (7) Available data on actuation instrumentation failures.

   The latest revisions of the above items were supplied by ComEd. Section I of the checklist in Appendix A was used to identify the data source of the plant specific information.

b. Construct the plant specific ECCS configuration from the plant specific information. Sections "A" through "E" in Section II of the Appendix A checklist was used for this process.

c. Compare the plant specific ECCS configuration with the generic ECCS configuration using the generic ECCS fault trees, ECCS description, technical specification requirements, and other generic inputs. Section III of the checklist was used for this process.

d. Classify the differences in ECCS system design, in support systems, and in instrumentation, into three categories:

   (1) Differences which obviously have no negative effect on the reliability of the ECCS. Examples of these "no effect" items are component name differences, symbol differences, and other minor non-functional differences. Other effects not requiring analysis are those in which the specific plant has greater redundancy than the generic model. Disposition of the items with obviously no negative effect is done with "no analysis required".
   (2) Differences which require engineering judgment for disposition because of the functional differences. Examples of these differences are the use of shared room cooling systems in a specific plant compared with individual room cooling systems in the generic plant. The disposition of such items would require engineering assessment in a "simple study" as shown in Appendix F of Reference 2.
   (3) Differences which require additional analyses to evaluate the effect on the ECCS reliability. Examples of such differences are use of two diesel generators and two electrical systems in a specific plant compared with a larger number of diesel generators and electrical systems in the generic evaluation. Disposition of these items would require additional analyses ("Modify fault trees and perform analysis.") to compare with the generic results. These analyses are documented in Reference 2.

e. Compile a list of plant specific differences of Categories (2) and (3).

f. Assess the reliability effect of the differences identified in Step (e) on the generic results. The results of the assessment are documented in Section III of the checklist, Appendix A.

g. Document the results of the plant specific evaluation.

The above seven step process is documented in Appendix A of this report.

3. RESULTS OF ECCS EVALUATION

The results of the plant specific evaluation of the ECCS for QC 1 & 2 are documented in Appendix A of this report. The results show that the ECCS and support systems configuration of QC 1 & 2 has eleven differences from the BWR 3/4 generic model* which are classified Category (3), and two which are in Category (2).

3.1 Detailed Analyses

The QC 1 & 2 differences in Category (3), requiring detailed analysis, are as follows:

a. The generic model has 4 LPCI pumps with 1 pump per loop, QC 1 & 2 have 2 LPCI loops with 2 pumps per loop.

b. The generic model has 1 HPCI pump, QC 1 & 2 have 2 HPCI pumps (1 multi-stage high pressure pump plus 1 booster pump).

c. The generic model has 2 core spray pumps per loop, QC 1 & 2 have 1 core spray pump per loop.

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* The term "generic model" means the ECCS configuration used in the generic analysis.

d. The generic model has 4 diesel generators, QC 1 & 2 have 2 diesel generators each. (One DG is shared between units 1 & 2, as discussed in Section 3.2, below.)

e. The generic model has 4 divisions of offsite AC power, QC 1 and 2 have 1 division fed from offsite AC power and the other division is fed from the Unit Auxiliary Transformer (UAT).

f. The generic model has 4 divisions of onsite AC power, QC 1 & 2 have 2 divisions of onsite AC power.

g. The generic model has 4 divisions of DC power, QC 1 & 2 have 2 divisions of DC power.

h. The generic model has four emergency service water loops, with loops 3 and 4 primarily providing cooling water to diesel generators 3 and 4. QC 1 and 2 are served by 2 divisions of diesel generator cooling water pumps. Each diesel generator has an associated cooling water pump that provides engine cooling. The unit diesel generator cooling water pumps provide cooling to the associated unit ECCS room coolers. The common diesel cooling water pump can be manually aligned to provide room cooling to Unit 1 or Unit 2 if necessary

i. The generic model has no loop selection logic for LPCI, QC 1 & 2 have loop selection logic.

j. The generic model has 8 individual instrument channels for RPV water level, Drywell pressure, and RPV pressure permissive signals; QC 1 & 2 have 4 common RPV level signals, 4 Drywell pressure signals, and 2 RPV pressure permissive signals. The RPV water level and Drywell pressure signals are arranged in a 1-out-of-2-twice logic scheme. The RPV pressure permissive signals are arranged in a 1-out-of-2 logic scheme.

k. The generic model core spray and LPCI injection valve signal failure requires 4 signals to fail; QC 1 & 2 core spray and LPCI injection valves can fail upon failure of 2 signals.

All eleven of these differences result in less redundancy of emergency equipment for QC 1 & 2, so they impact the ECCS water injection function failure frequency. The BWR 3/4 fault tree was modified to Case 4B, as described in Section 5.4 of Reference 2, to account for these differences.

3.2 Simple Studies

The Category (2) differences between QC 1 & 2 and the generic model, requiring a simple study, are:

a. The generic model has one diesel generator for each electrical division, QC 1 & 2 have one dedicated DG each, with a third DG shared between the two units. The difference in number of diesel generators was evaluated above in the Category (3) detailed analysis using the Case 4B study from Reference 2 for a plant with 2 diesel generators. However, the Case 4B study did not analyze for a shared diesel generators between two plants.

b. The generic model assumes monthly testing of ADS Drywell Pressure Bypass Timers and ADS Initiation Timers. QC 1 and 2 test these same timers every 18 months.

With regard to the sharing of the swing diesel generator (DG) between Units 1 and 2, this will have no effect on the analysis for LOSP at either one of the units. The following is stated in the UFSAR: "The onsite auxiliary electric power system is designed to provide reliable power to those auxiliaries necessary for power generation and to those auxiliary systems important to nuclear safety. In the event of total loss of auxiliary power, the auxiliary power required for safe shutdown is supplied from three standby emergency diesel generators located onsite. There is one dedicated diesel generator for each unit plus a swing generator that can be utilized by either unit. In the event of a total loss of all alternating

current (Station Blackout event), the auxiliary power required for safe shutdown is supplied from two standby diesel generators located in the Station Blackout Building."

4. SUMMARY AND CONCLUSIONS

A plant specific evaluation of modifying the surveillance test intervals and allowable out-of-service times of the ECCS from the technical specifications of QC 1 & 2 has been performed. The evaluation utilized the plant specific information supplied by ComEd and the generic basis and the additional analyses documented in References 1 and 2.

The results indicate that the ECCS configuration for QC 1 & 2 is similar to the ECCS configuration in the generic evaluation, with thirteen significant differences. Eleven of these differences between QC 1 & 2 and the generic model have been modeled by envelope Case 4B of Reference 2, plus two simple studies, which show that the proposed changes to ECCS actuation instrumentation Technical Specifications would meet the acceptance criteria in Reference 2. Therefore, the generic basis in References 1 and 2 is applicable to QC 1 & 2.

5. REFERENCES

(1) D. B. Atcheson, et al., "BWR Owners' Group Technical Specification Improvement Methodology (with Demonstration for BWR ECCS Actuation Instrumentation) Part 1", General Electric Company, NEDC-30936P-A, December 1988.

(2) D. B. Atcheson, et al., "BWR Owners' Group Technical Specification Improvement Methodology (with Demonstration for BWR ECCS Actuation Instrumentation) Part 2", General Electric Company, NEDC-30936P-A, December 1988.

APPENDIX A

ECCS ACTUATION INSTRUMENTATION EVALUATION FOR THE QUAD CITIES NUCLEAR POWER STATION, UNITS 1 & 2

Section I - ECCS Plant Specific Data Source

Utility: Commonwealth Edison Company

Plant: Quad Cities Nuclear Power Station, Units 1 & 2

Source Number

1. P&Ids Unit 1/Unit 2 : M-13/M-60, M-36/M-78, M-39/M-81, M-46/M-87, and M-50/M-89.
2. Emergency Service Water P&IDs
3. Electrical Drawing Unit 1/Unit 2: 4E-1328/4E-2328
4. Instrumentation Logic Diagrams
5. ECCS Fault Trees
6. Quad Cities PSA Success Criteria Notebook (#QC PSA-003, Feb. 99)
7. Technical Specifications
8. Other Drawings
9. Dependency Matrices
10. Failure Data
11. Test Procedure Questionnaire
12. Telephone Call Records
13. UFSAR 7.3

Section II - ECCS Configuration Data

A. ECCS System

	QC	GENERIC BWR 3/4	Difference (Y/N)	Data* Source
1. Number of:				
- Core Spray Pumps/Loops	2/2	4/2	Y	1
- LPCI Pumps	4	4	N	1
- ADS Valves	5	5	N	1
- HPCI Pumps	2	1	Y	1
2. Needed for Success, Number of:				
- Core Spray Pumps/Loops	1/1	2/1	Y	6
- LPCI Pumps	1	1	N	6
- ADS Valves	1	2	Y	6
3. Number of:				
- Diesel Generators	2**	4	Y	3
- Electrical Divisions	2	4	Y	3
4. IC or RCIC	RCIC	RCIC	N	1
5. Loop Selection Logic	Y	N	Y	13

* The numbers shown in the Data Source column refer to the documents listed in Section I, ECCS Plant Specific Data Source.

** Each unit has one dedicated diesel generator, and a third DG is shared between units 1 & 2.

Section II - ECCS Configuration Data

B. SUPPORT SYSTEM DEPENDENCIES

The dependencies each front line ECCS system has on the listed support subsystems for the generic and specific plants are shown.

FRONT LINE SYSTEMS

SUPPORT SUBSYSTEMS	LPCI ---LOOPS-- A	B	C	D	CORE SPRAY ---LOOPS-- A	B	ADS A	ADS B	RCIC	HPCI	DIESELS A	B*	C	D
OFFSITE AC POWER	X	X	G	G	X	X			G	G				
ONSITE AC POWER														
DIVISION 1	X		G		X		G	G	G	G				
DIVISION 2		X		G		X	G	G		G				
DIVISION 3	G		G		G				G					
DIVISION 4		G		G		G				G				
ONSITE DC POWER														
DIVISION 1	X		G		X		X		X		G	X		
DIVISION 2		X		G		X		X		X	X	G		
DIVISION 3	G		G		G		G		G				G	
DIVISION 4		G		G		G		G		G				G
SERVICE WATER														
EMERGENCY A**	X		G		X				X		X			
EMERGENCY B**		X		G		X				X		X		
EMERGENCY C										G			G	
EMERGENCY D														G
WATER SUPPLY														
SUPPRESSION POOL	X	X	G	G	X	X			X	X				
CONDENSATE TANK***					X	X			X	X				
SPRAY POND/RIVER											X	X	G	G

X = IN BOTH GENERIC AND SPECIFIC BWR 3/4s; G = ONLY IN GENERIC BWR 3/4
S = ONLY IN SPECIFIC BWR 3/4

* Diesel Generator B is shared between Units 1 and 2. DG C of Unit 2 serves the same role as DG A of Unit 1.

** The same Service Water systems for QC 1 and 2 are served by 2 divisions of diesel generator water pumps. Emergency Service Water A is the normal lineup and Emergency Service Water B can be manually aligned if required.

*** The CST can be lined up to the CS, but it is a manual action performed locally.

Section II - ECCS Configuration Data

B. SUPPORT SYSTEM DEPENDENCIES (Cont.)

The dependencies each front line ECCS system has on the listed support subsystems for the generic and specific plants are shown.

FRONT LINE SYSTEMS

SUPPORT SUBSYSTEMS	LPCI ---LOOPS--				CORE SPRAY ---LOOPS--		ADS	ADS			DIESELS			
	A	B	C	D	A	B	A	B	RCIC	HPCI	A	B*	C	D
AIR														
CONTROL AIR							G	G						
CONTAINMENT INSTR. AIR**							X	X						
ROOM COOLING														
LPCI	X	X	G	G										
CS					X	X								
RCIC									X					
HPCI										X				
DIESELS											X	X	G	G

X = IN BOTH GENERIC AND SPECIFIC BWR 3/4s; G = ONLY IN GENERIC BWR 3/4
S = ONLY IN SPECIFIC BWR 3/4

* Diesel Generator B is shared between Units 1 and 2. DG C of Unit 2 serves the same role as DG A of Unit 1.

** For Target Rock ADS valves only.

Section II - ECCS Configuration Data

C. INSTRUMENTATION DEPENDENCIES

The dependencies each front line ECCS system has on the listed actuation instrumentation for the generic and specific plants are shown.

FRONT LINE SYSTEMS

ACTUATION INSTRUMENTATION	--LPCI PUMPS-- A	B	C	D	CORE SPRAY --LOOPS-- A	B	ADS LOGIC A	B	RCIC	HPCI
RPV WATER LEVEL 1**										
LIS-263-72A*	X	S	S	S	X	S	X		S	S
-72B*	S	X	S	S	S	X		X	S	S
-72C*	S	S	X	S	X	S	X		S	S
-72D*	S	S	S	X	S	X		X	S	S
RPV WATER LEVEL 2										
692B,D,F H										G
692A,E/697A,E									G	
RPV WATER LEVEL 3										
1420-105A,106A							G			
1420-105B,106B								G		
RPV WATER LEVEL 8										
693A,E/698A,E									G	
693B,F										G
LIS-263-72A,B									S	S
DRYWELL PRESSURE										
PS 1001-90A,C	X	S	S	S	X	S	G		G	
B,D	S	X	S	S	S	X				G
E,G			G		G			G	G	
F,H				G		G				G
1001-89A,C (ADS287-101A,102A)							S			S
1001-89B,D (ADS287-101B,102B)								S		S

X = IN BOTH GENERIC AND SPECIFIC BWR 3/4s
G = ONLY IN GENERIC BWR 3/4
S = ONLY IN SPECIFIC BWR 3/4

* Generic BWR 3/4 has two sensors for each Level 1 line.

** For Quad Cities 1 & 2, RPV Level 1 is designated "Low-Low".

Section II - ECCS Configuration Data

C. INSTRUMENTATION DEPENDENCIES (Cont.)
The dependencies each front line ECCS system has on the listed actuation instrumentation for the generic and specific plants are shown.

FRONT LINE SYSTEMS

ACTUATION INSTRUMENTATION	--LPCI PUMPS-- A	B	C	D	CORE SPRAY --LOOPS-- A	B	ADS LOGIC A	B	RCIC	HPCI
RPV PRESSURE										
263-111A,C	X	S	S	S	G					
-111B,D	S	X	S	S		G				
-52A***	S	S	X	S	X	S				
-52B***	S	S	S	X	S	X				
INJECTION VALVE DELTA P										
DPIS-1459A	G									
-1459B		G								
DPR58C			G							
DPR58D				G						
LPCI PUMP DISCH PRESS HI										
1053-A,B,C,D							X	S		
1053-E,F,G,H							S	X		
CS PUMP DISCH PRESS HI										
1462 A,C							X	S		
1462 B,D							S	X		
ADS DRYWELL PRESS BYPASS TIMER										
A/C							X	S		
B/D							S	X		
ADS TIMER							X	X		
MANUAL INITIATION SW****									X	X

X = IN BOTH GENERIC AND SPECIFIC BWR 3/4s
G = ONLY IN GENERIC BWR 3/4
S = ONLY IN SPECIFIC BWR 3/4

*** Generic BWR 3/4 has two sensors for each RPV pressure signal

**** No system initiation switches for LPCI, Core Spray, and ADS. Individual components within these systems can be manually initiated.

Section II - ECCS Configuration Data

C. INSTRUMENTATION DEPENDENCIES (Cont.)
The dependencies each front line ECCS system has on the listed actuation instrumentation for the generic and specific plants are shown.

FRONT LINE SYSTEMS

RELATED **NON-ACTUATION INSTRUMENTATION**	LPCI PUMPS A	LPCI PUMPS B	LPCI PUMPS C	LPCI PUMPS D	CORE SPRAY LOOPS A	CORE SPRAY LOOPS B	ADS LOGIC A	ADS LOGIC B	RCIC	HPCI
LPCI PUMP DISCHARGE FLOW LOW										
DPT-81A	X	S								
81B		G	S	S						
C			G							
D				G						
CS SYS DISCHARGE FLOW LOW										
FS-1472A(Slave Trip Unit)					X					
1472B(Slave Trip Unit)						X				
CST LEVEL LOW										
LS 1/2-2350A,C									X	X
-2350B,D									S	S
SUPPRESSION POOL LEVEL HIGH									X	X
LS-2351A,B										
HPCI PUMP DISCHARGE FLOW LOW										X
FS-2354										
HPCI TURBINE EXHAUST PRESSURE HIGH										X
PS-2368A,B										
HPCI PUMP SUCTION PRESSURE LOW (653)										X
PS-2360										

X = IN BOTH GENERIC AND SPECIFIC BWR 3/4s
G = ONLY IN GENERIC BWR 3/4
S = ONLY IN SPECIFIC BWR 3/4

Section II - ECCS Configuration Data

D. Minimum Number of Sensors, Channels, or Components for Failure, QC.

A: = MINIMUM SENSOR FAILURES REQUIRED TO FAIL TRIP FUNCTION*
B: = MINIMUM NUMBER SENSOR FAILURES REQUIRED TO FAIL FUNCTION - TOTAL
C: = MINIMUM NUMBER OF SENSOR TYPES REQUIRED TO FAIL FUNCTION

TRIP FUNCTION	A	B	C	DIFFERENT FROM GENERIC (Y/N) B	C
CS PUMP INITIATION	2 DRYWELL PRESSURE AND 2 RPV LEVEL 1**	4	2	N	N
CS INJ VALVE	2 RPV LOW PRESSURE	2	1	Y	N
CS Flow Low	1 CS Flow Low	1	1	N	N
LPCI PUMP INITIATION	2 DRYWELL PRESSURE AND 2 RPV LEVEL 1**	4	2	N	N
LPCI INJ VALVE	2 RPV LOW PRESSURE	2	1	Y	N
LPCI Flow Low	1 LPCI Flow Low	1	1	N	N
ADS INITIATION	2 RPV LEVEL 1**	2	1	N	N
ADS TIME DELAY	2 TIMERS	2	1	N	N
ADS DRYWELL PRESSURE TIMER	2 TIMERS	2	1	N	N
HPCI INITIATION	2 DRYWELL PRESSURE AND 2 RPV LEVEL 1**	4	2	N	N
HPCI LEVEL 8	2*** RPV LEVEL 8 (HIGH)	2***	1	N	N
HPCI INJ VALVE	2 DRYWELL PRESSURE AND 2 RPV LEVEL 1**	4	2	N	N
HPCI Flow Low	1 HPCI Flow Low	1	1	N	N
HPCI WATER SOURCE	4 CST LEVEL	4	1	Y	N

* Based on data sources 4 & 13.
** For Quad Cities 1 and 2, RPV Level 1 is designated "Low-Low".
*** Minimum number of failures required to cause false trip.

Section II - ECCS Configuration Data

D. Minimum Number of Sensors, Channels, or Components for Failure, QC. (Cont.)

A: = MINIMUM SENSOR FAILURES REQUIRED TO FAIL TRIP FUNCTION*
B: = MINIMUM NUMBER SENSOR FAILURES REQUIRED TO FAIL FUNCTION - TOTAL
C: = MINIMUM NUMBER OF SENSOR TYPES REQUIRED TO FAIL FUNCTION

TRIP FUNCTION	A	B	C	DIFFERENT FROM GENERIC (Y/N) B	C
RCIC INITIATION	2 RPV LEVEL 1**	2	1	N	N
RCIC LEVEL 8	2*** RPV LEVEL 8	2***	1	N	N
RCIC WATER SOURCE	4 CST LOW LEVEL TRANSFER LOGIC	4	1	Y	N
RCIC INJ VALVE	2 RPV LEVEL 1**	2	1	N	N

* Based on data sources 4 & 13.
** For Quad Cities 1 and 2, RPV Level 1 is designated "Low-Low".
*** Minimum number of failures required to cause false trip.

Section II - ECCS Configuration Data

E. Surveillance Requirements, ECCS Instrumentation and Related Subsystems*

	SURVEILLANCE REQUIREMENTS** GENERIC 3/4	QC	DIFFERENCE (Y/N)
CORE SPRAY SYSTEM			
REACTOR WATER LEVEL 1***	M	M	N
DRYWELL PRESSURE HIGH	M	M	N
REACTOR PRESSURE LOW	M	M	N
MANUAL INITIATION	R	N/A	Y
LPCI			
REACTOR WATER LEVEL 1***	M	M	N
DRYWELL PRESSURE HIGH	M	M	N
REACTOR PRESSURE LOW	M	M	N
INJECTION VALVE DIFFERENTIAL PRESSURE LOW	M	N/A	Y
MANUAL INITIATION	R	N/A	Y
HPCI			
REACTOR WATER LEVEL 1***	M	M	N
DRYWELL PRESSURE HIGH	M	M	N
CST LEVEL LOW	M	M	N
SUPPRESSION POOL LEVEL HIGH	M	M	N
REACTOR WATER LEVEL 8	M	M	N
MANUAL INITIATION	R	E	N
ADS			
REACTOR WATER LEVEL 1***	M	M	N
DRYWELL PRESSURE HIGH	M	M	N
ADS DRYWELL PRESSURE BYPASS TIMER	M	E	Y
ADS TIMER	M	E	Y
CORE SPRAY PUMP DISCHARGE PRESSURE	M	M	N
LPCI PUMP DISCHARGE PRESSURE	M	M	N
REACTOR WATER LEVEL 3 (LOW)	M	N/A	Y
MANUAL INITIATION	R	N/A	Y
INJECTION VALVE STROKE TEST	Q	Q	N
DIESEL GENERATOR	M	M	N
ELECTRIC POWER			
ESSENTIAL AC	W	W	N
ESSENTIAL DC	W	W	N
ESSENTIAL AC BUSSES	W	W	N

* Based on Technical Specifications, data source No. 7.
** M = MONTHLY, W = WEEKLY, R = REFUELING (18 months), Q = QUARTERLY, E = 18 MONTHS
*** For Quad Cities 1 and 2, Reactor Water Level 1 is designated "Low-Low".

Section III - ECCS Configuration Differences Classification
(Quad Cities Nuclear Power Station, Units 1 & 2)

BWR 3/4 Generic Model	Plant Specific Difference	Classification (Justification if Insignificant)
A. ECCS System Differences		
1. There are 4 LPCI loops with 4 injection valves.	QC has 2 LPCI loops with 2 injection valves.	
2. HPCI has 1 pump.	HPCI has 2 pumps.	
3. Core spray has 2 loops with 2 pumps each.	Core spray has 2 loops with 1 pump each.	
4. 2 ADS valves are required for success.	1 ADS valves are required for success.	
B. Support Systems Differences		
1. 4 diesel generators.	2 DGs, one DG shared between Units 1 & 2.	
2. There are 4 divisions of offsite AC power	There is 1 division of offsite AC power and the other division is fed from the UAT.	
3. HPCI and RCIC are connected to offsite AC power and onsite AC power.	HPCI and RCIC do not require AC power for initiation, only DC.	
4. 4 divisions of onsite AC power.	2 divisions of onsite AC power.	

Section III - ECCS Configuration Differences Classification
(Quad Cities Nuclear Power Station, Units 1 & 2)

BWR 3/4 Generic Model	Plant Specific Difference	Classification (Justification if Insignificant)
B. Support Systems Differences (Cont.)		
5. 4 divisions of onsite DC power.	2 divisions of onsite DC power.	
6. ADS is connected to onsite AC power.	ADS does not require onsite AC power.	
7. Emergency service water has 4 loops.	QC 1 and 2 are served by 2 divisions of diesel generator water pumps. Emergency Service Water A is the normal lineup and Emergency Service Water B can be manually aligned if required.	
8. ADS is dependent on Containment Instrument Air	ADS is not dependent on Containment Instrument Air*.	

* The Target Rock valve uses instrument air (drywell pneumatics) for operation; however, the Target Rock is equipped with an accumulator which will allow operation upon loss of drywell pneumatics.

Section III - ECCS Configuration Differences Classification
(Quad Cities Nuclear Power Station, Units 1 & 2)

BWR 3/4 Generic Model	Plant Specific Difference	Classification (Justification if Insignificant)
C. Instrumentation and Procedures Differences		
1. LPCI has no loop selection logic.	LPCI uses loop selection logic.	
2. The number of instrument channels for RPV level, Drywell pressure and RPV pressure is 8.	Number of instrument channels for RPV level and Drywell pressure is 4 for each ECCS initiation. The number of RPV pressure permissive signals is 2.	
3. RPV Water Level 1 (Low-Low) and Level 3 (Low) provide a permissive function for ADS initiation.	Only RPV Water Level 1 (Low-Low) provides the same permissive function for ADS initiation.	
4. There are separate RPV Level 8 (High) sensors trip HPCI and RCIC.	Common RPV Level 8 (High) sensor trip HPCI and RCIC.	
5. RCIC is dependent on High Drywell Pressure.	QC 1 and 2 RCIC is not dependent on High Drywell Pressure.	

Section III - ECCS Configuration Differences Classification
(Quad Cities Nuclear Power Station, Units 1 & 2)

BWR 3/4 Generic Model	Plant Specific Difference	Classification (Justification if Insignificant)
C. Instrumentation and Procedures Differences (Cont.)		
6. LPCI relies on Injection Valve Delta P for opening.	There are no Delta P Injection Valve sensors. LPCI injection valve permissive is RPV low pressure.	
7. CS and LPCI injection valve signal failure requires 4 signals to fail.	CS and LPCIinjection valves can fail upon failure of 2 signals.	
8. LPCI pump discharge pressure high is a permissive.	LPCI pump discharge pressure signal for annunciation only.	
9. Each individual ECCS system has a manual initiation switch.	Only HPCI and RCIC have individual manual initiation switches. All other ECCS systems do not have manual initiation switches.	
D. Minimum Number of Sensors Required for Failure Differences		
1. 2 Condensate Storage Tank (CST) Level sensor failures are required to fail to transfer the HPCI and RCIC water source.	4 Condensate Storage Tank (CST) Level sensor failures are required to fail to transfer the HPCI and RCIC water source.	

Section III - ECCS Configuration Differences Classification
(Quad Cities Nuclear Power Station, Units 1 & 2)

BWR 3/4 Generic Model	Plant Specific Difference	Classification (Justification if Insignificant)
E. Surveillance Requirements Differences		
1. ADS Drywell Pressure Bypass Timers and ADS Initiation Timers are tested monthly.	ADS Drywell Pressure Bypass Timers and ADS Initiation Timers are tested every 18 months.	