Pacific Gas and
Electric Company

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PG&E Letter DCL-03-173

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
License Amendment Request 03-19
Revision to Technical Specifications 3.3.3 Post Accident Monitoring (PAM) Instrumentation and 3.6.8 Hydrogen Recombiners

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.90, PG&E hereby requests an amendment to the Technical Specifications (TS) for the Diablo Canyon Power Plant, Units 1 and 2.

The proposed amendment will delete the TS requirements related to hydrogen recombiners, and hydrogen monitors. The proposed TS changes support implementation of the revisions to 10 CFR 50.44, "Standards for Combustible Gas Control System in Light-Water-Cooled Power Reactors," that became effective October 16, 2003. The changes are consistent with Revision 1 of NRC-approved Industry/Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-447, "Elimination of Hydrogen Recombiners and Change to Hydrogen and Oxygen Monitors." The availability of this TS improvement was announced in the Federal Register on September 25, 2003 as part of the consolidated line item improvement process.

Enclosure 1 provides a description of the proposed change, the requested confirmation of applicability, and plant-specific verifications and commitments. Enclosure 2 provides the existing TS pages marked-up to show the proposed change. Enclosure 3 provides revised TS pages. Implementation of TSTF-447 also involves various changes to the TS Bases. Enclosure 4 provides marked-up and revised TS Bases for information only. The TS Bases changes will be submitted with a future update in accordance with TS 5.5.11, "Technical Specifications (TS) Bases Control Program."

PG&E has determined that this License Amendment Request (LAR) does not involve a significant hazard consideration as determined per 10 CFR 50.92. Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental

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assessment needs to be prepared in connection with the issuance of this amendment.

The change in this LAR is not required to address an immediate safety concern. PG&E requests approval of this LAR no later than December 2004, with the amendment being implemented within 60 days of the date of issuance.

Sincerely,

James R. Becker
Vice President – Diablo Canyon Operations and Station Director

jdc/4308
Enclosures

cc:	Edgar Bailey, DHS
	Bruce S. Mallett
	David L. Proulx
	Diablo Distribution
cc/enc:	Girija S. Shukla

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

	)	Docket No. 50-275
In the Matter of	)	Facility Operating License
PACIFIC GAS AND ELECTRIC COMPANY	)	No. DPR-80
	)	
Diablo Canyon Power Plant	)	Docket No. 50-323
Units 1 and 2	)	Facility Operating License
	)	No. DPR-82

AFFIDAVIT

James R. Becker, of lawful age, first being duly sworn upon oath states that he is Vice President - Diablo Canyon Operations and Station Director of Pacific Gas and Electric Company; that he has executed license amendment request LAR 03-19 on behalf of said company with full power and authority to do so; that he is familiar with the content thereof; and that the facts stated therein are true and correct to the best of his knowledge, information, and belief.

James R. Becker
Vice President – Diablo Canyon Operations and Station Director

Subscribed and sworn to before me this 30th day of December 2003.

Sandra Eatherly

Notary Public
County of San Luis Obispo
State of California

SANDRA EATHERLY
Commission # 1425568
Notary Public - California
San Luis Obispo County
My Comm. Expires Jul 18, 2007

EVALUATION

1.0 INTRODUCTION

The proposed license amendment deletes Technical Specification (TS) 3.6.8, "Hydrogen Recombiners," and references to the hydrogen monitors in TS 3.3.3, "Post Accident Monitoring (PAM) Instrumentation." The proposed TS changes support implementation of the revisions to 10 CFR 50.44, "Standards for Combustible Gas Control System in Light-Water-Cooled Power Reactors," that became effective on October 16, 2003. (The deletion of the requirements for the hydrogen recombiner and references to hydrogen monitors resulted in numbering and formatting changes to other TS, which were otherwise unaffected by this proposed amendment.)

The changes are consistent with Revision 1 of NRC-approved Industry/Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-447, "Elimination of Hydrogen Recombiners and Change to Hydrogen and Oxygen Monitors." The availability of this TS improvement was announced in the Federal Register on September 25, 2003, as part of the consolidated line item improvement process (CLIIP).

2.0 DESCRIPTION OF PROPOSED AMENDMENT

Consistent with the NRC-approved Revision 1 of TSTF-447, the proposed TS changes include:

TS 3.3.3, Condition C	Note: Reference to Hydrogen Monitors	Deleted
TS 3.3.3, Condition D	Inoperable Hydrogen Monitors	Deleted
SR 3.3.3.3	Channel Calibration for Hydrogen Monitors	Deleted
Table 3.3.3-1	Item 11, Hydrogen Monitors	Deleted
TS 3.6.8	Hydrogen Recombiners	Deleted

(Other TS changes included in this application are limited to renumbering and formatting changes that resulted directly from the deletion of the above requirements related to hydrogen recombiners and hydrogen monitors.)

As described in NRC-approved Revision 1 of TSTF-447, the changes to TS requirements (and associated renumbering of other TSs) result in changes to various TS Bases sections. Proposed changes to the TS Bases are provided for information only in Enclosure 4. The TS Bases changes will be submitted with a future update in accordance with TS 5.5.14, "Technical Specifications Bases Control Program."

3.0 BACKGROUND

The Background for this application is adequately addressed by the NRC Notice of Availability published on September 25, 2003 (68 FR 55416), TSTF-447, Revision 1, the documentation associated with the 10 CFR 50.44 rulemaking, and other related documents.

4.0 REGULATORY REQUIREMENTS AND GUIDANCE

The applicable regulatory requirements and guidance associated with this application are adequately addressed by the NRC Notice of Availability published on September 25, 2003 (68 FR 55416), TSTF-447, Revision 1, the documentation associated with the 10 CFR 50.44 rulemaking, and other related documents.

5.0 TECHNICAL ANALYSIS

PG&E has reviewed the safety evaluation (SE) published on September 25, 2003 (68 FR 55416), as part of the CLIIP Notice of Availability. This verification included a review of the NRC staff's SE, as well as the supporting information provided to support TSTF-447, Revision 1. PG&E has concluded that the justifications presented in the TSTF proposal and the SE prepared by the NRC staff are applicable to Diablo Canyon Power Plant (DCPP), Units 1 and 2, and justify this amendment for the incorporation of the changes to the DCPP TS.

6.0 REGULATORY ANALYSIS

A description of this proposed change and its relationship to applicable regulatory requirements and guidance was provided in the NRC Notice of Availability published on September 25, 2003 (68 FR 55416), TSTF-447, Revision 1, the documentation associated with the 10 CFR 50.44 rulemaking, and other related documents.

6.1 Verification and Commitments

As discussed in the model SE published in the Federal Register on September 25, 2003 (68 FR 55416), for this TS improvement, PG&E is making the following verifications and regulatory commitments:

1. PG&E has verified that a hydrogen monitoring system capable of diagnosing beyond design-basis accidents is installed at DCPP and is making a regulatory commitment to maintain that capability. The hydrogen monitors will be included in an Equipment Control Guideline (ECG). This regulatory commitment will be implemented within 60 days of issuance of the license amendment.

2. DCPP does not have an inerted containment.

7.0 NO SIGNIFICANT HAZARDS CONSIDERATION

PG&E has reviewed the proposed no significant hazards consideration determination published on September 25, 2003 (68 FR 55416), as part of the CLIIP. PG&E has concluded that the proposed determination presented in the notice is applicable to DCPP and the determination is hereby incorporated by reference to satisfy the requirement of 10 CFR 50.91(a).

8.0 ENVIRONMENTAL EVALUATION

PG&E has reviewed the environmental evaluation included in the model SE published on September 25, 2003 (68 FR 55416), as part of the CLIIP. PG&E has concluded that the staff's finding's presented in that evaluation are applicable to DCPP and the evaluation is hereby incorporated by reference for this application.

9.0 PRECEDENT

This application is being made in accordance with the CLIIP. PG&E is not proposing variations or deviations from the TS changes described in TSTF-447, Revision 1, or the NRC staff's model SE published on September 25, 2003 (68 FR 55416).

10.0 REFERENCES

Federal Register Notice: Notice of availability of Model Application Concerning Technical Specification Improvement to Eliminate Hydrogen Recombiner Requirement, and Relax the Hydrogen and Oxygen Monitor Requirements for Light Water Reactors Using Consolidated Line Item Improvement Process, published September 25, 2003 (68 FR 55416).

PROPOSED TECHNICAL SPECIFICATION CHANGES (MARK-UP)

3.3 INSTRUMENTATION

3.3.3 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3 The PAM instrumentation for each Function in Table 3.3.3-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2 and 3.

ACTIONS

-----NOTES-----
1. LCO 3.0.4 is not applicable.
2. 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 5.6.8.	Immediately
C. ~~-----NOTE-----~~ ~~Not applicable to hydrogen monitor channels.~~ ----- One or more Functions with two or more required channels inoperable.	C.1 Restore all but one channel to OPERABLE status.	7 days
~~D. Two hydrogen monitor channels inoperable.~~	~~D.1 Restore one hydrogen monitor channel to OPERABLE status.~~	~~72 hours~~

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
~~E~~D. Required Action and associated Completion Time of Condition C ~~or D~~ not met.	~~E~~D.1	Enter the Condition referenced in Table 3.3.3-1 for the channel.	Immediately
~~F~~E. As required by Required Action ~~E~~D.1 and referenced in Table 3.3.3-1.	~~F~~E.1 AND ~~F~~E.2	Be in MODE 3. Be in MODE 4.	6 hours 12 hours
F~~G~~. As required by Required Action ~~E~~D.1 and referenced in Table 3.3.3-1.	~~G~~F.1	Initiate action in accordance with Specification 5.6.8.	Immediately

SURVEILLANCE REQUIREMENTS

-----NOTE-----
SR 3.3.3.1 and SR 3.3.3.2 apply to each PAM instrumentation Function in Table 3.3.3-1.

SURVEILLANCE		FREQUENCY
SR 3.3.3.1	Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.3.2	-----NOTE----- Neutron detectors are excluded from CHANNEL CALIBRATION. ----- Perform CHANNEL CALIBRATION.	24 months
~~SR 3.3.3.3~~	~~Perform CHANNEL CALIBRATION for Hydrogen Monitors~~	~~92 days~~

Table 3.3.3-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITION REFERENCED FROM REQUIRED ACTION E.1
1. Neutron Flux (Wide Range NIS)	2	F
2. Steam Line Pressure	2 per steam generator	F
3. Reactor Coolant System (RCS) Hot Leg Temperature - T_{hot} (Wide Range)	2	F
4. RCS Cold Leg Temperature -T_{cold} (Wide Range)	2	F
5. RCS Pressure (Wide Range)	2	F
6. Reactor Vessel Water Level Indication System	2	G
7. a) Containment Recirculation Sump Water Level (Narrow Range)	2	F
b) Containment Reactor Cavity Sump Level-Wide Range	2	F
8. a) Containment Pressure (Wide Range)	2	F
b) Containment Pressure (Normal Range)	2	F
9. Containment Isolation Valve Position	2 per penetration flow path (a) (b)	F
10. Containment Area Radiation (High Range)	2	G
11. ~~Hydrogen Monitors~~(Deleted)	~~2~~	~~F~~
12. Pressurizer Level	2	F
13. a) Steam Generator Water Level (Wide Range)	4	F
b) Steam Generator Water Level (Narrow Range)	2 per steam generator	F
14. Condensate Storage Tank Level	2	F
15. Incore Thermocouples - Quadrant 1	2 (c)	F
16. Incore Thermocouples - Quadrant 2	2 (c)	F
17. Incore Thermocouples - Quadrant 3	2 (c)	F
18. Incore Thermocouples - Quadrant 4	2 (c)	F
19. Auxiliary Feedwater Flow	4	F
20. Refueling Water Storage Tank Water Level	2	F

(a) Not required for isolation valves whose associated penetration 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 channel consists of two Incore thermocouples.

3.6 CONTAINMENT SYSTEMS

3.6.8 ~~Hydrogen Recombiners~~Deleted

~~LCO 3.6.8 Two hydrogen recombiners shall be OPERABLE.~~

~~APPLICABILITY: MODES 1 and 2~~

~~ACTIONS~~

~~CONDITION~~	~~REQUIRED ACTION~~	~~COMPLETION TIME~~
~~A. One hydrogen recombiner inoperable.~~	~~A.1 -----NOTE----- LCO 3.0.4 is not applicable.~~ ~~Restore hydrogen recombiner to OPERABLE status.~~	~~30 days~~
~~B. Two hydrogen recombiners inoperable.~~	~~B.1 Verify by administrative means that the hydrogen control function is maintained.~~ ~~AND~~ ~~B.2 Restore one hydrogen recombiner to OPERABLE status.~~	~~1 hour~~ ~~AND~~ ~~Once per 12 hours thereafter~~ ~~7 days~~
~~C. Required Action and associated Completion Time not met.~~	~~C.1 Be in MODE 3.~~	~~6 hours~~

~~SURVEILLANCE REQUIREMENTS~~

~~SURVEILLANCE~~		~~FREQUENCY~~
~~SR 3.6.8.1~~	~~Perform a system functional test for each hydrogen recombiner.~~	~~24 months~~
~~SR 3.6.8.2~~	~~Visually examine each hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions.~~	~~24 months~~
~~SR 3.6.8.3~~	~~Perform a resistance to ground test for each heater phase.~~	~~24 months~~

PROPOSED TECHNICAL SPECIFICATION PAGES

3.3 INSTRUMENTATION

3.3.3 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3 The PAM instrumentation for each Function in Table 3.3.3-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2 and 3.

ACTIONS

---NOTES---

1. LCO 3.0.4 is not applicable.
2. 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 5.6.8.	Immediately
C. One or more Functions with two or more required channels inoperable.	C.1	Restore all but one channel to OPERABLE status.	7 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Required Action and associated Completion Time of Condition C not met.	D.1	Enter the Condition referenced in Table 3.3.3-1 for the channel.	Immediately
E. As required by Required Action D.1 and referenced in Table 3.3.3-1.	E.1	Be in MODE 3.	6 hours
	AND		
	E.2	Be in MODE 4.	12 hours
F. As required by Required Action D.1 and referenced in Table 3.3.3-1.	F.1	Initiate action in accordance with Specification 5.6.8.	Immediately

SURVEILLANCE REQUIREMENTS

-----NOTE-----

SR 3.3.3.1 and SR 3.3.3.2 apply to each PAM instrumentation Function in Table 3.3.3-1.

SURVEILLANCE		FREQUENCY
SR 3.3.3.1	Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.3.2	-----NOTE----- Neutron detectors are excluded from CHANNEL CALIBRATION. ----- Perform CHANNEL CALIBRATION.	24 months

Table 3.3.3-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITION REFERENCED FROM REQUIRED ACTION E.1
1. Neutron Flux (Wide Range NIS)	2	F
2. Steam Line Pressure	2 per steam generator	F
3. Reactor Coolant System (RCS) Hot Leg Temperature - T_{hot} (Wide Range)	2	F
4. RCS Cold Leg Temperature -T_{cold} (Wide Range)	2	F
5. RCS Pressure (Wide Range)	2	F
6. Reactor Vessel Water Level Indication System	2	G
7. a) Containment Recirculation Sump Water Level (Narrow Range)	2	F
b) Containment Reactor Cavity Sump Level-Wide Range	2	F
8. a) Containment Pressure (Wide Range)	2	F
b) Containment Pressure (Normal Range)	2	F
9. Containment Isolation Valve Position	2 per penetration flow path [(a)] [(b)]	F
10. Containment Area Radiation (High Range)	2	G
11. (Deleted)		
12. Pressurizer Level	2	F
13. a) Steam Generator Water Level (Wide Range)	4	F
b) Steam Generator Water Level (Narrow Range)	2 per steam generator	F
14. Condensate Storage Tank Level	2	F
15. Incore Thermocouples - Quadrant 1	2 [(c)]	F
16. Incore Thermocouples - Quadrant 2	2 [(c)]	F
17. Incore Thermocouples - Quadrant 3	2 [(c)]	F
18. Incore Thermocouples - Quadrant 4	2 [(c)]	F
19. Auxiliary Feedwater Flow	4	F
20. Refueling Water Storage Tank Water Level	2	F

(a) Not required for isolation valves whose associated penetration 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 channel consists of two Incore thermocouples.

3.6 CONTAINMENT SYSTEMS

3.6.8 Deleted

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PROPOSED TECHNICAL SPECIFICATION BASES CHANGES (MARKUP)

B 3.3 INSTRUMENTATION

B 3.3.3 Post Accident Monitoring (PAM) Instrumentation

BASES

BACKGROUND

The primary purpose of the PAM instrumentation is to display unit 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 Accidents (DBAs).

The OPERABILITY of the accident monitoring instrumentation ensures that there is sufficient information available on selected unit parameters to monitor and to assess unit status and behavior following an accident.

The availability of accident monitoring instrumentation is important so that responses to corrective actions can be observed and the need for, and magnitude of, further actions can be determined. These essential instruments are identified in the FSAR section 7.5 (Ref. 1) based upon the recommendations of Regulatory Guide 1.97 (Ref. 2) as required by Supplement 1 to NUREG-0737 (Ref. 3).

The instrument channels required to be OPERABLE by this LCO include two classes of parameters identified during unit specific implementation of Regulatory Guide 1.97 as Type A and/or Category I variables.

Type A variables are included in this LCO because they provide the primary information required for the control room operator to take specific manually controlled actions for which no automatic control is provided, and that are required for safety systems to accomplish their safety functions for DBAs.

Category I variables are the key variables deemed risk significant because they are needed to:

- Determine whether other systems important to safety are performing their intended functions;
- Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release; and

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BASES

BACKGROUND (continued)	• Provide information regarding the release of radioactive materials to allow for early indication of the need to initiate action necessary to protect the public, and to estimate the magnitude of any impending threat. The specific instrument Functions listed in Table 3.3.3-1 are discussed in the LCO section.
APPLICABLE SAFETY ANALYSES	The PAM instrumentation ensures the operability of Regulatory Guide 1.97 Type A and Category I variables so that the control room operating staff can: • Perform the diagnosis specified in the emergency operating procedures (these variables are restricted to preplanned actions for the primary success path of DBAs), e.g., loss of coolant accident (LOCA); • Take the specified, pre-planned, manually controlled actions, for which no automatic control is provided, and that are required for safety systems to accomplish their safety function; • Determine whether systems important to safety are performing their intended functions; • Determine the likelihood of a gross breach of the barriers to radioactivity release; • Determine if a gross breach of a barrier has occurred; and • Initiate action necessary to protect the public and to estimate the magnitude of any impending threat. 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 must be retained in TS because it is intended to assist operators in minimizing the consequences of accidents. Therefore, Category I, non-Type A, variables are important for reducing public risk.
LCO	The PAM instrumentation LCO provides OPERABILITY requirements for Regulatory Guide 1.97 Type A monitors, which provide information required by the control room operators to perform certain manual actions specified in the unit Emergency Operating Procedures. These manual actions ensure that a system can accomplish its safety function, and are credited in the safety analyses. Additionally, this LCO addresses Regulatory Guide 1.97 instruments that have been designated Category I, non-Type A.

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BASES

LCO (continued)

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

LCO 3.3.3 requires two OPERABLE channels for most Functions. Two OPERABLE channels ensure no single failure prevents operators from getting the information necessary for them to determine the safety status of the unit, and to bring the unit to and maintain it in a safe condition following an accident.

Furthermore, OPERABILITY of two channels allows a CHANNEL CHECK during the post accident phase to confirm the validity of displayed information.

The exception to the two channel requirement is Containment Isolation Valve (CIV) Position, Auxiliary Feedwater (AFW) flow indication and Steam Generator (SG) water level (wide range). For the CIV position, the important information is the status of the containment penetrations. The LCO requires one position indicator for each active CIV. 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 a passive valve, or via system boundary status. If a normally active CIV 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.

For SG water level (wide range) and AFW flow rate there is one indicator for each SG. Even though redundancy is not available, diverse indications are available. Loss of a single indicator would be addressed via Condition C for these two instrument functions.

There is one wide range water level indicator for each steam generator in the main control room. Wide range steam generator level measurement meets the intent of the single failure criterion for Category 1 variables by virtue of independent, diverse variables. Auxiliary feedwater (AFW) flow, narrow range SG level, SG pressure, reactor coolant pressure, and reactor coolant temperature indications are diverse variables which can be used to assist in determining whether adequate core cooling is provided. The wide range SG level is used to assist in determining the loss of the heat sink. Having one wide range level indicator, in conjunction with one AFW flow indicator, per SG is consistent with NUREG-0737 Item II.E.1.2 for Westinghouse plants.

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LCO (continued)

There is one AFW flow rate indicator for each SG in the main control room. Diverse indications are available from one wide range level indicator and three narrow range level indicators per SG. Each of the four AFW flow indicators is powered by a different source. Since only two of four SGs are required to establish a heat sink for the RCS, flow indication to at least two intact SGs is assured even if a single failure is assumed.

Table 3.3.3-1 includes instrumentation which is classified as either Type A and/or Category I variables in accordance with Regulatory Guide 1.97, FSAR Section 7.5, and SER 14.

Type A and Category I variables are required to meet Regulatory Guide 1.97 Category I (Ref. 2) design and qualification requirements for seismic and environmental qualification, single failure criterion, utilization of emergency standby power, immediately accessible display, continuous readout, and recording of display, except as exempted in SSER 31. Regulatory Guide 1.97, for certain Functions, requires that the Function be recorded on at least one channel. For these channels where direct and immediate trend or transient information is not essential for operator information, or both channels would be recorded per Regulatory Guide 1.97, the loss of the recorder is not considered to be a loss of Function. However, the recorder should be returned to service as soon as possible and an alternate means of obtaining the recorded information be established if the recorder is to be out-of service beyond the channel AOT.

Listed below are discussions of the specified instrument Functions listed in Table 3.3.3-1.

1. Neutron Flux (Wide Range NIS)

   Neutron Flux indication is provided to verify reactor shutdown. The wide range NIS is necessary to cover the full range of flux that may occur post accident.

   Neutron flux is used for accident diagnosis, verification of subcriticality, and diagnosis of positive reactivity insertion.

2. Steam Line Pressure

   Steam pressure is used to determine if a high energy secondary line rupture has occurred and the availability of the steam generators as a heat sink. It is also used to verify that a faulted steam generator is isolated. Steam pressure may be used to ensure proper cooldown rates or to provide a diverse indication for natural circulation cooldown.

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BASES

LCO (continued)

3, 4. Reactor Coolant System (RCS) Hot and Cold Leg Temperatures (Wide Range)

RCS Hot and Cold Leg Temperatures are Category I variables provided for verification of core cooling and long term surveillance. The intent of requiring this instrumentation is to be able to monitor ΔT. Therefore, to have an OPERABLE RCS inlet and outlet temperature, they should be in the same primary loop. If the outlet temperature is inoperable, core exit thermocouples can be used in conjunction with RCS inlet temperature to determine ΔT.

RCS hot (outlet) and cold (inlet) leg temperatures are used to determine RCS subcooling margin. RCS subcooling margin will allow termination of safety injection (SI), if still in progress, or reinitiation of SI if it has been stopped. RCS subcooling margin is also used for unit stabilization and cooldown control. RCS hot leg temperature also provides a temperature compensating signal for the reactor vessel level instrumentation system (RVLIS).

In addition, RCS cold leg temperature is used in conjunction with RCS hot leg temperature to verify the unit conditions necessary to establish natural circulation in the RCS. The RCS cold leg temperature also provides a temperature input signal for the low temperature overpressure protection (LTOP) system.

Reactor outlet temperature inputs to the Reactor Protection System are provided by two fast response resistance elements and associated transmitters in each loop. The channels provide indication over a range of 0°F to 700°F.

Each of the 4 hot legs and each of the 4 cold legs has one wide range RTD. These are separate from the narrow range RTDs providing input into the Reactor Protection System.

5. Reactor Coolant System Pressure (Wide Range)

RCS wide range pressure is a Category I variable provided for verification of core cooling and RCS integrity long term surveillance.

RCS pressure is used to verify delivery of SI flow to RCS from at least one train when the RCS pressure is below the pump shutoff head. RCS pressure is also used to verify closure of manually closed spray line valves and pressurizer power operated relief valves (PORVs).

In addition to these verifications, RCS pressure is used for determining RCS subcooling margin. RCS subcooling margin will allow termination of SI, if still in progress, or reinitiation of SI if it has been stopped. RCS pressure can also be used:

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BASES

LCO

5. Reactor Coolant System Pressure (Wide Range) (continued)

- to determine whether to terminate actuated SI or to reinitiate stopped SI;
- to determine when to reset SI and shut off low head SI;
- to manually restart low head SI;
- as reactor coolant pump (RCP) trip criteria; and
- to make a determination on the nature of the accident in progress and where to go next in the procedure.

RCS subcooling margin is also used for unit stabilization and cooldown control.

RCS pressure is also related to three decisions about depressurization. They are:

- to determine whether to proceed with primary system depressurization;
- to verify termination of depressurization; and
- to determine whether to close accumulator isolation valves during a controlled cooldown/depressurization.

Two final uses of RCS pressure are to determine whether to operate the pressurizer heaters and as an input to Reactor Vessel Water Level Instrumentation System (RVLIS).

RCS pressure is a Type A variable because the operator uses this indication to monitor the cooldown of the RCS following a steam generator tube rupture (SGTR) or small break LOCA. Operator actions to maintain a controlled cooldown, such as adjusting steam generator (SG) pressure or level, would use this indication. Furthermore, RCS pressure is one factor that may be used in decisions to terminate RCP operation.

6. Reactor Vessel Water Level Indication System (RVLIS)

RVLIS is provided for verification and long term surveillance of core cooling. It is also used for accident diagnosis and to determine reactor coolant inventory adequacy.

The RVLIS provides a direct measurement of the collapsed liquid level above the fuel alignment plate. The collapsed level represents the amount of liquid mass that is in the reactor vessel above the core. Measurement of the collapsed water level is selected because it is a direct indication of the water inventory.

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BASES

LCO (continued)

7. a. <u>Containment Recirculation Sump Level (Narrow Range) and</u>

b. <u>Containment Reactor Cavity Sump Water Level (Wide Range)</u>

Containment Recirculation Sump Level (Narrow Range) is used to verify that sufficient water is contained in the recirculation sump to allow operation of the Residual Heat Removal Pumps with the suction aligned to the containment recirculation sump.

Containment Reactor Cavity Sump Water Level (Wide Range) is provided for verification and long term surveillance of RCS integrity. The required Regulatory Guide 1.97 recorder for this function is part of this instrument channel.

The Containment Reactor Cavity Sump level instrumentation encompasses the range of the Containment Recirculation Sump and can be used to determine the appropriate time for swap-over of the RHR pumps from RWST to the Containment Recirculation Sump if required.

8. a. <u>Containment Pressure (Wide Range) and</u>

b. <u>Containment Pressure (Normal Range)</u>

Containment Pressure is provided for verification of RCS and containment OPERABILITY.

Containment pressure is used to verify closure of main steam isolation valves (MSIVs) during a main steam line break inside containment, and containment spray Phase B isolation when high-high containment pressure is reached.

Both instruments are required to cover the Regulatory Guide 1.97 range requirements.

9. <u>Containment Isolation Valve Position</u>

CIV Position is provided for verification of Containment OPERABILITY, and Phase A and Phase B isolation, and containment ventilation system isolation.

When used to verify Phase A and Phase B isolation, the important information is the isolation status of the containment penetrations. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each active CIV in a containment penetration flow path, i.e., two total channels of CIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active CIV having control room indication, Note (b) requires a single channel

(continued)

LCO

9. Containment Isolation Valve Position (continued)

of valve position indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve, as applicable, and prior knowledge of a passive valve, or via system boundary status. If a normally active CIV 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. This Function is on a per valve basis and ACTION A is entered separately for each inoperable valve indication. Note (a) to the Required Channels states that the Function is not required for isolation valves whose associated penetration 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.

10. Containment Area Radiation (High Range)

Containment Area Radiation is provided to monitor for the potential of significant radiation releases for use by operators in determining the need to invoke site emergency plans. Containment radiation level is used to determine if a high energy line break (HELB) containing radioactive fluid has occurred, and whether the event is inside or outside of containment.

11. ~~Hydrogen Monitors~~Deleted

~~Hydrogen monitoring is provided to detect high hydrogen concentration conditions that represent a potential for containment breach from a hydrogen explosion. This variable is also important in verifying the adequacy of mitigating actions, and is used to determine whether or not hydrogen recombiners should be started.~~

12. Pressurizer Level

Pressurizer Level is used to determine whether to terminate SI, if still in progress, or to reinitiate SI if it has been stopped. Knowledge of pressurizer water level is also used to verify the unit conditions necessary to establish natural circulation in the RCS and to verify that the unit is maintained in a safe shutdown condition.

(continued)

LCO (continued)

13. a. Steam Generator Water Level (Wide Range) and

b. Steam Generator Level (Narrow Range)

SG Water Level (Wide Range) is provided to monitor operation of decay heat removal via the SGs. The wide range level covers a span of 12 inches above the lower tubesheet to the steam generator separator. The measured differential pressure is displayed in percent level (cold calibration).

SG Water Level is used to:

- identify the faulted SG following a tube rupture;
- verify that the intact SGs are an adequate heat sink for the reactor;
- determine the nature of the accident in progress (e.g., verify an SGTR); and
- verify unit conditions for termination of SI during secondary unit HELBs outside containment.

Operator action is based on the control room indication of SG level. The RCS response during a design basis small break LOCA depends on the break size. For a certain range of break sizes, the reflux cooling mode of heat transfer is necessary to remove decay heat. Wide range level is a Type A variable because the operator must manually raise and control SG level to establish reflux cooling heat transfer. Operator action is initiated on a loss of subcooled margin. Feedwater flow is increased until the indicated wide range level reaches the reflux cooling initiation point.

There are 4 total required Steam Generator Wide Range Channels with one required on each steam generator. The redundancy of this Function is provided by the presence of 4 Steam Generators.

SG Water Level (Narrow Range) is redundant to the SG wide range level, and provides indication of adequate RCS heat removal capability during normal SG inventory conditions. The narrow range level covers a span from ≥ 437 inches to 581 inches above the lower tubesheet.

There are 3 Steam Generator Narrow Range Channels per steam generator with 2 required for this function.

14. Condensate Storage Tank (CST) Level

CST Level is provided to ensure water supply for auxiliary feedwater (AFW). The CST provides the ensured safety grade water supply for the AFW System. CST Level is displayed on a control room indicator, strip chart recorder, and unit computer.

(continued)

BASES

LCO

14. Condensate Storage Tank (CST) Level (continued)

CST Level is considered a Type A variable because the control room meter is the primary indication used by the operator.

The DBAs that require AFW are the loss of electric power, steam line break (SLB), and small break LOCA.

The CST is the initial source of water for the AFW System. However, as the CST is depleted, manual operator action is necessary to replenish the CST or align suction to the AFW pumps from the Fire Water Storage Tank or other alternate sources.

15, 16, 17, 18. In-Core Thermocouples

In-Core Thermocouples are provided for verification and long term surveillance of core cooling.

An evaluation was made of the minimum number of valid in-core thermocouples necessary for measuring core cooling. The evaluation determined the reduced complement of in-core thermocouple necessary to detect initial core recovery and trend the ensuing core heatup. The evaluations account for core nonuniformities, including incore effects of the radial decay power distribution, excore effects of condensate runback in the hot legs, and nonuniform inlet temperatures. Based on these evaluations, core cooling can be adequately monitored with two valid in-core thermocouple channels per quadrant with two in-core thermocouples per required channel. Core Exit Temperature is used to determine whether to terminate SI, if still in progress, or to reinitiate SI if it has been stopped. Core Exit Temperature is also used for unit stabilization and cooldown control.

Two OPERABLE channels of In-Core Thermocouples are required in each quadrant to provide indication of radial distribution of the coolant temperature rise across representative regions of the core. Power distribution symmetry was considered in determining the specific number and locations provided for diagnosis of local core problems. Therefore, two randomly selected thermocouples are not sufficient to meet the two thermocouples per channel requirement in any quadrant. The two thermocouples in each channel must meet the additional requirement that one is located near the center of the core and the other near the core perimeter, such that the pair of Core Exit Temperatures indicate the radial temperature gradient across their core quadrant. Unit specific evaluations in response to Item II.F.2 of NUREG-0737 (Ref. 3) should have identified the thermocouple pairings that satisfy these requirements. Two sets of two thermocouples ensure a single failure will not disable the ability to determine the radial temperature gradient.

(continued)

BASES

LCO (continued)

19. Auxiliary Feedwater (AFW) Flow

AFW Flow is provided to monitor operation of decay heat removal via the SGs. One AFW flow channel is provided for each steam generator.

The AFW Flow to each SG is determined from a differential pressure measurement calibrated for a range of 0 gpm to 300 gpm. Each differential pressure transmitter provides an input to a control room indicator and the unit computer. Since the primary indication used by the operator during an accident is the control room indicator, the PAM specification deals specifically with this portion of the instrument channel.

AFW flow is used three ways:

- to verify delivery of AFW flow to the SGs;
- to determine whether to terminate SI if still in progress, in conjunction with SG water level (narrow range); and
- to regulate AFW flow so that the SG tubes remain covered.

AFW flow is a Type A variable because operator action is required to throttle flow during an SLB accident to prevent the AFW pumps from operating in runout conditions. AFW flow is also used by the operator to verify that the AFW System is delivering the correct flow to each SG. However, the primary indication used by the operator to ensure an adequate inventory is SG level (Narrow Range) during normal SG inventory conditions.

20. Refueling Water Storage Tank (RWST) Water Level

RWST water level is used to verify the water source availability to the emergency core cooling system (ECCS) and Containment Spray Systems. It may also provide an indication of time for initiating cold leg recirculation from the sump following a LOCA. The RWST level channel additionally trips the Residual Heat Removal Pumps in preparation for transfer to cold leg recirculation.

APPLICABILITY

The PAM instrumentation LCO is applicable in MODES 1, 2, and 3. These variables are related to the diagnosis and pre-planned actions required to mitigate DBAs. The applicable DBAs are assumed to occur in MODES 1, 2, and 3. In MODES 4, 5, and 6, unit conditions are such that the likelihood of an event that would require PAM instrumentation is low; therefore, the PAM instrumentation is not required to be OPERABLE in these MODES.

(continued)

BASES (continued)

ACTIONS

Note 1 has been added in the ACTIONS to exclude the MODE change restriction of LCO 3.0.4. This exception allows entry into the applicable MODE while relying on the ACTIONS even though the ACTIONS may eventually require unit shutdown. This exception is acceptable due to the passive function of the instruments, the operator's ability to respond to an accident using alternate instruments and methods, and the low probability of an event requiring these instruments.

Note 2 has been added in the ACTIONS to clarify the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed on Table 3.3.3-1. When the required channels in Table 3.3.3-1 are specified on a per steam generator basis, then the Condition may be entered separately for each steam generator.

The Completion Time(s) of the inoperable channel(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function.

A.1

Condition A applies when one or more Functions have one required channel that is inoperable. Required Action A.1 requires restoring the inoperable channel 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

Condition B applies when the Required Action and associated Completion Time for Condition A are not met. This Required Action specifies immediate initiation of actions in Specification 5.6.8, 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 unit conditions that would require information provided by this instrumentation.

(continued)

BASES

ACTIONS (continued)

C.1

Condition C applies when one or more Functions have two or more inoperable required channels (i.e., two or more channels inoperable in the same function). Required Action C.1 requires restoring all but one channel in the Function(s) 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 no required channels OPERABLE 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 all but 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.

~~D.1~~

~~Condition D applies when two hydrogen monitor channels are inoperable. Required Action D.1 requires restoring one hydrogen monitor channel to OPERABLE status within 72 hours. The 72 hour Completion Time is reasonable based on the unlikely event that a LOCA (which would cause core damage) would occur during this time.~~

~~E~~D.1

Condition ~~E~~ D applies when the Required Action and associated Completion Time of Condition C ~~or D are~~is not met. Required Action ~~E~~D.1 requires entering the appropriate Condition referenced in Table 3.3.3-1 for the channel immediately. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met any Required Action of Condition C ~~or D~~, and the associated Completion Time has expired, Condition ~~E~~ D is entered for that channel and provides for transfer to the appropriate subsequent Condition.

~~F~~E.1 and ~~F~~E.2

If the Required Action and associated Completion Time of Conditions C ~~or D are~~is not met and Table 3.3.3-1 directs entry into Condition ~~F~~E, the unit must be brought to a MODE where the requirements of this LCO do not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and MODE 4 within 12 hours.

(continued)

BASES

ACTIONS

~~F~~E.1 and ~~F~~E.2 (continued)

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

~~G~~F.1

Alternate means of monitoring Reactor Vessel Water Level and Containment Area Radiation have been developed. These alternate means may be temporarily installed if the normal PAM channel cannot be restored to OPERABLE status within the allotted time. Monitoring the Core Exit Thermocouples, Pressurizer Level indication (07-LI-459A, 460A or 461), and RCS Subcooling Monitor indication (07-YI-31) provide an alternate means for RVLIS. These three parameters provide diverse information to verify there is adequate core cooling or RCS inventory. When Containment Area Radiation Level (High Range) monitors (R-30 and R-31) are inoperable, selected portable radiation monitoring equipment is made available for taking correlated readings at the equipment or personnel hatches as the alternate method. If these alternate means are used, the Required Action is not to shut down the unit but rather to follow the directions of Specification 5.6.8, in the Administrative Controls section of the TS. 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

A Note has been added to the SR Table to clarify that SR 3.3.3.1 and SR 3.3.3.2 apply to each PAM instrumentation Function in Table 3.3.3-1.

SR 3.3.3.1

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 the two instrument channels could be an indication of excessive instrument drift in one of the channels or of 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 unit instruments located throughout the unit.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.3.1 (continued)

Agreement criteria are determined by the unit 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. If the channels are within the criteria, it is an indication that the channels are OPERABLE.

As specified in the SR, a CHANNEL CHECK is only required for those channels that are normally energized. The Containment Hydrogen Concentration monitors are maintained in a "standby" condition which does not energize all of the monitor components, thus the monitors are not considered "normally energized."

The Frequency of 31 days is based on operating experience that demonstrates that channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

SR 3.3.3.2

A CHANNEL CALIBRATION is performed every 24 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 measured parameter with the necessary range and accuracy. CHANNEL CALIBRATION of the Neutron Flux Wide Range Function excludes the detectors. To ensure that the detectors are verified, the Neutron Flux Wide Range Channels are cross-correlated and normalized to reactor thermal power. CHANNEL CALIBRATION of the Containment Radiation Level (High Range) Function may consist of an electronic calibration of the channel, not including the detector, for range decades above 10R/h and a one point calibration check of the detector below 10 R/h with an installed or portable gamma source. Whenever an RTD is replaced in Functions 3 or 4, the next required CHANNEL CALIBRATION of the RTDs is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element. Whenever an incore thermocouple is replaced in Function 15, 16, 17, or 18 the next required CHANNEL CALIBRATION of the incore thermocouples is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element. For function 9, Containment Isolation Valve Position, the instrument loop consists of the position switch mounted on the valve, the indication lights in the monitor boxes and the interconnecting wiring. For the CHANNEL CALIBRATION to verify that the channel

(continued)

BASES

SURVEILLANCE REQUIREMENTS	SR 3.3.3.2 (continued) responds with the necessary range and accuracy, the test must verify that the proper indication is received when the valve is stroked to the fully closed position. Verification of intermediate position or actual percentage closed is not required, however, for OPERABILITY, the position indication must be able to communicate the proper isolation status of the containment penetration. Adjustments to the channel may be done as part of this surveillance or through other controlled instructions. The Frequency is based on operating experience and consistency with the typical industry refueling cycle. SR 3.3.3.3 A CHANNEL CALIBRATION is performed every 92 days. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to measured parameters with the necessary range and accuracy. The calibration sequence uses a zero and span sample gas in accordance with the manufacturer's recommendations. The Frequency is based on the manufacturer's recommendations and on operating experience.
REFERENCES	1. FSAR, 7.5. 2. Regulatory Guide 1.97, Revision 3. 3. NUREG-0737, Supplement 1, "TMI Action Items." 4. Supplemental Safety Evaluation Report 14. 5. Supplemental Safety Evaluation Report 31.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.8 ~~Hydrogen Recombiners~~Deleted

~~BASES~~

~~BACKGROUND~~	~~The function of the hydrogen recombiners is to eliminate the potential breach of containment due to a hydrogen-oxygen reaction.~~ ~~Per 10 CFR 50.44, "Standards for Combustible Gas Control Systems in Light-Water-Cooled Reactors" (Ref. 1), and GDC 41, "Containment Atmosphere Cleanup" (Ref. 2), hydrogen recombiners are required to reduce the hydrogen concentration in the containment following a loss of coolant accident (LOCA) or steam line break (SLB). The recombiners accomplish this by recombining hydrogen and oxygen to form water vapor. The vapor remains in containment, thus eliminating any discharge to the environment. The hydrogen recombiners are manually initiated since flammable limits would not be reached until several days after a Design Basis Accident (DBA).~~ ~~Two 100% capacity independent hydrogen recombiner systems are provided. Each consists of controls located in the control room, a power supply and a recombiner. Recombination is accomplished by heating a hydrogen-air mixture above 1150°F. A single recombiner is capable of maintaining the hydrogen concentration in containment below the 4.0 volume percent (v/o) flammability limit. Two recombiners are provided to meet the requirement for redundancy and independence. Each recombiner is powered from a separate Engineered Safety Features bus, and is provided with a separate power panel and control panel.~~
~~APPLICABLE SAFETY ANALYSES~~	~~The hydrogen recombiners provide for the capability of controlling the bulk hydrogen concentration in containment to less than the lower flammable concentration of 4.0 v/o following a DBA. This control would prevent a containment wide hydrogen burn, thus ensuring the pressure and temperature assumed in the analyses are not exceeded. The limiting DBA relative to hydrogen generation is a LOCA. Hydrogen may accumulate in containment following a LOCA as a result of:~~ ~~a. A metal steam reaction between the zirconium fuel rod cladding and the reactor coolant;~~ ~~b. Radiolytic decomposition of water in the Reactor Coolant System (RCS) and the containment sump;~~ ~~c. Hydrogen in the RCS at the time of the LOCA (i.e., hydrogen dissolved in the reactor coolant and hydrogen gas in the pressurizer vapor space); or~~

~~(continued)~~

~~BASES~~

~~APPLICABLE SAFETY ANALYSIS (continued)~~	~~d. Corrosion of metals exposed to containment spray and Emergency Core Cooling System solutions.~~ ~~To evaluate the potential for hydrogen accumulation in containment following a LOCA, the hydrogen generation as a function of time following the initiation of the accident is calculated. Conservative assumptions recommended by Reference 4 are used to maximize the amount of hydrogen calculated.~~ ~~Based on the conservative assumptions used to calculate the hydrogen concentration versus time after a LOCA, the hydrogen concentration in the primary containment would reach 3.5 v/o after 3 days after the LOCA and 4.0 v/o about 2 days later if no recombiner was functioning (Ref. 3). Initiating the hydrogen recombiners when the primary containment hydrogen concentration reaches 3.5 v/o will maintain the hydrogen concentration in the primary containment below flammability limits.~~ ~~The hydrogen recombiners are designed such that, with the conservatively calculated hydrogen generation rates discussed above, a single recombiner is capable of limiting the peak hydrogen concentration in containment to less than 4.0 v/o (Ref. 3). The Hydrogen Purge System is designed and constructed such that it is Design Class I (for Quality and electrical power) but not redundant. As such, it is an adequate backup to the redundant hydrogen recombiners since it would be relied upon only in the event of a non-design basis condition.~~ ~~The hydrogen recombiners satisfy Criterion 3 of 10CFR50.36(c)(2)(ii).~~
~~LCO~~	~~Two hydrogen recombiners must be OPERABLE. This ensures operation of at least one hydrogen recombiner in the event of a worst case single active failure.~~ ~~Operation with at least one hydrogen recombiner ensures that the post LOCA hydrogen concentration can be prevented from exceeding the flammability limit.~~
~~APPLICABILITY~~	~~In MODES 1 and 2, two hydrogen recombiners are required to control the hydrogen concentration within containment below its flammability limit of 4.0 v/o following a LOCA, assuming a worst case single failure.~~ ~~In MODES 3 and 4, both the hydrogen production rate and the total hydrogen produced after a LOCA would be less than that calculated for the DBA LOCA. Also, because of the limited time in these MODES, the probability of an accident requiring the hydrogen recombiners is low. Therefore, the hydrogen recombiners are not required in MODE 3 or 4.~~

~~(continued)~~

~~BASES~~

~~APPLICABILITY (continued)~~

~~In MODES 5 and 6, the probability and consequences of a LOCA are low, due to the pressure and temperature limitations in these MODES. Therefore, hydrogen recombiners are not required in these MODES.~~

~~ACTIONS~~

~~A.1~~

~~With one containment hydrogen recombiner inoperable, the inoperable recombiner must be restored to OPERABLE status within 30 days. In this condition, the remaining OPERABLE hydrogen recombiner is adequate to perform the hydrogen control function. However, the overall reliability is reduced because a single failure in the OPERABLE recombiner could result in reduced hydrogen control capability. The 30 day Completion Time is based on the availability of the other hydrogen recombiner, the small probability of a LOCA or SLB occurring (that would generate an amount of hydrogen that exceeds the flammability limit), and the amount of time available after a LOCA or SLB (should one occur) for operator action to prevent hydrogen accumulation from exceeding the flammability limit.~~

~~Required Action A.1 has been modified by a Note that states the provisions of LCO 3.0.4 are not applicable. As a result, a MODE change is allowed when one recombiner is inoperable. This allowance is based on the availability of the other hydrogen recombiner, the small probability of a LOCA or SLB occurring (that would generate an amount of hydrogen that exceeds the flammability limit), and the amount of time available after a LOCA or SLB (should one occur) for operator action to prevent hydrogen accumulation from exceeding the flammability limit.~~

~~B.1 and B.2~~

~~With two hydrogen recombiners inoperable, the ability to perform the hydrogen control function via alternate capabilities must be verified by administrative means within 1 hour. The alternate hydrogen control capabilities are provided by the containment Hydrogen Purge System. The 1 hour Completion Time allows a reasonable period of time to verify that a loss of hydrogen control function does not exist. In addition, the alternate hydrogen control system capability must be verified once per 12 hours thereafter to ensure its continued availability. Both the initial verification and all subsequent verifications may be performed as an administrative check by examining logs or other information to determine the availability of the key locked alternate hydrogen control system. It does not mean to perform the Surveillances are needed to demonstrate OPERABILITY of the alternate hydrogen control system. If the ability to perform the~~

~~(continued)~~

~~BASES~~

~~ACTIONS~~	~~B.1 and B.2 (continued)~~ ~~hydrogen control function is maintained, continued operation is permitted with two hydrogen recombiners inoperable for up to 7 days. Seven days is a reasonable time to allow two hydrogen recombiners to be inoperable because the hydrogen control function is maintained and because of the low probability of the occurrence of a LOCA that would generate hydrogen in the amounts capable of exceeding the flammability limit.~~ ~~C.1~~ ~~If the inoperable hydrogen recombiner(s) cannot be restored to OPERABLE status within the required Completion Time, 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 6 hours. The Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.~~
~~SURVEILLANCE REQUIREMENTS~~	~~SR 3.6.8.1~~ ~~Performance of a system functional test for each hydrogen recombiner ensures the recombiners are operational and can attain and sustain the temperature necessary for hydrogen recombination. In particular, this SR verifies that the minimum heater sheath temperature increases to ≥ 700°F in ≤ 90 minutes. After reaching 700°F, the power is increased to maximum power for approximately 2 minutes and power is verified to be ≥ 60 kW.~~ ~~Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.~~ ~~SR 3.6.8.2~~ ~~This SR ensures there are no physical problems that could affect recombiner operation. Since the recombiners are mechanically passive, they are not subject to mechanical failure. The only credible failure involves loss of power, blockage of the internal flow, missile impact, etc.~~

~~(continued)~~

~~BASES~~

~~SURVEILLANCE REQUIREMENTS~~	~~SR 3.6.8.2 (continued)~~ ~~A visual inspection is sufficient to determine abnormal conditions that could cause such failures (i.e., loose wiring or structural connections, deposits of foreign material, etc.). The 24 month Frequency for this SR was developed considering the incidence of hydrogen recombiners failing the SR in the past is low.~~ ~~SR 3.6.8.3~~ ~~This SR, which is performed following the functional test of SR 3.6.8.1, requires performance of a resistance to ground test for each heater phase to ensure that there are no detectable grounds in any heater phase. This is accomplished by verifying that the resistance to ground for any heater phase is ≥ 10,000 ohms.~~ ~~The 24 month Frequency for this Surveillance was developed considering the incidence of hydrogen recombiners failing the SR in the past is low.~~
~~REFERENCES~~	~~1. 10 CFR 50.44.~~ ~~2. 10 CFR 50, Appendix A, GDC 41.~~ ~~3. FSAR Section 6.2.5.~~ ~~4. Regulatory Guide 1.7, Revision 2.~~