SURVEILLANCE REQUIREMENTS

NOTE

A channel may be placed in an inoperable or bypass status for up to 6 hours for required surveillance testing.

SURVEILLANCE	FREQUENCY
SR 3.3.5.2.1 Perform CHANNEL FUNCTIONAL TEST.	[92] days
SR 3.3.5.2.2 Perform LOGIC SYSTEM FUNCTIONAL TEST.	[18] months
SR 3.3.5.2.3 Perform ECCS RESPONSE TIME TEST.	[18] months

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Two actuation logic channels inoperable for any ADS subsystem. OR Required Actions and associated Completion Times of Condition A not met for any ADS subsystem.	C.1 Verify automatic actuation capability in at least one ADS subsystem AND C.2 Restore automatic actuation capability in both ADS subsystems	1 hour 24 hours
D. Required Actions and associated Completion Times of Condition C not met.	D.1 Declare all ADS valves inoperable	Immediately

3.3 INSTRUMENTATION

3.3.5.2 Emergency Core Cooling System (ECCS) Actuation Logic

LCO 3.3.5.2 Two channels of actuation logic for each ECCS subsystem shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3, except that:
(a) ADS actuation logic is not required to be OPERABLE with reactor steam dome pressure ≤ 50 psig; and,
(b) RCIC actuation logic is not required to be OPERABLE with reactor steam dome pressure ≤ 150 psig.
MODES 4 and 5, when the associated ECCS subsystem is required to be OPERABLE.

ACTIONS

----------NOTE----------
Seperate Condition entry is allowed for actuation logic of each ECCS function.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One actuation logic channel inoperable for any ECCS subsystem.	A.1	Verify channel is in bypass/trip condition.	1 hour
	AND		
	A.2	Restore channel to OPERABLE status.	30 days
B. Two actuation logic channels inoperable for any ECCS injection subsystem. OR Required Actions and associated Completion Times of Condition A not met for any ECCS injection subsystem.	B.1	Declare the affected ECCS injection subsystem(s) inoperable.	Immediately

(continued)

Table 3.3.5.1-2 Emergency Core Cooling System Instrumentation
(Single Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITION REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
20. RHR-LPFL A Manual Initiation	1,2,3,4(a),5(a)	H	SR 3.3.5.1.5	N/A
21. RHR-LPFL B Manual Initiation	1,2,3,4(a),5(a)	H	SR 3.3.5.1.5	N/A
22. RHR-LPFL C Manual Initiation	1,2,3,4(a),5(a)	H	SR 3.3.5.1.5	N/A
23. RCIC Manual Initiation	1,2(c),3(c)	H	SR 3.3.5.1.5	N/A
24. HPCF B Manual Initiation	1,2,3,4(a),5(a)	H	SR 3.3.5.1.5	N/A
25. HPCF C Manual Initiation	1,2,3,4(a),5(a)	H	SR 3.3.5.1.5	N/A
26. ADS A Manual Initiation	1,2(b),3(b)	H	SR 3.3.5.1.5	N/A
27. ADS B Manual Initiation	1,2(b),3(b)	H	SR 3.3.5.1.5	N/A

(a) When the associated ECCS subsystem is required to be OPERABLE.
(b) With reactor steam dome pressure >[50] psig.
(c) With reactor steam dome pressure >[150] psig.

Table 3.3.5.1-2 Emergency Core Cooling System Instrumentation
(Single Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITION REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
12. RCIC Pump Discharge Flow--Low				
a. Pump Minimum Flow Valve Logic	1,2(c),3(c)	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] gpm and ≥ [ ] gpm
13. RHR A Minimum Flow Valve Time Delay Relay	1,2,3,4(a),5(a)	E	SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] seconds
14. RHR B Minimum Flow Valve Time Delay Relay	1,2,3,4(a),5(a)	E	SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] seconds
15. RHR C Minimum Flow Valve Time Delay Relay	1,2,3,4(a),5(a)	E	SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] seconds
16. ADS A Initiation Timer	1,2(b),3(b)	D	SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] seconds
17. ADS B Initiation Timer	1,2(b),3(b)	D	SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] seconds
18. ADS A Bypass Timer (High Drywell Pressure)	1,2(b),3(b)	D	SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] minutes
19. ADS B Bypass Timer (High Drywell Pressure)	1,2(b),3(b)	D	SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] minutes

(continued)

Table 3.3.5.1-2 Emergency Core Cooling System Instrumentation
(Single Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITION REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. RER Pump A Discharge Flow--Low				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] gpm and ≥ [ ] gpm
8. RER Pump B Discharge Flow--Low				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] gpm and ≥ [ ] gpm
9. RHR Pump C Discharge Flow--Low				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] gpm and ≥ [ ] gpm
10. HPCF Pump B Discharge Flow--Low				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] gpm and ≥ [ ] gpm
11. HPCF Pump C Discharge Flow--Low				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] gpm and ≥ [ ] gpm

(continued)

Table 3.3.5.1-2 Emergency Core Cooling System Instrumentation
(Single Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITION REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. EPCF Pump B Discharge Pressure--High				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
b. ADS Permissive	1,2(b),3(b)	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
5. EPCF Pump C Discharge Pressure--High				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
b. ADS Permissive	1,2(b),3(b)	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
6. RCIC Pump Discharge Pressure--High				
a. Pump Minimum Flow Valve Logic	1,2(c),3(c)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig

(continued)

Table 3.3.5.1-2 Emergency Core Cooling System Instrumentation
(Single Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITION REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. RHR Pump A Discharge Pressure--High				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
b. ADS Permissive	1,2(b),3(b)	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
2. RHR Pump B Discharge Pressure--High				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
b. ADS Permissive	1,2(b),3(b)	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
3. RHR Pump C Discharge Pressure--High				
a. Pump Minimum Flow Valve Logic	1,2,3,4(a),5(a)	H	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig
b. ADS Permissive	1,2(b),3(b)	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] psig and ≤ [ ] psig

(continued)

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
(Four Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
9. Suppression Pool Water Level--High, Suction Swapover (A-D)				
a. RCIC	1,2(c),3(c)	G	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] inches
b. HPCF B c. HPCF C	1,2,3,4(a),5(a)	G	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] inches
10. APRM --Not Downscale (A-D)				
a. ADS A Innibit b. ADS B Inhibit	1,2(c),3(c)	F	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ [ ] % RTP

(a) When the associated ECCS [illegible] is required to be OPERABLE.
(b) With reactor steam dome pressure [illegible] [50] psig.
(c) With reactor steam dome pressure >[150] psig.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
(Four Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
6. Drywell Pressure-- High (A-D)				
a. RHR - LPFL A	1,2,3	I	SR 3.3.5.1.1	≤ [ ] psig
b. RHR - LPFL B			SR 3.3.5.1.2	
c. RHR - LPFL C			SR 3.3.5.1.4	
d. HPCF B			SR 3.3.5.1.5	
e. HPCF C			SR 3.3.5.1.6	
f. RCIC	1,2(c),3(c)	I	SR 3.3.5.1.1	≤ [ ] psig
			SR 3.3.5.1.2	
			SR 3.3.5.1.4	
			SR 3.3.5.1.5	
			SR 3.3.5.1.6	
g. [illegible]	1,2(b),3(b)	F	SR 3.3.5.1.1	≤ [ ] psig
h. [illegible]			SR 3.3.5.1.2	
			SR 3.3.5.1.4	
			SR 3.3.5.1.5	
7. Reactor Steam Dome Pressure-- Low, Injection Permissive (Wide Range A-D)				
a. RHR - LPFL A	1,2,3	I	SR 3.3.5.1.1	≥ [ ] psig
b. RHR - LPFL B			SR 3.3.5.1.2	and
c. RHR - LPFL C			SR 3.3.5.1.4	≤ [ ] psig
			SR 3.3.5.1.5	
8. Condensate Storage Tank Level--Low, Suction Swapover (A-D)				
a. RCIC	1,2(c),3(c)	G	SR 3.3.5.1.1	≥ [ ] inches
			SR 3.3.5.1.2	
			SR 3.3.5.1.3	
			SR 3.3.5.1.5	
b. HPCF B	1,2,3,4(a),5(a)	G	SR 3.3.5.1.1	≥ [ ] inches
c. HPCF C			SR 3.3.5.1.2	
			SR 3.3.5.1.3	
			SR 3.3.5.1.5	

(continued)

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
(Four Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. Reactor Vessel Water Level-- Low Low, Level 1.5 (Wide Range E-H)				
a. HPCF B	1,2,3,4(a),5(a)	I	SR 3.3.5.2.1	≥ [ ] inches
b. HPCF C			SR 3.3.5.2.2	
			SR 3.3.5.2.4	
			SR 3.3.5.2.5	
			SR 3.3.5.2.6	
c. ADS A Inhibit	1,2(b),3(b)	D	SR 3.3.5.1.1	≥ [ ] inches
d. ADS B Inhibit			SR 3.3.5.1.2	
			SR 3.3.5.1.4	
			SR 3.3.5.1.5	
4. Reactor Vessel Water Level-- Low Low, Level 2 (Wide Range A-D)				
a. RCIC	1,2(c),3(c)	I	SR 3.3.5.2.1	≥ [ ] inches
			SR 3.3.5.2.2	
			SR 3.3.5.2.4	
			SR 3.3.5.2.5	
			SR 3.3.5.2.6	
5. Reactor Vessel Water Level-- High, Level 8 (Narrow Range A-D)				
a. RCIC	1,2(c),3(c)	I	SR 3.3.5.2.1	≤ [ ] inches
			SR 3.3.5.2.2	
			SR 3.3.5.2.4	
			SR 3.3.5.2.5	
b. HPCF B	1,2,3,4(a),5(a)	I	SR 3.3.5.2.1	≤ [ ] inches
c. HPCF C			SR 3.3.5.2.2	
			SR 3.3.5.2.4	
			SR 3.3.5.2.5	

(continued)

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
(Four Channel Functions)

FUNCTION	APPLICABLE MODES	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level-- Low Low Low, Level 1 (Wide Range A-D)				
a. RHR - LPFL A b. RHR - LPFL C	1,2,3,4(a),5(a)	I	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] inches
c. ADS A	1,2(b),3(b)	D	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] inches
2. Reactor Vessel Water Level-- Low Low Low, Level 1 (Wide Range E-H)				
a. RHR - LPFL B	1,2,3,4(a),5(a)	I	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] inches
b. ADS B	1,2(b),3(b)	D	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ [ ] inches

(continued)

SURVEILLANCE REQUIREMENTS

----------NOTES----------

1. Refer to Tables 3.3.5.1-1 and 3.3.5.1-2 to determine which SRs shall be performed for each ECCS function.

2. A channel may be placed in an inoperable or bypass status for up to 6 hours for required surveillance testing.

SURVEILLANCE	FREQUENCY
SR 3.3.5.1.1 Perform CHANNEL CHECK.	12 hours
SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.	[92] days
SR 3.3.5.1.3 Perform CHANNEL CALIBRATION.	[92] days
SR 3.3.5.1.4 Perform CHANNEL CALIBRATION.	[18] months
SR 3.3.5.1.5 Perform LOGIC SYSTEM FUNCTIONAL TEST.	[18] months
SR 3.3.5.1.6 Demonstrate the ECCS RESPONSE TIME is within limits.	[18] months on a STAGGERED TEST BASIS

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Actions and associated Completion Times of Condition D or E not met. OR As required by Required Action C.1 and referenced in Table 3.3.5.1-1.	F.1 Declare all ADS valves inoperable	Immediately
G. As required by Required Action C.1 and referenced in Table 3.3.5.1-1.	G.1 Align the affected subsystem(s) pump suction to the suppression pool.	24 hours
H. As required by Required Action C.1 and referenced in Table 3.3.5.1-2.	H.1 Restore channel to OPERABLE status.	7 days
I. Required Actions and associated Completion Times of Condition G or H not met. OR As required by Required Action C.1 and referenced in Table 3.3.5.1-1.	I.1 Declare the associated subsystem(s) inoperable.	Immediately

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Three or more channels inoperable for ECCS functions in Table 3.3.5.1-1. OR One channel inoperable for ECCS functions in Table 3.3.5.1-2 OR Required Actions and associated Completion Times of Condition A or B not met.	C.1 Enter the Condition referenced in Table 3.3.5.1-1 or 3.3.5.1-2 for the function.	Immediately
D. As required by Required Action C.1 and referenced in Table 3.3.5.1-1 or Table 3.3.5.1-2.	D.1 Verify automatic actuation capability in at least one ADS subsystem AND D.2 Restore automatic actuation capability in both ADS subsystems	1 hour 24 hours
E. As required by Required Action C.1 and referenced in Table 3.3.5.1-2.	E.1 Disable ADS permissive function for affected channel AND E.2 Verify at least three OPERABLE ECCS subsystems capable of supplying ADS permissive signals	1 hour 1 hour

(continued)

3.3 INSTRUMENTATION

3.3.5.1 Emergency Core Cooling System (ECCS) Instrumentation

LCO 3.3.5.1 Four ECCS instrumentation trip channels for each function in Table 3.3.5.1-1 and one ECCS instrumentation trip channel for each function in Table 3.3.5.1-2 shall be OPERABLE.

APPLICABILITY: According to Tables 3.3.5.1-1 and 3.3.5.1-2.

ACTIONS

----------NOTE----------
Seperate Condition entry is allowed for each ECCS function

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One trip channel inoperable for ECCS functions in Table 3.3.5.1-1.	A.1	-------NOTE------- LCO 3.0.4 is not applicable. ---------- Place channel in bypass or trip.	1 hour
	AND		
	A.2	Restore channel to OPERABLE status.	Prior to entering MODE 2 following next MODE 5 entry.
B. Two trip channels inoperable for ECCS functions in Table 3.3.5.1-1.	B.1	Place one channel in bypass and the other in trip.	1 hour
	AND		
	B.2	Restore one channel to OPERABLE status.	Prior to completion of the next CHANNEL FUNCTIONAL TEST

(continued)

is no longer required. Alternatively, loss of some instrumentation and logic would only necessitate manually performing a required iteration that under the degraded conditions would no longer occur automatically (e.g. aligning RCIC to its safety related suction source, the suppression pool). Such actions for ABWR mimic very closely those specified in the BWR/6 ITS.

The Surveillance Requirements for ECCS instrumentation are virtually identical to those in the BWR/6 ITS. Minor modifications are made to reflect minor design differences, however, the intent is the same regarding scope and content.

LCO 3.3.5.2 ECCS Actuation Logic

This LCO covers the bulk of the ECCS logic aside from the actual instrumentation and associated setpoint comparison and digital trip signal initiation. Although the equipment differs from past BWR designs, the system is effectively the same in how it functions and with regards to technical specifications. Basically, if the initiation logic is inoperable, then the associated hardware must either be put in a safe state and/or declared inoperable. With one output logic channel in a given subsystem pair out of service, the channel is put in the trip/bypass state and the logic reverts to one out of one based on the status of the remaining logic channel. In many cases this will occur automatically as a result of system self testing if a fault is detected. If a logic channel is determined to be inoperable, it must be verified to be in the trip/bypass state (or placed there), resulting in a one-out-of-one logic. This state results in a more reliable logic configuration for initiation, but is also more prone to inadvertent actuations. Therefore, the channel must be returned to OPERABLE status within 30 days. As most repairs are expected to be simple, restoration would be expected to be made as soon as practicable. For plant availability reasons, it would be in the operator's best interest to restore operability and return to a two out of two logic configuration as quickly as possible given the increased probability of inadvertent actuation in a one out of one configuration. With both output logic channels inoperable, corrective action and/or cascading to the associated hardware LCO would be required immediately.

Required surveillance testing is equivalent to current BWRs for this portion of the LCO, consisting of CHANNEL FUNCTIONAL and LOGIC SYSTEM FUNCTIONAL TESTs.

The actual ECCS instrumentation for ABWR is very similar to that in recent BWR designs with essentially the same variables providing trip input. However, the LCO has been separated into two separate LCOs, borrowing from how digital systems are treated in the CE and B&W ITS products. LCO 3.3.5.1 deals with the actual instrumentation, as well as the associated setpoint trip determination done at the DTM level, and for both four channel and single channel instrument inputs. This LCO then is essentially limited to issues concerning instrumentation and the verification that trips occur at the proper variable setpoints. LCO 3.3.5.2 deals with the automatic output trip logic performed at the SLU level, including manual initiation. This latter LCO covers the output logic that actually affects system actions such as pump start and valve repositioning.

LCO 3.3.5.1 ECCS Instrumentation

This LCO deals with the OPERABILITY of instruments and instrument trip channels, including setpoints. The LCO uses the familiar instrument table (only now there are actually two tables) where setpoint values, Applicability requirements and Required Surveillances are specified. However, the tables are now arranged by variable, to reflect the fact that the same instrumentation is used to supply initiation signals to multiple subsystems. For those variables that are monitored by four instrument channels, all four are required to be OPERABLE (see Table 3.3.5.1-1). However, with one instrument trip channel out of service, the channel (or division of sensors) can be bypassed and the logic automatically reverts to two out of three in all corresponding subsystem actuation logic. Alternately, the channel could be tripped, which effectively results in a one out of three logic. Either is an acceptable long term condition at the instrument trip channel level as there would still be sufficient redundancy at the trip output logic and manual actuation levels.

The intent of the Required Action is to assure adequate protection but without forcing an unneeded shutdown to repair equipment that might not be readily accessible during operation. Of course, most repairs are likely to be simple card or other electronic subassembly replacements that can be done on-line with the affected division of sensors in bypass. In such cases, restoration should be done as soon as practicable. With two channels out, one is bypassed and the other tripped, resulting effectively in an one out of two configuration for the remaining channels. This situation is acceptable for a shorter duration. For variables monitored by only a single instrument channel, that channel must be OPERABLE or else more immediate action is required.

Failure to meet Required Actions would generally necessitate cascading to the LCO for the subsystem(s) affected by the inoperable instrumentation or logic, or by placing the plant in an operating mode, or conditions, where the ECCS subsystem

Abbreviated Discussion of ABWR Bases - ECCS Instrumentation

The ABWR ECCS actuation instrumentation system uses digitally multiplexed instrument channels and associated digital trip logic. In general, four separate instrument divisions are used to monitor the required variables for determining the need for ECCS actuation. However, some individual subsystem permissive logic utilizes single instrument channels (e.g. pump discharge pressure). The LCO has therefore been written to handle single channel and four channel instrumentation separately. For the four channel cases the system utilizes four separate logic channels to perform the required trip determination. This occurs within the divisional Digital Trip Modules (DTMs). Each divisional DTM receives input from the instrumentation in that same division for each variable monitored. For analog variables the DTMs make the trip/no-trip decision by comparing a digitized analog value against a setpoint and initiating a trip condition for that variable if the setpoint is exceeded. In cases where the trip determination is made by the monitoring element itself (e.g. pressure switch) the DTM simply passes on the signal in the form of a trip/no-trip output. The output of the four divisional DTMs (a trip/no-trip condition) for each variable is then routed to the appropriate ECCS subsystem(s) initiation logic. Single channel variable inputs are also routed to the individual subsystem logic, as appropriate.

The two out of four trip decision is made by the individual ECCS Safety System Logic Units (SLUs), which are arranged in redundant pairs for each of the three divisions of ECCS equipment. Thus, there are a total of six ECCS SLUs providing initiation logic for the six ECCS pumping subsystems and two divisions of ADS. Each SLU receives the appropriate variable input (tripped/not-tripped) from each of the four divisions of DTMs and then performs the required two out of four initiation logic determination. For multi-variable inputs the decision to actuate the affected equipment is made on a per variable basis such that, for the four channel variables, setpoint exceedence in two instrument divisions *for the same variable* is required to initiate an actuation signal. This trip determination occurs simultaneously in both SLUs in a given division for an affected subsystem and at essentially the same time in affected subsystems of other divisions. Single instrument channel trip inputs are routed to both SLUs in the appropriate divisional pair(s), each of which performs its own trip determination for the associated variable. In all cases, a trip in both of the SLUs of a subsystem pair is required to initiate that particular subsystem or to cause the desired action to take place (e.g. minimum flow valve opening). Thus, at the output stage, the logic is two out of two on an individual output command basis.

DRAFT PROPOSED ABWR TECHNICAL SPECIFICATIONS
SECTION 3.3.5.1/2 - ECCS ACTUATION INSTRUMENTATION/LOGIC

Attached are proposed technical specifications for the ABWR ECCS Instrumentation. As discussed in the previous RPS submittal, these specifications were developed from the BWR/6 Improved Technical Specifications (ITS) and adjusted for relevant design differences in the ABWR. It was intended to retain the look and feel of the BWR ITS to the maximum extent practical. When departures were necessary to reflect design or performance differences, the ITS products for the other vendor designs were utilized where appropriate. The attached specifications do not yet address the issue of redundant feature (cross train) operability since the resolution of how this subject will be addressed in the ITS program is still being finalized. It is intended that the attached specifications for ABWR will be modified accordingly once a final resolution under the ITS program has been reached.

With regards to instrumentation systems, the ABWR uses input from many of the same variables as with past BWR designs. Thus, to a great extent, the basic technical specifications have remained the same. However, the logic and processing of input is done with digital technology that is a departure from past BWR practice. In that regard it is very similar to the technology used in other vendor designs. Thus, their ITS products were used as a basis for some of the modifications that were made to the ABWR specifications and are reflected in the example attached. Included with the attached specifications are very abbreviated bases intended to provide general insight into the proposed specifications, with particular emphasis on differences from recent past practice. These descriptions are in no way meant to be a substitute for the full blown bases which are to be provided in a future submittal. The intent of this submittal is to provide the NRC staff with an indication of the direction GE is headed in the Instrumentation area of Tech Specs and to seek early feedback.