TSTF
TECHNICAL SPECIFICATIONS TASK FORCE
A JOINT OWNERS GROUP ACTIVITY

January 20, 2009

TSTF-09-01
PROJ0753

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Transmittal of TSTF-515, Revision 0, "Revise Post-Accident Monitoring Instrumentation based on Reg. Guide 1.97, Rev. 4 and NEDO-33349"

Dear Sir or Madam:

Enclosed for NRC review is Revision 0 of TSTF-515, "Revise Post-Accident Monitoring Instrumentation based on Reg. Guide 1.97, Rev. 4 and NEDO-33349." TSTF-515 is applicable to Boiling Water Reactors.

Any NRC review fees associated with the review of TSTF-515 should be billed to the Boiling Water Reactors Owners Group.

Should you have any questions, please do not hesitate to contact us.

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PWR Owners Group

BWR
OWNERS' GROUP

Technical Specification Task Force
Improved Standard Technical Specifications Change Traveler

Revise Post-Accident Monitoring Instrumentation based on Reg Guide 1.97, Rev. 4 and NEDO-33349

NUREGs Affected: ☐ 1430 ☐ 1431 ☐ 1432 ☑ 1433 ☑ 1434

Classification 1) Technical Change Recommended for CLIIP?: Yes

Correction or Improvement: Improvement NRC Fee Status: Not Exempt

Benefit: Increases Equipment Operability

Industry Contact: John Messina, (330) 384-5878, jmessina@firstenergycorp.com

See attached justification.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: BWROG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 19-Nov-08

Owners Group Comments
Comments received.

Owners Group Resolution: Approved Date: 01-Dec-08

OG Revision 1 Revision Status: Active

Revision Proposed by: BWROG

Revision Description:
Revised to address BWROG comments.

TSTF Review Information

TSTF Received Date: 24-Dec-08 Date Distributed for Review 24-Dec-08

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 20-Jan-09

NRC Review Information

NRC Received Date: 20-Jan-09

OG Revision 1 Revision Status: Active

Affected Technical Specifications

Bkgnd 3.3.3.1 Bases	PAM Instrumentation	
S/A 3.3.3.1 Bases	PAM Instrumentation	
LCO 3.3.3.1	PAM Instrumentation	
	Change Description:	Revise Table 3.3.3.1-1
LCO 3.3.3.1 Bases	PAM Instrumentation	
Ref. 3.3.3.1 Bases	PAM Instrumentation	
Action 3.3.3.1.F	PAM Instrumentation	
	Change Description:	Delete Action
Action 3.3.3.1.F Bases	PAM Instrumentation	
	Change Description:	Delete Action
5.6.5	Post Accident Monitoring Report	

1.0 Description

The proposed change will eliminate certain Post-Accident Monitoring (PAM) Instrumentation Functions (and associated Required Actions) from NUREG-1433 and 1434 (Improved Standard Technical Specifications (ISTS) for BWR/4 and BWR/6 plants). The technical basis for this change is described in NEDO-33349,"BWR Application to RG 1.97 Revision 4" [Reference 1], which identifies a methodology that complies with RG 1.97, Revision 4 [Reference 2].

2.0 Proposed Changes

1. Delete Item 5, "Primary Containment Area Radiation," from Technical Specifications (TS) Table 3.3.3.1-1, "Post Accident Monitoring Instrumentation."

2. Delete Condition F from Limiting Condition for Operation (LCO) 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation." Condition F is only used when the deleted Primary Containment Area Radiation monitor is inoperable.

3. Delete Item 6, "Drywell Sump Level," from TS Table 3.3.3.1-1, "Post Accident Monitoring Instrumentation."

4. Delete Item 7, "Drywell Drain Sump Level," from TS Table 3.3.3.1-1, "Post Accident Monitoring Instrumentation."

5. Delete Item 8, "Penetration Flow Path PCIV Position," from TS Table 3.3.3.1-1, "Post Accident Monitoring Instrumentation."

6. Delete Item 9, “Wide Range Neutron Flux,” from TS Table 3.3.3.1-1, Post Accident Monitoring Instrumentation.”

7. Delete Item 10, "Primary Containment Pressure," from TS Table 3.3.3.1-1, "Post Accident Monitoring Instrumentation."

8. Renumber Instrumentation Function 11, as Function 5 on TS Table 3.3.3.1-1, "Post Accident Monitoring Instrumentation."

9. Delete Notes (a) and (b) from TS Table 3.3.3.1-1. Redesignate Note "(c)" as Note "(a)."

10. Delete REVIEWER’S NOTE 2 on TS Table 3.3.3.1-1.

11. Delete reference to Condition F of LCO 3.3.3.1 in TS 5.6.5, "Post Accident Monitoring Report."

12. The Bases are revised to reflect the changes to the Specifications. The regulatory criteria for inclusion of PAM instrumentation into the Technical Specifications is being changed such that only Type A variables are required to be included.

3.0 Background

BWR Improved Standard Technical Specification (NUREG-1433/1434) Specification 3.3.3 for Post Accident Monitoring (PAM) is based on Revisions 2 and 3 of Regulatory Guide (RG) 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," which were prescriptive. The current PAM provisions require the inclusion of all Type "A" variables which are noted as being plant-specific and all non-Type A "Category 1" variables. Type A variables are defined in RG 1.97 Revision 2 and 3 as "those variables to be monitored which provide the primary information required to permit the control room operators to take the specified manually controlled actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for design basis accidents events." RG 1.97 Rev 2 and 3 established Categories for design and qualification criteria with Category 1 being the highest quality. The Category is assigned to non-Type A variables in RG 1.97 Revision 2/3 Table 1 for BWRs. NUREG-1433/1434 includes selected non-Type A variables.

NRC has issued Revision 4 to RG 1.97. RG 1.97 Revision 4 provides a more flexible and comprehensive method of determining an appropriate set of accident monitoring variables for nuclear power plants. This is accomplished by providing explicit criteria establishing how the variables are to be determined. In addition, the specific design and qualification requirements are established based on the importance of the specific variable type.

The selection criteria established by RG 1.97 Revision 4 provides a set of variables that is similar in definition to the prescriptive list contained in prior RG 1.97 revisions. However, when the process established in Revision 4 is applied, the basis for the selection of each variable can be identified in a comprehensive manner that allows appropriate design and qualification requirement to be determined. In addition, the process results in establishing the bases for PAM Technical Specification requirements consistent with 10CFR 50.36 and prior NRC directives for addressing post accident monitoring requirements.

The Boiling Water Reactors Owners Group (BWROG) has developed a generic Licensing Topical Report (LTR), NEDO-33349, which identifies a methodology that complies with RG 1.97 Revision 4. The methodology has been developed based on generic BWR safety analysis methodology consistent with the typical BWR plant licensing basis and the application of generic symptom-based emergency procedure guidelines (EPGs).

To demonstrate the applicability of the methodology, typical BWR plants (a BWR/4 and 6) are evaluated and a typical list of accident monitoring variables are identified. The list of variables includes the variable type, classification basis, and design and qualification requirements. The list of variables identified using the BWROG methodology does, in some cases, differ from those identified in RG 1.97 Revision 3. These differences are due to the application of the specific criteria identified. However, the overall objective of providing an acceptable set of accident monitoring instrumentation is met. In addition, the methodology establishes a common list of Type A variables applicable to the BWR design.

4.0 Technical Analysis

The proposed license amendment deletes the Primary Containment Area Radiation, Drywell Sump Level, Drywell Drain Sump Level, Penetration Flow Path PCIV Position, and Primary Containment Pressure Instrumentation requirements from the ISTS. The NRC position on the incorporation of Post Accident Monitoring instrumentation in the TS is documented in correspondence dated May 9, 1988, T. E. Murley (NRC) to R. F. Janecek (BWR Owners' Group) [Reference 3]. The NRC position is that Regulatory Guide (RG) 1.97, Type A, and Category 1, accident monitoring instrumentation should be incorporated into the plant's TS. According to NUREG-1433/1434, accident monitoring instrumentation that satisfies the definition of Type A in RG 1.97 meets Criterion 3 of 10 CFR 50.36(c)(2)(ii). Also, Category I, non-Type A instrumentation is retained in TS because they are intended to assist operators in minimizing the consequences of accidents. Therefore, Category I, non-Type A variables are important for reducing public risk.

RG 1.97 Revision 4 provides a more flexible and comprehensive method of determining an appropriate set of accident monitoring variables for nuclear power plants. This was accomplished by providing explicit criteria establishing how the variables were to be determined. In addition, the specific design and qualification requirements were established based on the importance of the specific variable type, resulting in the elimination of Categories. It is intended that RG 1.97 Revision 4 be used to satisfy the prescriptive guidance previously provided by the Nuclear Regulatory Commission in Revisions 2 and 3 to RG 1.97. Although principally written for new reactors, Revision 4 is available for currently operating reactors as discussed in Regulatory Position 1 of the RG.

Licensing Topical Report (LTR) NEDO- 33349, Revision 1, has been prepared at the direction of the BWROG to identify a methodology that can be used to comply with RG 1.97, Revision 4. It includes implementation recommendations on meeting the RG 1.97 regulatory positions and use of the methodology results to support plant modifications based on the provisions of Rev. 4. This methodology is intended to be applicable to all operating BWR plants. The methodology has been developed based on generic BWR safety analysis methodology consistent with the typical BWR plant licensing basis and the application of generic symptom-based emergency procedure guidelines (EPGs).

Section 7.3 of the LTR identifies the ISTS implications of applying RG 1.97 Revision 4. Section 7.4 of the LTR provides the technical basis for why the deleted instrument functions no longer meet Criterion 3 of 10 CFR 50.36(c)(2)(ii). It was concluded that the PAM instrument functions contained in STS for the Type A and the non-Type A Category 1 (Type B and C) instruments (per RG 1.97 Revision 2 and 3) were equivalent to the Type A, B, and C of RG 1.97 Revision 4 with the exceptions of Primary Containment Radiation, Drywell Sump Level, Drywell Drain Sump Level, and Penetration Flow Path PCIV Position. Accordingly, these PAM Instrumentation Functions (including their attendant operability and surveillance requirements) are proposed to be deleted.

As noted in Section 7 of the LTR, changes to variables have been included which have resulted from approval of plant specific deviations. Wide Range Neutron Flux is proposed for deletion based on NEDO-31558, which was approved previously by the NRC [Reference 5].

Additionally, the proposed change deletes Primary Containment Pressure from Table 3.3.3.1-1. Drywell Pressure and Primary Containment Pressure are essentially the same instruments for BWR Mark I and II Primary containment designs, with both terms used interchangeably. Mark III Primary Containment design has a drywell completely surrounded by the containment that is separated from the containment atmosphere by the water in a weir wall and the containment to drywell vacuum breakers. For all three Primary Containment designs, Drywell Pressure is used as the EPG entry condition which supports plant mitigation strategies related to Primary Containment Control functions. Drywell pressure is used for determination of Primary Containment integrity. [Reference 4] As such, the Primary Containment Pressure instrumentation function may be deleted.

Table A-1 to Appendix A of the LTR compares the RG 1.97 Revision 4 criteria to the Type B and C Category 1 variables in RG 1.97 Revisions 2 and 3. This table demonstrates that these variables are either: a) previously included as a Type A instruments, or b) downgraded or deleted as Type B or C variables under Revision 4. Accordingly, the criterion described in the APPLICABLE SAFETY ANALYSES of the Technical Specification Bases for PAM instrumentation inclusion “to assist operators in minimizing the consequences of accidents” is subsumed under Criterion 3 of 10 CFR 50.36(c)(2)(ii), and is being deleted. The net effect is that only Type A variables are to be included in the TS under RG 1.97 Revision 4.

5.0 Regulatory Analysis

5.1 No Significant Hazards Consideration

The TSTF has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Do the proposed changes involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed change revises the list of instruments that included in the Technical Specifications as Post Accident Monitoring (PAM) instrumentation. PAM instrumentation is not an initiator to any accident previously evaluated. PAM Instrumentation is used to mitigate the consequences of an accident. However, NRC Regulatory Guide 1.97, Revision 4, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," determined that certain instruments currently in the Technical Specifications are not required to be in the Technical Specifications to adequately respond to and mitigate an event. As a result, the removal of these instruments from the

Technical Specifications does not have a significant effect on the consequences of an accident.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Do the proposed changes create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed change revises the list of instruments that included in the Technical Specifications as Post Accident Monitoring (PAM) instrumentation. The proposed change does not alter the physical design, safety limits, or safety analysis assumptions associated with the operation of the plant. Accordingly, the proposed changes do not introduce any new accident initiators, nor do they reduce or adversely affect the capabilities of any plant structure, system, or component in the performance of their safety function.

   Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Do the proposed changes involve a significant reduction in a margin of safety?

   Response: No.

   The proposed change revises the list of instruments that included in the Technical Specifications as Post Accident Monitoring (PAM) instrumentation. The instrumentation removed from the Technical Specifications does not provide primary information required to permit operators to take specific manually controlled actions for which no automatic control is provided, and are not required for safety systems to accomplish their safety functions for design basis accident events. As a result, the margin of safety provided by these instruments being controlled in the Technical Specifications is not significantly reduced.

   Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Based on the above, the TSTF concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

Appendix A of 10 CFR Part 50 – General Design Criterion (GDC) 13, "Instrumentation and Control," requires operating reactor licensees to provide instrumentation to monitor variables and systems over their anticipated ranges for accident conditions as appropriate to ensure adequate safety.

Appendix A of 10 CFR Part 50 – GDC 19, "Control Room," requires operating reactor licensees to provide a control room from which actions can be taken to maintain the nuclear power unit in a safe condition under accident conditions, including loss-of-coolant accidents (LOCAs). In addition, operating reactor licensees must provide equipment (including the necessary instrumentation), at appropriate locations outside the control room, with a design capability for prompt hot shutdown of the reactor.

Appendix A of 10 CFR Part 50 – GDC 64, "Monitoring Radioactivity Releases," requires operating reactor licensees to provide the means for monitoring the reactor containment atmosphere, spaces containing components to recirculate LOCA fluids, effluent discharge paths, and the plant environs for radioactivity that may be released as a result of postulated accidents.

Subsection (2)(xix) of 10 CFR 50.34(f), "Additional TMI-Related Requirements," requires operating reactor licensees to provide adequate instrumentation for use in monitoring plant conditions following an accident that includes core damage.

Regulatory Guide 1.97 Revision 4, "Criteria For Accident Monitoring Instrumentation For Nuclear Power Plants," describes a method that the NRC staff considers acceptable for use in complying with the agency's regulations with respect to satisfying criteria for accident monitoring instrumentation in nuclear power plants. This revision endorses (with certain clarifying regulatory positions specified in Section C of the Regulatory Guide) the "IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations," which the Institute of Electrical and Electronics Engineers (IEEE) promulgated as IEEE Std. 497-2002.

The proposed change does not affect plant compliance with these regulations.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 Environmental Consideration

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in

the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 References

1. NEDO-33349, Revision **[LATER]**, "BWR Application to RG 1.97 Revision 4," GE/Hitachi Nuclear Energy, dated **[LATER]**.

2. Regulatory Guide 1.97 Revision 4, “Criteria For Accident Monitoring Instrumentation For Nuclear Power Plants,” June 2006.

3. Letter, T. E. Murley (USNRC) to R. F. Janecek (BWR Owners' Group), dated May 9, 1988.

4. BWROG-08070, "Responses to Requests for Additional Information (RAIs) Regarding the Submittal of BWROG Licensing Topical Report (LTR) NEDO-33349, Revision 1, "BWR Application to Regulatory Guide 1.97, Revision 4," (TAC No. MD6697), dated October 31, 2008.

5. NRC Safety Evaluation Report on NEDO-31558, “BWROG Proposed Neutron Monitoring System Post-Accident Monitoring Functional Criteria,” February 2, 1993.

3.3 INSTRUMENTATION

3.3.3.1 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3.1 The PAM instrumentation for each Function in Table 3.3.3.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.5.	Immediately
C. One or more Functions with two required channels inoperable.	C.1 Restore one required channel to OPERABLE status.	7 days
D. Required Action and associated Completion Time of Condition C not met.	D.1 Enter the Condition referenced in Table 3.3.3.1-1 for the channel.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. As required by Required Action D.1 and referenced in Table 3.3.3.1-1.	E.1 Be in MODE 3.	12 hours
~~F. [As required by Required Action D.1 and referenced in Table 3.3.3.1-1.~~	~~F.1 Initiate action in accordance with Specification 5.6.5.~~	~~Immediately]~~

SURVEILLANCE REQUIREMENTS

----------NOTE----------
These SRs apply to each Function in Table 3.3.3.1-1.

SURVEILLANCE		FREQUENCY
SR 3.3.3.1.1	Perform CHANNEL CHECK.	31 days
SR 3.3.3.1.2	Perform CHANNEL CALIBRATION.	[18] months

Table 3.3.3.1-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1
1. Reactor Steam Dome Pressure	2	E
2. Reactor Vessel Water Level	2	E
3. Suppression Pool Water Level	2	E
4. Drywell Pressure	2	E
~~5. Primary Containment Area Radiation~~	~~2~~	~~[F]~~
~~[6. Drywell Sump Level~~	~~2~~	~~E]~~
~~[7. Drywell Drain Sump Level~~	~~2~~	~~E]~~
~~8. Penetration Flow Path PCIV Position~~	~~2 per penetration flow path(a) (b)~~	~~E~~
~~9. Wide Range Neutron Flux~~	~~2~~	~~E~~
~~10. Primary Containment Pressure~~	~~2~~	~~E~~
~~11~~5. [Relief Valve Discharge Location] Suppression Pool Water Temperature	2(~~c~~a)	E

~~(a) Not required for isolation valves whose associated penetration flow path is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.~~

~~(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.~~

(~~c~~a) Monitoring each [relief valve discharge location].

----------REVIEWER'S NOTE----------
Table 3.3.3.1-1 shall be amended for each plant as necessary to list:
1. All Regulatory Guide 1.97 Revision 4, Type A instruments. ~~and~~
~~2. All Regulatory Guide 1.97, Category 1, non-Type A instruments specified in the plant's Regulatory Guide 1.97, Safety Evaluation Report.~~

5.6 Reporting Requirements

5.6.5 Post Accident Monitoring Report

When a report is required by Condition B ~~or F~~ of LCO 3.3.[3.1], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

----------REVIEWER'S NOTE----------
These reports may be required covering inspection, test, and maintenance activities. These reports are determined on an individual basis for each unit and their preparation and submittal are designated in the Technical Specifications.

B 3.3 INSTRUMENTATION

B 3.3.3.1 Post Accident Monitoring (PAM) Instrumentation

BASES

BACKGROUND

The primary purpose of the PAM instrumentation is to display plant variables that provide information required by the control room operators during accident situations. This information provides the necessary support for the operator to take the manual actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Events. The instruments that monitor these variables are designated as Type A~~, Category I, and non-Type A, Category I~~, in accordance with Regulatory Guide 1.97 (Ref. 1).

The OPERABILITY of the accident monitoring instrumentation ensures that there is sufficient information available on selected plant parameters to monitor and assess plant status and behavior following an accident. This capability is consistent with the recommendations of Reference 1.

APPLICABLE SAFETY ANALYSES

The PAM instrumentation LCO ensures the OPERABILITY of Regulatory Guide 1.97, Type A variables so that the control room operating staff can:

- Perform the diagnosis specified in the Emergency Operating Procedures (EOPs). These variables are restricted to preplanned actions for the primary success path of Design Basis Accidents (DBAs), (e.g., loss of coolant accident (LOCA)) and

- Take the specified, preplanned, manually controlled actions for which no automatic control is provided, which are required for safety systems to accomplish their safety function.

~~The PAM instrumentation LCO also ensures OPERABILITY of Category I, non-Type A, variables so that the control room operating staff can:~~

- ~~Determine whether systems important to safety are performing their intended functions,~~

- ~~Determine the potential for causing a gross breach of the barriers to radioactivity release,~~

- ~~Determine whether a gross breach of a barrier has occurred, and~~

- ~~Initiate action necessary to protect the public and for an estimate of the magnitude of any impending threat.~~

BASES

APPLICABLE SAFETY ANALYSES (continued)

The plant specific Regulatory Guide 1.97 Analysis (Ref. 2) documents the process that identified Type A ~~and Category I, non-Type A,~~ variables.

Accident monitoring instrumentation that satisfies the definition of Type A in Regulatory Guide 1.97 meets Criterion 3 of 10 CFR 50.36(c)(2)(ii). ~~Category I, non-Type A, instrumentation is retained in Technical Specifications (TS) because they are intended to assist operators in minimizing the consequences of accidents. Therefore, these Category I variables are important for reducing public risk.~~

LCO

LCO 3.3.3.1 requires two OPERABLE channels for all but one Function to ensure that no single failure prevents the operators from being presented with the information necessary to determine the status of the plant and to bring the plant to, and maintain it in, a safe condition following that accident.

Furthermore, provision of two channels allows a CHANNEL CHECK during the post accident phase to confirm the validity of displayed information. [More than two channels may be required at some plants if the Regulatory Guide 1.97 analysis determined that failure of one accident monitoring channel results in information ambiguity (that is, the redundant displays disagree) that could lead operators to defeat or to fail to accomplish a required safety function.]

~~The exception to the two channel requirement is primary containment isolation valve (PCIV) position. In this case, the important information is the status of the primary containment penetrations. The LCO requires one position indicator for each active PCIV. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve and prior knowledge of passive valve or via system boundary status. If a normally active PCIV is known to be closed and deactivated, position indication is not needed to determine status. Therefore, the position indication for valves in this state is not required to be OPERABLE.~~

The following list is a discussion of the specified instrument Functions listed in Table 3.3.3.1-1 in the accompanying LCO. These discussions are intended as examples of what should be provided for each Function when the plant specific list is prepared.

BASES

LCO (continued)

1. Reactor Steam Dome Pressure

Reactor steam dome pressure is a Type A~~Category I~~ variable provided to support monitoring of Reactor Coolant System (RCS) integrity and to verify operation of the Emergency Core Cooling Systems (ECCS). Two independent pressure transmitters with a range of 0 psig to 1500 psig monitor pressure. Wide range recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

2. Reactor Vessel Water Level

Reactor vessel water level is a Type A~~Category I~~ variable provided to support monitoring of core cooling and to verify operation of the ECCS. The wide range water level channels provide the PAM Reactor Vessel Water Level Function. The wide range water level channels measure from 17 inches below the dryer skirt down to a point just below the bottom of the active fuel. Wide range water level is measured by two independent differential pressure transmitters. The output from these channels is recorded on two independent pen recorders, which is the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

The wide range water level instruments are uncompensated for variation in reactor water density and are calibrated to be most accurate at operational pressure and temperature.

3. Suppression Pool Water Level

Suppression pool water level is a Type A~~Category I~~ variable provided to detect a breach in the reactor coolant pressure boundary (RCPB). This variable is also used to verify and provide long term surveillance of ECCS function. The wide range suppression pool water level measurement provides the operator with sufficient information to assess the status of both the RCPB and the water supply to the ECCS. The wide range water level indicators monitor the suppression pool water level from the center line of the ECCS suction lines to the top of the pool. Two wide range suppression pool water level signals are transmitted from separate differential pressure transmitters and are continuously recorded on two recorders in the control room. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

BASES

LCO (continued)

4. Drywell Pressure

Drywell pressure is a Type A~~Category I~~ variable provided to detect breach of the RCPB and to verify ECCS functions that operate to maintain RCS integrity. Two wide range drywell pressure signals are transmitted from separate pressure transmitters and are continuously recorded and displayed on two control room recorders. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

~~5. Primary Containment Area Radiation (High Range)~~

~~Primary containment area radiation (high range) is provided to monitor the potential of significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans. [For this plant, primary containment area radiation (high range) PAM instrumentation consists of the following:]~~

~~6. Drywell Sump Level~~

~~Drywell sump level is a Category I variable provided for verification of ECCS functions that operate to maintain RCS integrity. [For this plant, the drywell sump level PAM instrumentation consists of the following:]~~

~~7. Drywell Drain Sump Level~~

~~Drywell drain sump level is a Category I variable provided to detect breach of the RCPB and for verification and long term surveillance of ECCS functions that operate to maintain RCS integrity. [For this plant, the drywell drain sump level PAM instrumentation consists of the following:]~~

~~8. Primary Containment Isolation Valve (PCIV) Position~~

~~PCIV position is provided for verification of containment integrity. In the case of PCIV position, the important information is the isolation status of the containment penetration. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each active PCIV in a containment penetration flow path, i.e., two total channels of PCIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active PCIV having control room indication, Note (b) requires a single channel of valve position~~

~~BASES~~

~~LCO (continued)~~

~~indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration via indicated status of the active valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration flow path is isolated, position indication for the PCIV(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration flow path is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.~~

~~[For this plant, the PCIV position PAM instrumentation consists of the following:]~~

~~9. Wide Range Neutron Flux~~

~~Wide range neutron flux is a Category I variable provided to verify reactor shutdown. [For this plant, the wide range neutron flux PAM instrumentation consists of the following:]~~

~~10. Primary Containment Pressure~~

~~Primary containment pressure is a Category I variable provided to verify RCS and containment integrity and to verify the effectiveness of ECCS actions taken to prevent containment breach. Two wide range primary containment pressure signals are transmitted from separate pressure transmitters and are continuously recorded and displayed on two control room recorders. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.~~

~~11~~5. Suppression Pool Water Temperature

Suppression pool water temperature is a Type A~~Category I~~ variable provided to detect a condition that could potentially lead to containment breach and to verify the effectiveness of ECCS actions taken to prevent containment breach. The suppression pool water temperature instrumentation allows operators to detect trends in suppression pool water temperature in sufficient time to take action to prevent steam quenching vibrations in the suppression pool. Twenty-four temperature sensors are arranged in six groups of four independent and redundant channels, located such that there is a group of sensors within a 30 ft line of sight of each relief valve discharge location.

BASES

LCO (continued)

Thus, six groups of sensors are sufficient to monitor each relief valve discharge location. Each group of four sensors includes two sensors for normal suppression pool temperature monitoring and two sensors for PAM. The outputs for the PAM sensors are recorded on four independent recorders in the control room (channels A and C are redundant to channels B and D, respectively). All four of these recorders must be OPERABLE to furnish two channels of PAM indication for each of the relief valve discharge locations. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channels. Each suppression pool water temperature [relief valve discharge location] is treated separately and each [relief valve discharge location] is considered to be a separate function. Therefore, separate Condition entry is allowed for each inoperable [relief valve discharge location.]

APPLICABILITY

The PAM instrumentation LCO is applicable in MODES 1 and 2. These variables are related to the diagnosis and preplanned actions required to mitigate DBAs. The applicable DBAs are assumed to occur in MODES 1 and 2. In MODES 3, 4, and 5, plant conditions are such that the likelihood of an event that would require PAM instrumentation is extremely low; therefore, PAM instrumentation is not required to be OPERABLE in these MODES.

ACTIONS

A Note has been provided to modify the ACTIONS related to PAM instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable PAM instrumentation channels provide appropriate compensatory measures for separate Functions. As such, a Note has been provided that allows separate Condition entry for each inoperable PAM Function.

BASES

ACTIONS (continued)

A.1

When one or more Functions have one required channel that is inoperable, the required inoperable channel must be restored to OPERABLE status within 30 days. The 30 day Completion Time is based on operating experience and takes into account the remaining OPERABLE channels (or, in the case of a Function that has only one required channel, other non-Regulatory Guide 1.97 instrument channels to monitor the Function), the passive nature of the instrument (no critical automatic action is assumed to occur from these instruments), and the low probability of an event requiring PAM instrumentation during this interval.

B.1

If a channel has not been restored to OPERABLE status in 30 days, this Required Action specifies initiation of action in accordance with Specification 5.6.5, which requires a written report to be submitted to the NRC. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. This action is appropriate in lieu of a shutdown requirement, since alternative actions are identified before loss of functional capability, and given the likelihood of plant conditions that would require information provided by this instrumentation.

C.1

When one or more Functions have two required channels that are inoperable (i.e., two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur.

BASES

ACTIONS (continued)

D.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.3.1-1. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met the Required Action of Condition C and the associated Completion Time has expired, Condition D is entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1

For the majority of Functions in Table 3.3.3.1-1, if the Required Action and associated Completion Time of Condition C is not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

~~F.1~~

~~Since alternate means of monitoring primary containment area radiation have been developed and tested, the Required Action is not to shut down the plant, but rather to follow the directions of Specification 5.6.5. These alternate means may be temporarily installed if the normal PAM channel cannot be restored to OPERABLE status within the allotted time. The report provided to the NRC should discuss the alternate means used, describe the degree to which the alternate means are equivalent to the installed PAM channels, justify the areas in which they are not equivalent, and provide a schedule for restoring the normal PAM channels.~~

SURVEILLANCE REQUIREMENTS

The following SRs apply to each PAM instrumentation Function in Table 3.3.3.1-1.

SR 3.3.3.1.1

Performance of the CHANNEL CHECK once every 31 days ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel against a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter

BASES

SURVEILLANCE REQUIREMENTS (continued)

should read approximately the same value. Significant deviations between instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared to similar plant instruments located throughout the plant.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

The Frequency of 31 days is based upon plant operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel of a given Function in any 31 day interval is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of those displays associated with the required channels of this LCO.

SR 3.3.3.1.2

A CHANNEL CALIBRATION is performed every 18 months, or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies the channel responds to measured parameter with the necessary range and accuracy.

The Frequency is based on operating experience and consistency with the typical industry refueling cycles.

REFERENCES

1. Regulatory Guide 1.97 Revision 4, "Instrumentation for Light Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," ~~[date]~~June 2006.

2. [Plant specific documents (e.g., NRC Regulatory Guide 1.97, SER letter).~~-~~]

3.3 INSTRUMENTATION

3.3.3.1 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3.1 The PAM instrumentation for each Function in Table 3.3.3.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.5.	Immediately
C. One or more Functions with two required channels inoperable.	C.1 Restore one required channel to OPERABLE status.	7 days
D. Required Action and associated Completion Time of Condition C not met.	D.1 Enter the Condition referenced in Table 3.3.3.1-1 for the channel.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. As required by Required Action D.1 and referenced in Table 3.3.3.1-1.	E.1 Be in MODE 3.	12 hours
~~F. [As required by Required Action D.1 and referenced in Table 3.3.3.1-1.~~	~~F.1 Initiate action in accordance with Specification 5.6.5.~~	~~Immediately]~~

SURVEILLANCE REQUIREMENTS

----------NOTE----------
These SRs apply to each Function in Table 3.3.3.1-1.

SURVEILLANCE		FREQUENCY
SR 3.3.3.1.1	Perform CHANNEL CHECK.	31 days
SR 3.3.3.1.2	Perform CHANNEL CALIBRATION.	[18] months

Table 3.3.3.1-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1
1. Reactor Steam Dome Pressure	2	E
2. Reactor Vessel Water Level	2	E
3. Suppression Pool Water Level	2	E
4. Drywell Pressure	2	E
~~5. Primary Containment Area Radiation~~	~~2~~	~~[F]~~
~~[6. Drywell Sump Level~~	~~2~~	~~E]~~
~~[7. Drywell Drain Sump Level~~	~~2~~	~~E]~~
~~8. Penetration Flow Path PCIV Position~~	~~2 per penetration flow path(a) (c)~~	~~E~~
~~9. Wide Range Neutron Flux~~	~~2~~	~~E~~
~~10. Primary Containment Pressure~~	~~2~~	~~E~~
~~11~~5. [Relief Valve Discharge Location] Suppression Pool Water Temperature	2(~~c~~a)	E

~~(a) Not required for isolation valves whose associated penetration flow path is isolated by at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.~~

~~(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.~~

(~~c~~a) Monitoring each [relief valve discharge location].

----------REVIEWER'S NOTE----------
Table 3.3.3.1-1 shall be amended for each plant as necessary to list:
1. All Regulatory Guide 1.97 Revision 4, Type A instruments. ~~and~~
~~2. All Regulatory Guide 1.97, Category 1, non-Type A instruments specified in the plant's Regulatory Guide 1.97, Safety Evaluation Report.~~

5.6 Reporting Requirements

5.6.5 Post Accident Monitoring Report

When a Special Report is required by Condition B ~~or F~~ of LCO 3.3.[3.1], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.6 [Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-Stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]

----------REVIEWER'S NOTE----------
These reports may be required covering inspection, test, and maintenance activities. These reports are determined on an individual basis for each unit and their preparation and submittal are designated in the Technical Specifications.

B 3.3 INSTRUMENTATION

B 3.3.3.1 Post Accident Monitoring (PAM) Instrumentation

BASES

BACKGROUND

The primary purpose of the PAM instrumentation is to display plant variables that provide information required by the control room operators during accident situations. This information provides the necessary support for the operator to take the manual actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Events. The instruments that monitor these variables are designated as Type A, ~~Category I, and non-Type A, Category I~~ in accordance with Regulatory Guide 1.97 (Ref. 1).

The OPERABILITY of the accident monitoring instrumentation ensures that there is sufficient information available on selected plant parameters to monitor and assess plant status and behavior following an accident. This capability is consistent with the recommendations of Reference 1.

APPLICABLE SAFETY ANALYSES

The PAM instrumentation LCO ensures the OPERABILITY of Regulatory Guide 1.97, Type A, variables so that the control room operating staff can:

- Perform the diagnosis specified in the Emergency Operating Procedures (EOP). These variables are restricted to preplanned actions for the primary success path of Design Basis Accidents (DBAs) (e.g., loss of coolant accident (LOCA)) and

- Take the specified, preplanned, manually controlled actions for which no automatic control is provided, which are required for safety systems to accomplish their safety function.

~~The PAM instrumentation LCO also ensures OPERABILITY of Category I, non-Type A, variables. This ensures the control room operating staff can:~~

- ~~Determine whether systems important to safety are performing their intended functions,~~

- ~~Determine the potential for causing a gross breach of the barriers to radioactivity release,~~

- ~~Determine whether a gross breach of a barrier has occurred, and~~

- ~~Initiate action necessary to protect the public and to obtain an estimate of the magnitude of any impending threat.~~

BASES

APPLICABLE SAFETY ANALYSES (continued)

The plant specific Regulatory Guide 1.97 analysis (Ref. 2) documents the process that identified Type A ~~and Category I, non-Type A,~~ variables.

PAM instrumentation that meets the definition of Type A in Regulatory Guide 1.97 satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). ~~Category I, non-Type A, instrumentation is retained in the Technical Specifications (TS) because it is intended to assist operators in minimizing the consequences of accidents. Therefore, these Category I, non-Type A, variables are important for reducing public risk.~~

LCO

LCO 3.3.3.1 requires two OPERABLE channels for all but one Function to ensure no single failure prevents the operators from being presented with the information necessary to determine the status of the unit and to bring the unit to, and maintain it in, a safe condition following that accident.

Furthermore, provision of two channels allows a CHANNEL CHECK during the post accident phase to confirm the validity of displayed information. [More than two channels may be required at some units if the Regulatory Guide 1.97 analysis determined that failure of one accident monitoring channel results in information ambiguity (e.g., the redundant displays disagree) that could lead operators to defeat or to fail to accomplish a required safety function.]

~~The exception of the two channel requirement is primary containment isolation valve (PCIV) position. In this case, the important information is the status of the primary containment penetrations. The LCO requires one position indicator for each active PCIV. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve and prior knowledge of passive valve or via system boundary status. If a normally active PCIV is known to be closed and deactivated, position indication is not needed to determine status. Therefore, the position indication for valves in this state is not required to be OPERABLE.~~

Listed below is a discussion of the specified instrument Functions listed in Table 3.3.3.1-1, in the accompanying LCO. These discussions are intended as examples of what should be provided for each Function when the plant specific Bases are prepared.

BASES

LCO (continued)

1. Reactor Steam Dome Pressure

Reactor steam dome pressure is a Type A~~Category I~~ variable provided to support monitoring of Reactor Coolant System (RCS) integrity and to verify operation of the Emergency Core Cooling Systems (ECCS). Two independent pressure transmitters with a range of 0 psig to 1500 psig monitor pressure. Wide range recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

2. Reactor Vessel Water Level

Reactor vessel water level is a Type A~~Category I~~ variable provided to support monitoring of core cooling and to verify operation of the ECCS. The wide range water level channels provide the PAM Reactor Vessel Water Level Function. The wide range water level channels measure from 17 inches below the dryer skirt down to a point just below the bottom of the active fuel. Wide range water level is measured by two independent differential pressure transmitters. The output from these channels is recorded on two independent pen recorders. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

The wide range water level instruments are uncompensated for variation in reactor water density and are calibrated to be most accurate at operational pressure and temperature.

3. Suppression Pool Water Level

Suppression pool water level is a Type A~~Category I~~ variable provided to detect a breach in the reactor coolant pressure boundary (RCPB). This variable is also used to verify and provide long term surveillance of ECCS function. The wide range suppression pool water level measurement provides the operator with sufficient information to assess the status of the RCPB and to assess the status of the water supply to the ECCS. The wide range water level indicators monitor the suppression pool level from the center line of the ECCS suction lines to the top of the pool. Two wide range suppression pool water level signals are transmitted from separate differential pressure transmitters and are continuously recorded on two recorders in the control room. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

BASES

LCO (continued)

4. Drywell Pressure

Drywell pressure is a Type A~~Category I~~ variable provided to detect breach of the RCPB and to verify ECCS functions that operate to maintain RCS integrity. Two wide range drywell pressure signals are transmitted from separate pressure transmitters and are continuously recorded and displayed on two control room recorders. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

~~5. Primary Containment Area Radiation (High Range)~~

~~Primary containment area radiation (high range) is provided to monitor for the potential of significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans.~~

~~[For this plant, primary containment area radiation (high range) PAM instrumentation consists of the following:]~~

~~6. Drywell Sump Level~~

~~Drywell sump level is a Category I variable provided for verification of ECCS functions that operate to maintain RCS integrity.~~

~~[For this plant, the drywell sump level PAM instrumentation consists of the following:]~~

~~7. Drywell Drain Sump Level~~

~~Drywell drain sump level is a Category I variable provided to detect breach of the RCPB and for verification and long term surveillance of ECCS functions that operate to maintain RCS integrity.~~

~~[For this plant, the drywell drain sump level PAM instrumentation consists of the following:]~~

BASES

LCO (continued)

8. Primary Containment Isolation Valve (PCIV) Position

PCIV position is provided for verification of containment integrity. In the case of PCIV position, the important information is the isolation status of the containment penetration. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each active PCIV in a containment penetration flow path, i.e., two total channels of PCIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active PCIV having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to verify redundantly the isolation status of each isolable penetration via indicated status of the active valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration is isolated, position indication for the PCIV(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.

[For this plant, the PCIV position PAM instrumentation consists of the following:]

9. Wide Range Neutron Flux

Wide range neutron flux is a Category I variable provided to verify reactor shutdown.

[For this plant, wide range neutron flux PAM instrumentation consists of the following:]

10. Primary Containment Pressure

Primary containment pressure is a Category I variable provided to verify RCS and containment integrity and to verify the effectiveness of ECCS actions taken to prevent containment breach. Two wide range primary containment pressure signals are transmitted from separate pressure transmitters and are continuously recorded and displayed on two control room recorders. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

BASES

LCO (continued)

~~11~~5. Suppression Pool Water Temperature

Suppression pool water temperature is a Type A~~Category I~~ variable provided to detect a condition that could potentially lead to containment breach, and to verify the effectiveness of ECCS actions taken to prevent containment breach. The suppression pool water temperature instrumentation allows operators to detect trends in suppression pool water temperature in sufficient time to take action to prevent steam quenching vibrations in the suppression pool. Twenty-four temperature sensors are arranged in six groups of four independent and redundant channels, located such that there is a group of sensors within a 30 ft line of sight of each relief valve discharge location.

Thus, six groups of sensors are sufficient to monitor each relief valve discharge location. Each group of four sensors includes two sensors for normal suppression pool temperature monitoring and two sensors for PAM. The outputs for the PAM sensors are recorded on four independent recorders in the control room. (Channels A and C are redundant to channels B and D, respectively.) All four of these recorders must be OPERABLE to furnish two channels of PAM indication for each of the relief valve discharge locations. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channels. Each suppression pool water temperature [relief valve discharge location] is treated separately and each [relief valve discharge location] is considered to be a separate function. Therefore, separate Condition entry is allowed for each inoperable [relief valve discharge location].

APPLICABILITY

The PAM instrumentation LCO is applicable in MODES 1 and 2. These variables are related to the diagnosis and preplanned actions required to mitigate DBAs. The applicable DBAs are assumed to occur in MODES 1 and 2. In MODES 3, 4, and 5, plant conditions are such that the likelihood of an event that would require PAM instrumentation is extremely low; therefore, PAM instrumentation is not required to be OPERABLE in these MODES.

BASES

ACTIONS

A Note has been provided to modify the ACTIONS related to PAM instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable PAM instrumentation channels provide appropriate compensatory measures for separate inoperable functions. As such, a Note has been provided that allows separate Condition entry for each inoperable PAM Function.

A.1

When one or more Functions have one required channel that is inoperable, the required inoperable channel must be restored to OPERABLE status within 30 days. The 30 day Completion Time is based on operating experience and takes into account the remaining OPERABLE channel (or in the case of a Function that has only one required channel, other non-Regulatory Guide 1.97 instrument channels to monitor the Function), the passive nature of the instrument (no critical automatic action is assumed to occur from these instruments), and the low probability of an event requiring PAM instrumentation during this interval.

B.1

If a channel has not been restored to OPERABLE status in 30 days, this Required Action specifies initiation of actions in accordance with Specification 5.6.5, which requires a written report to be submitted to the NRC. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. This Action is appropriate in lieu of a shutdown requirement since alternative Actions are identified before loss of functional capability, and given the likelihood of plant conditions that would require information provided by this instrumentation.

BASES

ACTIONS (continued)

C.1

When one or more Functions have two required channels that are inoperable (i.e., two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur. Condition C is modified by a Note that excludes hydrogen monitor channels. Condition D provides appropriate Required Actions for two inoperable hydrogen monitor channels.

D.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.3.1-1. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met the Required Action of Condition C, and the associated Completion Time has expired, Condition D is entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1

For the majority of Functions in Table 3.3.3.1-1, if the Required Action and associated Completion Time of Condition C is not met, the plant must be placed in a MODE in which the LCO does not apply. This is done by placing the plant in at least MODE 3 within 12 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant condition from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

~~F.1~~

~~Since alternate means of monitoring primary containment area radiation have been developed and tested, the Required Action is not to shut down the plant but rather to follow the directions of Specification 5.6.5. These alternate means may be temporarily installed if the normal PAM channel cannot be restored to OPERABLE status within the allotted time. The report provided to the NRC should discuss the alternate means used, describe the degree to which the alternate means are equivalent to the installed PAM channels, justify the areas in which they are not equivalent, and provide a schedule for restoring the normal PAM channels.~~

SURVEILLANCE REQUIREMENTS

The following SRs apply to each PAM instrumentation Function in Table 3.3.3.1-1.

SR 3.3.3.1.1

Performance of the CHANNEL CHECK once every 31 days ensures that a gross instrumentation failure has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared to similar plant instruments located throughout the plant.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

The Frequency of 31 days is based upon plant operating experience with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel of a given function in any 31 day interval is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of those displays associated with the required channels of this LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.1.2

A CHANNEL CALIBRATION is performed every 18 months, or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop including the sensor. The test verifies that the channel responds to the measured parameter with the necessary range and accuracy. The Frequency is based on operating experience and consistency with the typical industry refueling cycles.

REFERENCES

1. Regulatory Guide 1.97 Revision 4, "Instrumentation for Light-Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," ~~[Date]~~June 2006.

[2. Plant specific documents (e.g., FSAR, NRC Regulatory Guide 1.97, SER letter).]