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PG&E Letter DCL-09-49

10 CFR 50.90

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 09-02, Revision to Technical Specification 3.4.15, "RCS Leakage Detection Instrumentation," Operability Requirements and Actions for RCS Leakage Detection Instrumentation

Dear Commissioners and Staff:

In accordance with 10 CFR 50.90, enclosed is an application for amendment to Facility Operating License Nos. DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP), respectively. The enclosed License Amendment Request (LAR) proposes to revise Technical Specification (TS) 3.4.15, "Reactor Coolant System (RCS) Leakage Detection Instrumentation."

The proposed change would revise the Operating Licenses to revise TS 3.4.15 to add a new Condition for any containment sump monitor, the containment atmosphere particulate radioactivity monitor, and the containment fan cooler unit (CFCU) condensate collection monitor inoperable. The proposed change would revise the TS 3.4.15 Condition for all required monitors inoperable. Also, the proposed change would remove the word "required" from TS 3.4.15 Condition A, Required Action A.2, Condition B, and Required Action B.2, would revise TS 3.4.15 Condition A to apply to any containment sump monitor, and would revise the name of the CFCU condensate collection monitor in the TS 3.4.15 Actions. The TS 3.4.15 Bases are updated to eliminate discussion of information that could be erroneously interpreted as Operability requirements from all sections except the Limiting Condition for Operation Section. The TS 3.4.15 Bases are updated to describe the required response time of the instruments. The TS Bases are updated to revise the basis for OPERABILITY for the containment sump monitors, containment atmosphere particulate radioactivity monitor, containment atmosphere gaseous radioactivity monitor, and the CFCU condensate collection monitor. Also, the TS Bases are updated to add the basis for the new and revised TS 3.4.15 Conditions.

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The enclosure contains a description of the proposed changes, the supporting technical analyses, and the no significant hazards consideration determination. Attachments 1 and 2 contain marked-up and retyped (clean) TS pages, respectively. Attachment 3 provides the marked-up TS Bases changes. TS Bases changes will be implemented pursuant to TS 5.5.14, "Technical Specifications Bases Control Program," at the time this amendment is implemented.

Pacific Gas and Electric (PG&E) has determined that this 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 assessment needs to be prepared in connection with the issuance of this amendment.

The changes in this LAR are not required to address an immediate safety concern. PG&E requests approval of this LAR no later than June 30, 2010. PG&E requests the license amendment(s) be made effective upon NRC issuance, to be implemented within 180 days from the date of issuance.

PG&E makes no regulatory commitments (as defined by NEI 99-04) in this letter. This letter includes no revisions to existing regulatory commitments.

If you have any questions or require additional information, please contact Stan Ketelsen at 805-545-4720.

I state under penalty of perjury that the foregoing is true and correct.

Executed on July 3, 2009.

Sincerely,

James R. Becker
Site Vice President

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Enclosure
cc: Gary W. Butner, California Department of Public Health
Elmo E. Collins, NRC Region IV Regional Administrator
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cc/enc: Michael S. Peck, NRC, Senior Resident Inspector
Alan B. Wang, NRC Project Manager, Office of Nuclear Reactor Regulation

EVALUATION OF THE PROPOSED CHANGE

License Amendment Request 09-02 Revision to Technical Specification 3.4.15, "RCS Leakage Detection Instrumentation," Operability Requirements and Actions for RCS Leakage Detection Instrumentation

1. SUMMARY DESCRIPTION

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ATTACHMENTS:

1. Technical Specification Page Markups
2. Retyped Technical Specification Pages
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1. SUMMARY DESCRIPTION

This letter is a License Amendment Request (LAR) to amend Operating Licenses DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP), respectively.

The proposed changes would amend the Operating Licenses to revise Technical Specification (TS) 3.4.15, "Reactor Coolant System (RCS) Leakage Detection Instrumentation," to add a new Condition for any containment sump monitor, the containment atmosphere particulate radioactivity monitor, and the containment fan cooler unit (CFCU) condensate collection monitor inoperable, to revise the Condition for all required monitors inoperable, remove the word "required" from Condition A, Required Action A.2, Condition B, and Required Action B.2, revise TS 3.4.15 Condition A to apply to any containment sump monitor, and to revise the name of the CFCU condensate collection monitor in the Actions. The TS 3.4.15 Bases are updated to eliminate discussion of information that could be erroneously interpreted as OPERABILITY requirements from all sections except the Limiting Condition for Operation (LCO) Section and to describe the required response time of the instruments. The TS Bases are also updated to revise the basis for OPERABILITY for the containment sump monitors, containment atmosphere particulate radioactivity monitor, containment atmosphere gaseous radioactivity monitor, and the CFCU condensate collection monitor, and to add the basis for the new and revised TS 3.4.15 Conditions.

2. DETAILED DESCRIPTION

A new TS 3.4.15 Condition D is added for the Condition with any containment sump monitor inoperable, the containment atmosphere particulate radioactivity monitor inoperable, and the required CFCU condensate collection monitor inoperable. New Required Actions are added for Condition D, which are D.1, to analyze grab samples of the containment atmosphere, and D.2.1 to restore containment sump monitor to OPERABLE status, or D.2.2 to restore containment atmosphere particulate radioactivity monitor to OPERABLE status, or D.2.3 to restore required CFCU condensate collection monitor to OPERABLE status. The Completion Time for Required Action D.1 is once per 12 hours and the Completion Times for Required Actions D.2.1, D.2.2, and D.2.3 are 7 days. The current Condition D and associated Required Actions, and Completion Times are moved to new Condition F. The current Condition E Required Action E.1 is replaced with new Required Actions E.1 to analyze grab samples of the containment atmosphere, and E.2 to perform SR 3.4.13.1, and E.3 to restore at least one RCS leakage detection monitor to OPERABLE status. The Completion Times for Required Actions E.1 and E.2 are once per 6 hours, and the Completion Time for Required Action E.3 is 72 hours. The word "required" is removed from TS 3.4.15 Condition A, Required Action A.2, Condition B, and Required Action B.2. TS 3.4.15 Condition A is revised to explicitly apply when any containment sump monitor is inoperable. In the TS 3.4.15 Action C section, the name used for the CFCU condensate collection monitor is revised from, "containment air cooler condensate flow rate monitor," to ,"CFCU condensate collection monitor."

The TS 3.4.15 Bases Background Section is updated to specify the applicable Revision of Regulatory Guide (RG) 1.45, to delete discussion of information that could be erroneously interpreted as OPERABILITY requirements, to identify the equipment described that is not required by TS 3.4.15, and to address sensitivity and response time.

The TS 3.4.15 Bases Applicable Safety Analyses Section sentence, "The need to evaluate the severity of an alarm or an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary," is revised to, "The need to evaluate the severity of an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary." The TS 3.4.15 Bases Applicable Safety Analyses Section sentence on sensitivity and response time is removed.

The first paragraph of the TS 3.4.15 Bases LCO section is revised to eliminate the sentence on the purpose for RCS leakage detection instrumentation, and to remove unnecessary words describing the ability to detect leakage.

The following five new TS 3.4.15 Bases LCO Section paragraphs are added that describe revised operability requirements for the three instruments required to be OPERABLE:

> "OPERABILITY of the containment sump monitor systems, the particulate radioactivity monitor, the gaseous radioactivity monitor, and the CFCU condensate collection monitor is based on the capability to indicate a 1 gpm leak rate within four hours. This allowable response time is based on the leak-before-break (LBB) methodology criterion for leakage detection systems, for plants with leakage detection systems that did not meet all of the provisions of RG 1.45, that at least one leakage detection system with sensitivity capable of detecting an unidentified leakage rate of one gpm in four hours should be operable (References 5 and 7).
>
> The containment structure sumps and reactor cavity sump are used to collect unidentified LEAKAGE. The containment structure sumps and the reactor cavity sump have associated sump level and sump pump integrated flow monitors that are visually monitored to detect when there is an increase in LEAKAGE above the normal value. The identification of an increase in unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the sumps and it may take longer than one hour to detect a 1 gpm increase in unidentified LEAKAGE, depending on the origin and magnitude of the LEAKAGE. This sensitivity is acceptable for containment sump monitor OPERABILITY.

The reactor coolant contains radioactivity that, when released to the containment, may be detected by the gaseous or particulate containment atmosphere radioactivity monitor. Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE, but have recognized limitations. Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. If there are few fuel element cladding defects and low levels of activation products, it may not be possible for the gaseous or particulate containment atmosphere radioactivity monitors to detect a 1 gpm increase within four hours during normal operation. However, the gaseous or particulate containment atmosphere radioactivity monitor is OPERABLE when it is capable of detecting a 1 gpm increase in unidentified LEAKAGE within 1 hour given an RCS activity equivalent to that assumed in the design calculations for the monitors (Reference 3).

An increase in humidity of the containment atmosphere could indicate the release of water vapor to the containment. The condensate drain flow from the CFCUs is collected and the average flow rate is manually determined using the elapsed time to collect a constant volume of condensate. Elapsed times less than a predefined value indicate a 1 gpm or more increase in unidentified LEAKAGE. The time required to detect a 1 gpm increase above the normal value varies based on environmental and system conditions and may take longer than 1 hour and up to 4 hours. This sensitivity is acceptable for CFCU condensate collection monitor OPERABILITY.

OPERABILITY of the RCS leakage detection instrumentation includes the control room indication associated with the instrumentation but does not include control room alarms or alarm setpoints."

The TS 3.4.15 Bases Actions section is updated to remove an incorrect sentence in the Action B paragraph, to describe the new D.1, D.2.1, D.2.2, and D.2.3 Actions, to describe the revised E.1, E.2, and E.3 Actions, and to move the text for the current D.1 and D.2 Actions to new F.1 and F.2 Actions.

The TS 3.4.15 Bases Surveillance Requirements (SRs) Section sentence, "The test ensures that the monitors can perform their function in the desired manner including alarm functions", is revised to, "The test ensures that the monitors can perform their function in the desired manner"

In summary, the TS 3.4.15 changes add a new Condition, Required Action, and Completion Time for the Condition with any containment sump monitor inoperable, the containment atmosphere particulate radioactivity monitor inoperable, and the required CFCU condensate collection monitor inoperable, move the current Condition D and associated Required Actions, and Completion Times to new Condition F, replace the current Condition E Required Action with new Required Actions, and Completion Times, remove the word "required" from Condition A, Required Action A.2, Condition B, and Required Action B.2, revise TS 3.4.15 Condition A to apply to any containment sump monitor, and revise the name of the CFCU condensate collection monitor in the Action C section. The TS 3.4.15 Bases changes eliminate discussion of information that could be erroneously interpreted as OPERABILITY requirements from all sections except the LCO Section, describe the required response time of the instruments, revise the basis for OPERABILITY for the containment sump monitors, containment atmosphere particulate radioactivity monitor, containment atmosphere gaseous radioactivity monitor, and the CFCU condensate collection monitor, add the basis for the new and revised TS 3.4.15 Conditions, and clarify the functions included in the surveillance test for the containment atmosphere radioactivity monitors.

The proposed TS changes are noted on the marked-up TS page provided in Attachment 1 to this enclosure. The proposed retyped TS is provided in Attachment 2. The revised TS Bases mark-up is contained in Attachment 3.

Design and Licensing Basis of DCPP RCS Leakage Detection System

The DCPP RCS leakage detection system does not meet all aspects of, but instead meets the intent of 10 CFR 50, Appendix A, General Design Criterion (GDC) 30 and RG 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," dated May 1973, guidelines in that it provides for detection, identification, and monitoring of reactor coolant leakage.

Compliance of DCPP RCS Leakage Detection System with GDCs

The DCPP construction permits, which established many of the plant design criteria, were issued in April 1968 and December 1970 for DCPP Units 1 and 2, respectively. The DCPP units are designed to comply with the Atomic Energy Commission (AEC) GDCs for Nuclear Power Plant Construction Permits, published in 10 CFR 50 Appendix A in July 1967. The DCPP compliance with the 1967 GDC is discussed in DCPP FSAR Section 3.1. Until February 1971, GDC 16 applied to RCS leakage detection. The 1967 GDC Criterion 16, Monitoring Reactor Coolant Pressure Boundary (Category B), stated:

> *Means shall be provided for monitoring the reactor coolant pressure boundary to detect leakage.*

Revision 0 of the DCPP Final Safety Analysis Report (FSAR) dated September 28, 1973, Section 3.1.4.6, as well as the latest issued Revision 18 of the FSAR, discuss the DCPP compliance with the 1967 GDC 16 and states:

All RCS components are designed, fabricated, inspected, and tested in conformance with the ASME Boiler and Pressure Vessel Code.

Leakage is detected by an increase in the amount of makeup water required to maintain a normal level in the pressurizer. The reactor vessel closure joint is provided with a temperature monitored leakoff between double gaskets.

Leakage into the reactor containment is drained to the reactor building sump where the level is monitored.

Leakage is also detected by measuring the airborne activity and quantity of the condensate drained from each reactor containment fan cooler unit.

These leakage detection methods are described in detail in Section 5.2.

In February 1971, updated GDCs were published as Appendix A to 10 CFR 50, and the 1967 GDC 16 was replaced by GDC 30. The 1971 GDC 30, Quality of Reactor Coolant Pressure Boundary, stated:

Components which are part of the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested to the highest quality standards practical. Means shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage.

The DCPP design did not fully meet all aspects of the February 1971 GDC since they were issued after the construction licenses were issued. Revision 0 of the FSAR, Appendix 3.1A, as well as the latest issued Revision 18 of the FSAR, discuss the DCPP compliance with the 1971 GDCs, including 1971 GDC 30, and state for GDC 30 that DCPP, "conforms with the intent of Criterion 30." GDC 30, Appendix 3.1A, of the FSAR states:

The DCPP Units 1 and 2 designs conform with the intent of Criterion 30. The quality levels employed in the design, fabrication, erection and testing for each reactor coolant pressure boundary are extremely comprehensive. Systems are included in the plant to detect and, to the extent practical, to locate leakage. This criterion is associated with 1967 GDCs 9 and 16.

On October 16, 1974, the AEC issued Revision 0 of the DCPP Units 1 and 2 Safety Evaluation Report (SER). As discussed on page 1-2 of Revision 0 of the SER, the SER considered FSAR Amendments 1 though 17. Section 5.2.7 addressed the review of the reactor coolant pressure boundary leakage detection system for GDC 30 conformance. The AEC stated the leakage detection system "conforms with the functional requirements recommended in RG 1.45," and that, "the leakage detection systems have detection capabilities, which conform with those recommended in RG 1.45." Section 5.2.7 stated as follows:

> *Adequate provisions have been made to detect leakage of reactor coolant to the containment. The major components of the system are: containment atmosphere particulate radioactivity monitors, radiogas monitors, level indicators on the containment sumps, and a water temperature monitor on the containment air recirculation and cooling unit. The system has sufficient sensitivity to measure small leaks, will identify the leakage source to the extent practicable, will include suitable control alarms and read-outs, and conforms with the functional requirements recommended in Regulatory Guide 1.45, 'Reactor Coolant Pressure Boundary Leakage Detection Systems.' In addition, indirect indications of leakage can be obtained from the containment humidity, pressure, and temperature indicators. Significant intersystem leakage will be indicated by abnormal readings from the radioactivity monitors used to detect failed fuel, and indirectly, by the coolant flow and level measuring instrumentation provided for normal operational control of the system.*
>
> *The leakage detection systems have detection capabilities which conform with those recommended in Regulatory Guide 1.45, and provide reasonable assurance that any structural degradation resulting in leakage during service will be detected in time to permit corrective actions. This constitutes an acceptable basis for satisfying the requirements of AEC General Design Criterion No. 30.*

The subsequent 33 staff SER Supplements through 1986, concluding with SER Supplement 34 did not further address the reactor coolant leakage detection systems, GDC 30, or RG 1.45 compliance.

Compliance with RG 1.45, Revision 0

The DCPP RCS leakage detection system does not meet all aspects of RG 1.45, Revision 0, guidelines, but instead meets the intent of RG 1.45, Revision 0.

RG 1.45, Revision 0, Section, "Detector Response Time," states in part:

> *In analyzing the sensitivity of leak detection systems using airborne particulate or gaseous radioactivity, a realistic primary coolant radioactivity concentration assumption should be used. The expected values in the environmental report would be acceptable.*

RG 1.45, Revision 0, Position C.5, states:

> *The sensitivity and response time of each leakage detection system in regulatory position 3 above employed for unidentified leakage should be*

adequate to detect a leakage rate, or its equivalent, of one gpm in less than one hour.

RG 1.45, Revision 0, Position C.6, states:

The leakage detection systems should be capable of performing their functions following seismic events that do not require plant shutdown. The airborne particulate radioactivity monitoring system should remain functional when subjected to the SSE.

During the AEC staff review of the FSAR as part of the DCPP application for an operating license, the staff issued a request for additional information (RAI) on January 4, 1974. Questions 5.7 through 5.9 stated as follows:

5.7 Indicate whether your leakage detection methods will be sufficiently sensitive to give results comparable to those obtained by conformance with Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems" (May 1973). Submit a table of the leakage detection systems and include the sensitivity (gpm) and response time of each system. The staff position is that each leakage detection system should be capable of detecting an unidentified leakage of one gpm in one hour or less.

5.8 Provide sufficient information to assure (1) that the leakage detection systems will be capable of performing their functions following seismic events not requiring plant shutdown, and (2) that the airborne particulate radioactivity monitoring system will remain functional following an SSE.

5.9 Indicate to what extent Regulatory Guide 1.45 is followed with regard to: (1) procedures for conversion of the various leakage indicators to a common leakage equivalent, and (2) collection and monitoring of unidentified leakage separately from identified leakage sources.

PG&E provided responses to the above RAI in part in Amendment 3 to the application for the operating license dated February 15, 1974, and Amendment 4 to the application for the operating license dated February 28, 1974.

In Amendment 3 to the application for the operating license, the containment air particulate and containment radiogas detectors were identified in FSAR Table 5.2-22, as Seismic Category II that are designed to function under conditions up to the DCPP design earthquake (DE). Note 2 of FSAR, Table 5.2-22, stated:

These units were not constructed to withstand DDE accelerations; however, they will be housed in a Seismic Class I structure and protected from external damage associated with a seismic event. Therefore, it is *considered that this unit can be returned to operational status within 36 hours of a DDE.*

The DCPP DE is less severe than the double design earthquake (DDE) and as stated in current FSAR Section 3.7.1.1, the DDE corresponds to the Safe Shutdown Earthquake (SSE) described in Appendix A to 10 CFR 100. Since the containment atmosphere radioactivity monitors were not designed for an SSE, they did not meet RG 1.45, Revision 0, Position C.6.

In Amendment 4 to the application for the operating license, the DCPP FSAR, Section 5.2.4, in the Subsection, "Sensitivity and Response Time," stated:

The containment radioactive gas monitor is inherently less sensitive (threshold at 10^{-7} μCi/cc) than the containment air particulate monitor, and would function in the event that significant reactor coolant gaseous activity exists from fuel cladding defects. The sensitivity and range are such that gross count rates equivalent to from 10^{-6} to 10^{-3} μCi/cc will be detected. This system is also adequate to detect a 1 gpm leak in several minutes as shown in Figure 5.2-14.

The containment gaseous activity will result from any fission product gases (Kr-85, Xe-136) leaking from the Reactor Coolant System as well as from the Ar-41 produced in the air around the reactor vessel. Assuming a constant background radioactivity in the containment atmosphere due predominantly to Ar-41, and reactor coolant gaseous activity of 0.03 μCi/cc (corresponding to about 0.05 percent fuel defects), a 1 gpm coolant leak would double the background in about 2 hours. The occurrence of a leak of 2 to 4 gpm would double the background in less than 1 hour. In these circumstances this instrument is a useful backup to the air particulate monitor.

These FSAR descriptions for the containment atmosphere gaseous radioactivity monitor did not meet RG 1.45 Position C.5 since significant reactor coolant gaseous activity was required for the monitor to detect 1-gpm in less than 1 hour.

The original TS requirements for the leakage detection systems were contained in TS 3/4.4.6, "Reactor Coolant System Leakage," in the initial TS for DCPP. The TS 3/4.4.6.1 Bases issued in November of 1984 in NUREG-1102 for Unit 1, in April of 1985 in NUREG-1132 for Unit 2, and in August of 1985 in NUREG-1151 for Units 1 and 2 stated the detection systems were, "functionally consistent with the recommendation of RG 1.45," and did not state that leakage detection systems fully met RG 1.45. The TS 3/4.4.6.1 Bases in NUREG-1102, NUREG-1132, and NUREG-1151 stated:

The RCS leakage detection systems required by this specification are provided to monitor and detect leakage from the reactor coolant pressure *boundary. These Detection Systems are functionally consistent with the recommendation of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973.*

DCPP LBB Approval

Generic Letter (GL) 84-04, "Safety Evaluation of Westinghouse Topical Reports Dealing With Elimination of Postulated Pipe Breaks in PWR Primary Main Loops (Generic Letter 84-04)," dated February 1, 1984, informed pressurized water reactor utilities of the NRC review of the Westinghouse topical reports to address the asymmetric blowdown loads on the PWR primary systems that result from a limited number of discrete break locations. GL 84-04 stated that the staff evaluation concluded an acceptable technical basis had been provided so that the asymmetric blowdown loads resulting from double-ended pipe breaks in main coolant loop piping need not be considered as a design basis for the Westinghouse Owner's Group plants, provided two Conditions were met. The second Condition, the only Condition that relates to the design and operation of RCS leakage detection systems, stated:

> *Leakage detection systems at the facility should be sufficient to provide adequate margin to detect the leakage from the postulated circumferential throughwall flaw utilizing the guidance of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," with the exception that the seismic qualification of the airborne particulate radiation monitor is not necessary. At least one leakage detection system with sensitivity capable of detecting 1 gpm in 4 hours must be operable.*

This second Condition was also included in Section 5.0, "Conclusions and Recommendations," of GL 84-04.

NUREG-1061, Volume 3, "Report of the U.S. Nuclear Regulatory Commission Piping Review Committee," dated November 1984, contained the results of the Piping Review Committee Pipe Break Task Group that was formed in response to a request by the Executive Director for Operations of the U.S. NRC for a comprehensive review of the NRC requirements in the area of nuclear power plant piping. Section 5.0, "Acceptance Criteria for Leak-Before-Break (LBB) Submittals," provided the task group recommendations for application of LBB approach in the NRC licensing process. Section 5.7, "Size of Postulated Throughwall Flaw," discussed the margin between the calculated leak rate and the detectable leak rate and the leakage detection system requirements for LBB applications, specifically the time and capability to detect the presence of a leak for fluid systems inside containment. With respect to the leakage detection for PWRs, in Section 5.7 it was stated:

> *Specifically, the Task Group recommends that the specified margin can be achieved as follows:*

(a) For PWRs, either operating or under construction, that meet all the provisions of Regulatory Guide 1.45, each leakage detection system should be adequate to detect the rate of unidentified leakage, or its equivalent, of 1 gpm in less than one hour.

(b) For operating PWRs that do not meet all of the provisions of Regulatory Guide 1.45, at least one leakage detection system with sensitivity capable of detecting an unidentified leakage rate of one gpm in four hours should be operable.

As discussed in Section 2.2 of a NRC safety assessment contained in NRC Letter, "Safety Assessment Regarding Containment Radiation Monitor Sensitivity at St. Lucie Plant, Units 1 and 2 and Turkey Point Plant, Units 3 and 4 (TAC No. M40294)," dated May 27, 1999, the GL 84-04 Condition that at least one leakage detection system with sensitivity capable of detecting 1-gpm in 4 hours must be operable to support the technical basis for LBB is a variance from RG 1.45.

PG&E requested approval of a plant-specific LBB analysis in PG&E Letter DCL-92-059, dated March 16, 1992, and obtained NRC approval of LBB in a NRC safety evaluation dated February 3, 1993.

In the safety evaluation, the NRC referenced the acceptance criteria of NUREG-1061, and relied upon the PG&E submittal statement that the DCPP leakage detection system for the reactor coolant pressure boundary, "meets the intent of RG 1.45, which recommends that a leakage of one gallon per minute in one hour be detected."

To adopt the variance to RG 1.45, Revision 0, provided in GL 84-04, and NUREG-1061, Volume 3, PG&E updated the TS 3.4.15 Bases to include a discussion of the LBB methodology and the required leakage detection system response time. This change was made to the TS 3.4.15 Bases as part of the TS conversion to the Westinghouse Standard Technical Specifications proposed in PG&E Letter DCL 97-106, "License Amendment Request 97-09, Technical Specification Conversion License Amendment Request," dated June 2, 1997, and approved as part of License Amendments 135 for DCPP Units 1 and 2 issued on May 28, 1999. The TS 3.4.15 Bases Applicable Safety Analysis Section was updated to state:

The asymmetric loads produced by postulated breaks are the result of assumed pressure imbalance, both internal and external to the RCS. The internal asymmetric loads result from a rapid decompression that causes large transient pressure differentials across the core barrel and fuel assemblies. The external asymmetric loads result from the rapid depressurization of the annulus regions, such as the annulus between the reactor vessel and the shield wall, and cause large transient pressure *differentials to act on the vessel. These differential pressure loads could damage RCS supports, core cooling equipment or core internals. This concern was first identified as Multiplant Action (MPA) D-10 and subsequently as Unresolved Safety Issue (USI) 2, "Asymmetric LOCA Loads" (Ref. 4).*

The resolution of USI-2 for Westinghouse PWRs was the use of fracture mechanics technology for RCS piping > 10 inches diameter. (Ref. 5). This technology became known as leak before-break (LBB). Included within the LBB methodology was the requirement to have leak detection systems capable of detecting a 1.0 gpm leak within four hours. This leakage rate is designed to ensure that adequate margins exist to detect leaks in a timely manner during normal operating conditions. The use of the LBB methodology is described in Reference 6.

RCS Leakage Detection System

The DCPP RCS leakage detection system is described in FSAR Section 5.2.7. It describes that means are provided to detect and, to the extent practical, identify the location of reactor coolant leakage sources. Detection systems with diverse modes of operation are used to ensure adequate surveillance with sufficient sensitivity so that increases in leakage rate can be detected before the integrated leakage rate reaches a value that could interfere with the safe operation of the plant.

Systems using diverse methods and modes of operation are provided to continuously monitor environmental conditions within the containment, and to detect the presence of radioactive and nonradioactive leakage to the containment. Once operation begins, background levels are established, thereby, providing a baseline for leakage detection. Deviations from normal conditions indicate possible changes in leakage rates and are monitored in the control room and the auxiliary building. Indications of leakage include changes in containment particulate and gaseous activity, containment sump level, containment condensation, and other volumetric measurement such as increased coolant makeup demand. A list of systems available to detect RCS leakage is provided in FSAR Table 5.2-16.

Containment Radioactivity Monitors

Containment radioactivity monitors continuously monitor the air particulate and gaseous activity levels in the containment during normal plant operation. Leakage to the containment from the reactor coolant pressure boundary results in changes in airborne radioactivity concentrations that can be detected by this equipment. Detector sensitivity and response time, in terms of leakage rates and time to provide indication and/or alarm, depends on the radioactivity concentration in the reactor coolant itself.

The containment radioactivity monitors measure beta and/or gamma activity in the containment by taking continuous air samples from the containment atmosphere. This sample flow first passes through the particulate monitor and then through the gas monitor assembly. The sample is then returned to the containment.

The containment atmosphere particulate radioactivity monitor (RM-11) is provided to measure air particulate gamma radioactivity in the containment. This is normally used to meet TS LCO 3.4.15.b. The sampler for this channel takes a continuous air sample from the containment atmosphere. The inlet line from inside the containment is routed through the containment penetration to the monitor, which is located adjacent to the penetration. The sample is monitored by a scintillation counter-filter paper detector assembly. The particulate matter is collected on the filter paper's constantly moving surface and is viewed by a photomultiplier-scintillation crystal combination. The sample is returned to the containment after it passes through the series-connected gas monitor.

The containment atmosphere particulate radioactivity monitor sensitivity and range are such that gross count rates equivalent to from 10^{-6} to 10^{-9} μCi/cc are detected. The sensitivity of the containment atmosphere particulate activity monitor to an increase in reactor coolant leakage rate is dependent on the magnitude of the normal leakage into the containment and is greatest where normal leakage is low. As shown in FSAR Figure 5.2-9, this system has adequate response to detect a 1-gpm leak within 1 hour when reactor coolant activity associated with greater than a minimum of 0.1 percent fuel defects exists.

The containment atmosphere gaseous radioactivity monitor (RM-12) is provided to measure gaseous beta-gamma radioactivity in the containment. The detector consists of a gamma sensitive Geiger Mueller tube mounted in the monitor container. This channel takes a continuous air sample from the containment atmosphere that passes through the particulate monitor and then through the gas monitor assembly. The sample is circulated in a fixed volume where it is monitored by a radiation detector. The sample is then returned to the containment.

The containment radioactive gas monitor is inherently less sensitive (threshold at 10^{-7} μCi/cc) than the containment atmosphere particulate radioactivity monitor, and would function in the event that significant reactor coolant gaseous activity results from fuel cladding defects. The sensitivity and range are such that gross count rates equivalent to from 10^{-3} to 10^{-6} μCi/cc are detected. This system is adequate to detect a 1-gpm leak within 1 hour as shown in FSAR Figure 5.2-9 when reactor coolant activity associated with greater than a minimum of 0.1 percent fuel defects exists.

The containment gaseous activity results from any fission product gases (e.g., Kr-85, Xe 135) leaking from the RCS as well as from the argon-41 produced in the air around the reactor vessel. Assuming a constant background radioactivity in the containment atmosphere due predominantly to argon-41, and reactor coolant gaseous activity of 0.03 μCi/cc (corresponding to about 0.05 percent fuel defects), a 1-gpm coolant leak would double the fission product gas background in about 2 hours. The occurrence of a leak of 2 to 4 gpm would double the background in less than 1 hour. In these circumstances, this instrument is a useful backup to the containment atmosphere particulate radioactivity monitor.

The adequacy of the containment atmosphere particulate and gaseous radioactivity monitors to detect a change in leakage during the initial period of plant operation is limited by low coolant activity levels. The containment atmosphere gaseous radioactivity monitor is not as sensitive as the other leakage detection systems during this period because the argon-41 background masks the low level of gaseous activity from coolant leakage.

Containment Structure Sump and Reactor Cavity Sump Level and Flow Monitor System

Leakage from the primary system results in reactor coolant flowing into one of the containment sumps. Sump level and sump pump integrated flow is monitored to provide a measure of the overall leakage that is in liquid state. As indicated in FSAR Table 5.2-16, the containment structure sumps have a range of 1 to 48 inches of water column and a repeatability of plus or minus 1 inch. The reactor cavity sumps have a range of 1 to 35 inches of water column and repeatability of plus or minus 1 inch. The approximate response time to detect a 1-gpm leak for the containment structure sumps and reactor cavity sumps is less than one hour. The use of the containment structure sumps and reactor cavity sumps requires operator monitoring and logging to note changes in indicated sump level and sump pump total flow. As part of the routine shift check procedure, the operators determine leakage to the sumps by adding the total sump level change and total sump pump discharges and dividing by the elapsed time from the previous shift check reading that was performed.

CFCU Condensate Collection Monitor System

The CFCU condensate collection monitor system (also referred to containment air cooler condensate flow rate monitor system in current TS 3.4.15, Action C) provides a measure of the amount of leakage vaporized. This system collects and measures moisture condensed from the containment atmosphere by the cooling coils of the fan cooler air circulation units. Moisture from leaks partially evaporate into the containment atmosphere and are condensed on the fan cooling coils. This system dependably and accurately measures total vaporized leakage, including leakage from the cooling coils themselves. It measures the liquid runoff flowrate from the drain pans under each CFCU. The condensate measuring system consists of a vertical standpipe, valves, and instrumentation installed in the drain piping of the CFCU. Level switches (HI and HI-HI) are provided in each CFCU drain line. The level switches have a fixed location in each drain line providing a repeatable alarm.

Depending on the number of CFCUs in operation, the drainage flowrate from each unit due to normal condensation is determined. Additional or abnormal leaks result in containment humidity and condensation runoff rate increases, and the additional leakage is measured. Under equilibrium conditions, the quantity of condensate collected by the cooling coils of the fan cooler units is equal to the evaporated water leakage and steam leakage from systems within the containment. After equilibrium is attained, condensate flow from approximately 0.1 to 30 gpm per detector can be measured by this system. For equilibrium conditions, the approximate response time to detect a 1-gpm leak for CFCU condensate collection monitor system is 1 hour. The response time depends on initial conditions and may take longer if containment humidity is initially low or RCS temperature is low.

The use of the CFCU condensate collection monitor system requires it to be placed in service, and requires manual operator action to determine the RCS leak rate. Therefore, this system is normally not in use to meet TS LCO 3.4.15.c and instead the containment atmosphere gaseous radioactivity monitor is used to meet TS LCO 3.4.15.c. When the system is placed in service, the time intervals between the receipt of the HI-level and HI-HI level alarms are monitored and logged by the operator. Alarm intervals less than a conservative pre-defined value indicate a leak and direct the operator to perform an RCS inventory balance to better quantify the RCS leakage rate.

Other Methods of RCS Leakage Detection

In addition to the TS 3.4.15 required RCS leakage detection instrumentation, other methods exist to detect RCS leakage. These methods include the RCS water inventory balance, volume control tank (VCT) level, pressurizer level, and charging pump flow.

As prescribed by TS 3.4.13, an RCS water inventory balance is required to be performed periodically to meet SR 3.4.13.1 12 hours after establishment of steady state operation. Tracking the RCS inventory in a consistent manner provides an effective means of quantifying overall system leakages. The RCS water inventory balance determines the leak rate from the RCS by taking the difference in RCS and chemical and volume control system inventory change over a period of time without inventory makeup or diversion. The RCS leak rate is calculated automatically using the plant process computer. When the plant process computer is not available, the RCS leak rate can be calculated manually using plant process computer data or control room vertical board instruments for input. The use of the plant process computer to calculate the RCS leak rate is the preferred method due to its higher accuracy than the manual method. When there is a high degree of RCS stability, the plant process computer is capable of providing a RCS leak rate accuracy within approximately plus or minus 0.1 gpm. If the gross RCS leak rate exceeds 0.3 gpm (0.283 gpm if using the manual leak rate method with zinc injection in service), Surveillance Test Procedure (STP) R-10C, "Reactor Coolant System Water Inventory Balance," requires further evaluation to be performed to determine the source of the leakage and to differentiate between IDENTIFIED and UNIDENTIFIED LEAKAGE as defined in TS 3.4.13.

VCT level is routinely monitored by operators to identify any changes in RCS inventory. As described in FSAR Table 5.2-16, the range of indicated VCT level is zero to 100 percent, and the sensitivity is approximately 19 gallons per percent level. A 1-gpm RCS leak would result in approximately a 3 percent change in VCT level in an hour.

Pressurizer liquid level is routinely monitored by operators to identify any changes in RCS inventory. As described in FSAR Table 5.2-16, the range of indicated pressurizer level is zero to 100 percent and the sensitivity is approximately 125 gallons per percent level. A 1-gpm RCS leak would result in approximately a one percent change in pressurizer level in two hours.

During normal operation only one charging pump is operating. If a gross loss of RCS inventory should occur, the flowrate mismatch of the charging and letdown flows would indicate RCS leakage. As described in FSAR Table 5.2-16, the range of indicated charging pump flow is zero to 200 gpm, and the sensitivity is plus or minus 10 percent span when flow is greater than 60 gpm. This leakage detection method has insufficient accuracy and repeatability to detect a 1-gpm change in flowrate, and is useful to detect significantly larger RCS leaks.

Various containment air temperature and pressure sensors can supplement indications of RCS leakage. Containment temperature and pressure fluctuate slightly during plant operation, but a rise above the normally indicated range of values may indicate RCS leakage into the containment. Alarm signals from these instruments would be valuable in recognizing a gross loss of RCS inventory.

<u>Purpose for Proposed Amendments</u>

On November 3, 2008, the NRC Integrated Inspection Report 05000275/2008004 and 05000323/2008004 issued noncited violation 05000275/2008004-03 for performing an inadequate operability evaluation of the Unit 1 containment atmosphere gaseous radioactivity monitor reactor coolant leak detection system. The plant Resident Inspectors raised a concern on August 13, 2008, that the design assumption of failed reactor fuel was not present in Unit 1, and that the leak detector may not be capable of performing the specified safety function. PG&E entered the concern in the corrective action program via Action Request (AR) A0737958 on August 14, 2008, and documented in the AR that the containment atmosphere gaseous radioactivity monitor reactor coolant leak detection system was operable in part based on its ability to perform the design function as described in the FSAR. After review of AR A0737958, the resident inspectors concluded that the gaseous radioactivity monitor was not operable since the conditions assumed for functionality, including a specified RCS source term, were not met. After further investigation of the issue, PG&E declared the gaseous radioactivity monitor inoperable on each unit on September 23, 2008, and placed the TS 3.4.15.c CFCU condensate collection monitor in service. The use of the CFCU condensate collection monitor is a burden for plant operators because it is a manually operated leakage detection system.

The containment atmosphere gaseous radioactivity monitor cannot be assured to detect a 1-gpm leak within four hours with normal low RCS activity levels. In addition, although low RCS activity levels are normal, it is expected the RCS activity level will continue to decrease as industry initiatives for improved fuel performance are implemented. Predicting future changing conditions in RCS activity and the impact on the response time of the containment atmosphere gaseous radioactivity monitor is impractical. However, the containment atmosphere gaseous radioactivity monitor continues to be important since experience has shown that it can respond even when low RCS activity is present, and it is useful to operators to identify RCS leakage, and to discriminate RCS leakage from other sources of leakage into containment. Therefore, PG&E proposes to revise the TS 3.4.15 Bases such that operability of the containment atmosphere gaseous radioactivity monitor is based on the design capabilities of the monitor described in the FSAR. The monitor response described in the FSAR is based on the original design calculations for the atmosphere gaseous radioactivity monitor that assumed an RCS activity associated with a minimum of 0.1 percent fuel defects. This change will allow TS 3.4.15.c to be normally met using the containment atmosphere gaseous radioactivity monitor and will remove the current burden on plant operators in having to use the CFCU condensate collection system to meet TS 3.4.15.c.

The proposed change to TS 3.4.15 Required Action E will reduce the potential for unnecessary MODE changes and requests for enforcement discretion by allowing a limited time period to repair one or more of the inoperable monitors.

3. TECHNICAL EVALUATION

<u>New TS 3.4.15 Condition D</u>

The new TS 3.4.15 Condition D is added for the Condition with any containment sump monitor inoperable, the containment atmosphere particulate radioactivity monitor inoperable, and the required CFCU condensate collection monitor inoperable. When the containment atmosphere gaseous radioactivity monitor is the only operable monitor, the current TS require performance of SR 3.4.13.1 (RCS water inventory balance) once per 24 hours and restoration of the inoperable monitors within 30 days. The proposed change requires analyzing grab samples from the containment atmosphere once per 12 hours and restoration of at least one additional monitor within 7 days. The requirement to analyze grab samples provides an alternate periodic method to monitor for RCS leakage. A containment grab sample is more sensitive than the containment atmosphere gaseous and particulate radioactivity monitors with respect to the ability to detect RCS leakage, and also to detect smaller differences in containment activity. Due to the time to take and analyze the grab sample, this is not a continuous monitoring method. However, by reducing the time between required grab samples, there will be no significant loss of monitoring capability during the limited time period allowed by the proposed change. The 12 hour performance of analysis of containment grab samples is reasonable given the availability of the containment atmosphere gaseous radioactivity monitor to detect RCS leakage. The 7 day Completion Time to restore another monitor is reasonable given the alternate periodic method available to detect an RCS leak and the low probability of a RCS leak during this period. The TS 3.4.15 containment atmosphere gaseous radioactivity monitor as well as the non-TS FSAR Table 5.2-16, described VCT level, pressurizer level, and charging pump flow monitors provide diverse capability to detect an RCS leak.

<u>Relocation of Current Condition D to New Condition F</u>

The Relocation of Current Condition D and associated Required Actions and Completion Times to new Condition F is an editorial change to support the addition of new Condition D. No changes to current Condition D, or its associated Required Actions and Completion Times, are made in the relocation to new Condition F.

<u>Revision to Current Condition E</u>

When all RCS leakage detection monitors are inoperable, current TS 3.4.15 Condition E requires entry into LCO 3.0.3 immediately. The proposed change requires analyzing grab samples from the containment atmosphere, and performing an RCS water inventory balance every 6 hours. The containment grab samples will identify an increase in RCS leak rate, which could then be quantified by the RCS water inventory balance. The RCS water inventory balance is capable of identifying a 1-gpm RCS leak rate. When there is a high degree of RCS stability, performance of the RCS water inventory balance with the plant process computer is capable of providing an RCS leak rate accuracy within approximately plus or minus 0.1 gpm. Unlike the other TS 3.4.15 Required Actions, in Required Action E.2, the RCS water inventory balance must be performed regardless of the plant conditions. If plant conditions are not sufficiently stable to perform an RCS water inventory balance, a plant shutdown is required. The combination of the frequent containment atmosphere grab samples and RCS water inventory balance calculations provides reasonable assurance that any significant RCS pressure boundary degradation will be detected soon after leak occurrence, and, therefore, minimize the potential for subsequent growth propagation to a gross failure. The RCS water inventory balance calculation determines the magnitude of RCS unidentified leakage by use of instrumentation readily available to the control room operators. There are also other non-TS indications of RCS leakage available to the operator in the control room, such as VCT level, pressurizer level, and charging pump flow.

A large increase in RCS leakage is a rare occurrence, but is most likely associated with a rapid change in plant conditions such as a plant shutdown. Providing a limited Completion Time to restore at least one RCS leakage monitor may avoid a plant shutdown with no operable RCS leakage monitoring instrumentation. The NRC approved a similar change for the condition of no operable RCS leakage detection instrumentation for the Millstone Units 2 and 3 plants (ADAMS Accession No.: ML082261529) on September 30, 2008.

The DCPP units have obtained NRC approval of a plant-specific LBB analysis in a NRC safety evaluation dated February 3, 1993, based on PG&E Letter DCL-92-059, dated March 16, 1992, that contained Westinghouse Electric Corporation technical report WCAP-13039, "Technical Justification for Eliminating Large Primary Loop Rupture as the Structural Design Basis for the Diablo Canyon Units 1 and 2 Nuclear Power Plants," dated November 1991. The basic concept of LBB is that certain piping material has sufficient fracture toughness (i.e., ductility) to resist rapid flaw propagation. A postulated flaw in such piping would not lead to pipe rupture and potential damage to adjacent safety related systems, structures, and components before the plant could be placed in a safe, shutdown condition. Before pipe rupture, the postulated flaw would lead to limited but detectable leakage, which would be identified by the leak detection systems in time for the operator to take action. The NRC staff reviews the application of LBB methodology to primary system piping to ensure that certain safety margins are satisfied to assure the structural integrity of the pipe. There is significant conservatism in this evaluation. Standard Review Plan (SRP), Section 3.6.3, specifies a margin of the square-root of 2 be applied to the loads to assure that leakage size flaws are stable at the normal load plus safe-shutdown earthquake load. A margin of 10 is to be applied to leakage so that detection of leakage from the postulated flaw size is ensured when the pipe is subjected to normal operational loads. In addition, the critical-size flaw should be twice as large as the leakage-size flaw (i.e., a margin of 2 on leakage-size flaw). The DCPP plant specific LBB analysis met all the above SRP 3.6.3 criteria except for the elbow weld connecting the crossover leg and reactor coolant pump where the margin between the leakage-size flaw and the critical-size flaw was 1.95. This exception was found to be acceptable in the NRC safety evaluation that stated, "Considering the overall crack size calculation, the staff believes that the margin of 1.95 is within the uncertainty bounds of 2.0 and is acceptable. The structural integrity of the pipe during a leak-before-break event will not be compromised."

Since continuous RCS leakage monitoring capability is an essential part of the DCPP LBB licensing basis, an evaluation of the revision to TS 3.4.15 Condition E on the LBB analysis has been performed. NRC acceptance of the DCPP LBB analysis in February 1993 eliminated the large primary loop rupture from the structural design basis of both DCPP units. The evaluation of design considerations affecting structural integrity contained in WCAP-13039 concluded: (1) high and low cycle fatigue effects were acceptable for the full life of the plant and of negligible effect during any continuous six-hour operating period, (2) overload events such as water hammer were precluded by design, testing, and operational considerations, (3) adequate margin exists between the leak rate of small stable flaws and leak-detection system capabilities, (4) ample margin exists between the size of small detectable flaws and larger stable flaws, (5) materials properties used in the end-of-service life evaluation included ample margin for materials-aging effects, and (6) stress corrosion cracking is precluded by use of fracture resistant materials and controls on RCS chemistry.

Operating experience of the last 17 years has upheld all but one of the WCAP-13039 findings, with stress corrosion cracking the notable exception. Recent PWR experience has revealed a significant degree of exposure in nickel-based alloys to the primary water stress corrosion cracking (PWSCC) mechanism. Therefore, the possibility of an existing but undiscovered PWSCC crack driven by PWSCC and/or fatigue from incipient to catastrophic leakage during the 6-hour leakage determination window must be considered in the proposed TS change.

PWSCC has been found in the PWR environment in Alloy 600 base material and Alloy 82/182 welds, with the highest rates of crack growth occurring in the latter. The DCPP RCS piping contains several Alloy 82/182 dissimilar metal butt welds. EPRI Report MRP-115, "Materials Reliability Program: Crack Growth Rates for Evaluating Primary Water Stress Corrosion Cracking (PWSCC) of Alloy 82, 182, and 132 Welds," dated November 2004, extracts flaw growth rates from an extensive database of international test results. The flaw growth rate of Alloy 182 is shown to be higher than that of Alloy 82 and both materials grow cracks faster than Alloy 600 base material. The MRP-115 Alloy 182 crack growth rate curve Figure 4-7 indicates a maximum rate of about 2E-09 meter/second or 2.5 inch/year at very high stress intensity factors. At this crack growth rate, total crack growth in 6 hours is 0.002-inch.

The LBB methodology is based on calculations demonstrating that a flaw large enough to leak at a rate 10 times that of the minimum leak-detection system limit will remain stable at twice that size (i.e., length), thus preserving the ability to respond to the leak in a deliberate manner. At DCPP, the limit of detectability is 1 gpm; the smallest leakage flaw occurs at the hot leg/reactor pressure vessel weld, where the 10 gpm leak is a 2.9-inch flaw; and the critical flaw size is 7.62-inch, or 4.76-inch longer than the leakage flaw. At the maximum 2.5 inch/year growth rate described above, PWSCC flaw growth during the 6-hour window would be negligible.

The growth of a flaw by fatigue is driven by alternating stress, which can only result from a change in plant operating state such as startup, shutdown, power change, safety injection, or an external event such as earthquake. Since the RCS piping is designed to sustain the cumulative fatigue damage of the nominal (40 or 50-year) life of the plant, the amount of damage incurred in any 6 hour period is insignificant. The unlikely occurrence of a design seismic event during this period would incur only 20 stress cycles, far less than necessary for significant growth of a small detectable flaw.

In summary, the conditions and events potentially capable of driving a hidden RCS primary loop piping flaw from incipient leakage to critical (i.e., unstable) size during any continuous 6 hour period of leak detection system inoperability have been evaluated. None have been found capable of driving a flaw more than a negligible amount during a 6 hour period. Therefore, the proposed change to TS 3.4.15 Condition E is found to be consistent with the DCPP LBB design basis.

Removal of "Required" from TS 3.4.15 Condition A, Required Action A.2, Condition B, and Required Action B.2

The change to remove the word "required" from TS 3.4.15 Condition A, Required Action A.2, Condition B, and Required Action B.2 is made since the use of the word "required" is incorrect in these locations. The term "required" is reserved for situations in which there are multiple ways to meet the LCO, such as the current TS 3.5.15.c LCO requirement for either a CFCU condensate collection monitor or the containment atmosphere gaseous radioactivity monitor to be operable. The removal of the word "required" from TS 3.4.15 Condition A, Required Action A.2, Condition B, and Required Action B.2 prevents potential interpretation that instruments other than the containment sump monitors and containment atmosphere particulate radioactivity monitor could be used to meet the TS 3.4.15 LCO requirements.

Revision to TS 3.4.15 Condition A

TS 3.4.15 Condition A is revised to explicitly apply when any containment sump monitor is inoperable. LCO TS 3.4.15.a states that both containment structure sumps and the reactor cavity sump level and flow monitor system shall be OPERABLE. Condition A must be entered when LCO 3.4.15.a is not met. However, current Condition A states "containment sump monitors inoperable" that can be literally misinterpreted to only apply when more than one containment structure sump and reactor cavity sump monitor is inoperable. The revision to TS 3.4.15 Condition A prevents misinterpretation of when current Condition A applies and ensures that Condition A is entered when any containment sump monitor or reactor cavity sump monitor is inoperable.

Revision of Name of the CFCU Condensate Collection Monitor

The change to the name used for the CFCU condensate collection monitor in the TS 3.4.15 Actions section is an editorial change to provide consistency for the name throughout TS 3.4.15, and does not involve any change in plant equipment. The NUREG-1431, Revision 3, Westinghouse Standard Technical Specifications use the term, "air cooler condensate flow rate monitor," for this RCS leakage detection system while PG&E uses the term, "CFCU condensate collection monitor," for DCPP. The change eliminates the potential for confusion that the air cooler condensate flow rate monitor referred to in the current TS Actions is a different component than the CFCU condensate collection monitor referred to in current LCO 3.4.15.c and SR 3.4.15.5.

TS Bases Changes

The TS 3.4.15 Bases Background Section is updated to specify Revision 0 for the reference to RG 1.45 since this revision was used during the design and licensing of DCPP and Revision 1 issued in 2008 has not been adopted in the licensing basis. The Background Section sentences related to the capabilities of the instruments are deleted since this information can be incorrectly interpreted as operability requirements and operability related information should be contained in the LCO Section of the Bases. The Background Section is updated to clearly identify the equipment described that is not required by TS 3.4.15 in order to prevent misinterpretation of the equipment required by TS 3.4.15. The new Background Section sentence addressing the difference in sensitivity and response time between the leakage detection systems is consistent with RG 1.45, Revision 0.

The TS 3.4.15 Bases Applicable Safety Analyses Section sentence on the importance of an alarm or an indication to operators is revised to reflect the DCPP RCS leakage detection system design being based on visual monitoring of control room indication and not alarms as initially described in Section 5.2.4, and Table 5.2-22 in Amendment 3, to the application for the operating license dated February 15, 1974, and as described in current FSAR Section 5.2.7.2 and Table 5.2-16. The radiation monitoring instrumentation channels and alarm and trip setpoints were originally contained in the TS in section 3/4.3.3 and associated Table 3.3-6. For the DCPP containment gaseous activity and particulate activity monitors for RCS leakage, the alarm and trip setpoints were specified in Table 3.3-6 as "N.A." (i.e., not applicable). The TS 3.4.15.b containment atmosphere particulate radioactivity monitor, and TS 3.4.15.c containment atmosphere gaseous radioactivity monitor, have alarms and setpoints. However, the alarms and setpoints are not required for operability since monitor indications are provided in the control room and the operators, as part of routine shift checks, perform a comparison of the monitor readings to the monitor reading from the previous shift. The TS 3.4.15.a containment sumps and the TS 3.4.15.c CFCU condensate collection systems, do not have an alarm based on RCS leak rate, and instead rely on manual calculation of the RCS leak rate. The TS 3.4.15 Bases Applicable Safety Analyses Section sentence on response times and sensitivities is deleted since this information is contained in the LCO Section.

The TS 3.4.15 Bases Background Section phrases "a high degree of confidence" and "extremely small leaks" are revised since they are not consistent with RG 1.45, Revision 0. The phrases are revised to use terminology that accurately describes the design assumption of the system.

The five new paragraphs added to the TS 3.4.15 Bases LCO Section paragraph describe revised operability requirements for the three instruments required to be operable. The first new TS 3.4.15 Bases LCO Section paragraph added provides an allowable 4-hour response time that is the basis for OPERABILITY for the containment sump monitors, the particulate radioactivity monitor, the gaseous radioactivity monitor, and the CFCU condensate collection monitor. As discussed in Section 2, the DCPP TS 3.4.15 leakage detection instruments are designed to be capable of a 1-hour response time such that they can detect a 1-gpm leak rate within 1 hour at the design conditions and assumptions. However, a 4-hour response time may be required during certain realistic operating conditions when design conditions and assumptions do not exist due to a specific leak location, RCS temperature, RCS activity, and containment humidity. For example, the CFCU condensate collection monitor may not be capable of detecting a 1-gpm leak rate within 1 hour during operation in Mode 4 when the RCS temperature is below 212 degrees Fahrenheit. The 4-hour response time is based on the LBB methodology criterion contained in Section 5.0 of GL 84-04 and Section 5.7 of NUREG-1061, Volume 3, that specify having 1 leakage detection method operable that could detect a 1-gpm leak rate within 4 hours provided sufficient safety margin to support LBB approval. PG&E previously added reference to this LBB methodology criterion to the TS 3.4.15 Applicable Safety Analysis Section through a license amendment, which was requested by PG&E Letter DCL 97-106, dated June 2, 1997, and approved in License Amendments 135 for DCPP Units 1 and 2 issued on May 28, 1999. PG&E requested approval of a plant-specific LBB analysis in PG&E Letter DCL-92-059, dated March 16, 1992, and obtained NRC approval of LBB in a NRC safety evaluation dated February 3, 1993. Based on the conclusions of the LBB evaluation flaw growth evaluation discussed for the TS 3.4.15 Condition E change, the 4-hour response time provides reasonable assurance that leaks will be detected in time to prevent large piping failures.

The second, third, and fourth new TS 3.4.15 Bases LCO Section paragraphs describe the detailed OPERABILITY requirements for the containment sump monitors, the particulate radioactivity monitor, the gaseous radioactivity monitor, and the CFCU condensate collection monitor based on the NRC approved design of these systems. The limitations that can result in a delay in time to detect a 1-gpm increase in unidentified LEAKAGE are identified. These limitations are consistent with the limitation of leakage detection instrumentation discussed in RG 1.45, Revision 0. For the particulate radioactivity monitor and the gaseous radioactivity monitor, the Bases relate OPERABILITY for the monitor response time to the RCS activity assumed in the design calculations through a reference to the FSAR. The monitor response described in the FSAR is based on the original design calculations for the particulate radioactivity monitor and gaseous radioactivity monitor that assumed an RCS activity associated with a minimum of 0.1 percent fuel defects.

The containment atmosphere gaseous radioactivity monitor may not be able to detect a 1-gpm leak within 4 hours with normal low RCS activity levels. During operation when the TS 3.4.15.a containment sumps and the TS 3.4.15.b containment atmosphere particulate radioactivity monitor are operable, and the containment atmosphere gaseous radioactivity monitor is used to meet TS 3.4.15.c (instead of the CFCU condensate collection system), 2 methods of RCS leakage detection are available to detect leakage at normal low RCS gaseous activity levels. Although PG&E is not committing to RG 1.45, Revision 1 as part of this LAR, having two RCS leakage detection systems operable is consistent with RG 1.45, Revision 1, Position 2.3 that states the TS should identify at least two independent and diverse instruments and/or methods to detect RCS leakage. During operation when the TS 3.4.15.a containment sumps, TS 3.4.15.b containment atmosphere particulate radioactivity monitor, and TS 3.4.15.c CFCU condensate collection monitor are inoperable, and the containment atmosphere gaseous radioactivity monitor is the only operable monitor, the proposed addition of new TS 3.4.15 Condition D limits the time period of operation and requires diverse RCS leakage detection capability through analysis of containment grab samples every 12 hours. In addition, there are other non-TS indications of RCS leakage available to the operator in the control room (i.e., VCT level, pressurizer level, and charging pump flow) that supplement the diverse RCS leakage detection capability provided by the proposed TS 3.4.15 Condition D Required Actions.

The fifth new TS 3.4.15 Bases LCO Section paragraph added and the revision to the TS 3.4.15 Bases SRs section for SR 3.4.15.2, reflects that OPERABILITY of the RCS leakage detection instrumentation is based in part on the control room indication associated with the instrumentation, and not on associated alarms or alarm setpoints. This change reflects the DCPP RCS leakage detection system design being based on control room indication, and not alarms as described in current FSAR Section 5.2.7.2 and Table 5.2-16. The control room indication provided for the TS 3.4.15.b containment atmosphere particulate radioactivity monitor and TS 3.4.15.c containment atmosphere gaseous radioactivity monitor and the required routine shift checks of the monitor indication are acceptable to ensure operators identify increases in RCS leakage without an alarm. The

TS 3.4.15.a containment sumps, and the TS 3.4.15.c CFCU condensate collection systems, do not have an alarm based on RCS leak rate and instead rely on manual calculation of the RCS leak rate.

The TS 3.4.15 Bases Action Section is updated in the Action A paragraph to incorporate the change to Condition A that ensures that Condition A is entered when any containment sump monitor or reactor cavity sump monitor is inoperable as required by TS 3.4.15.a.

The TS 3.4.15 Bases Actions Section is updated to remove an incorrect sentence in the Action B paragraph that states continued operation is allowed if the air cooling condensate flow rate monitoring system is OPERABLE. This sentence is only applicable to plants that have a TS Required Action that verifies the containment air cooler condensate flow rate monitor is OPERABLE. The DCPP TS Required Actions for Condition B do not contain the Required Action.

The TS 3.4.15 Bases changes for new Actions D.1, D.2.1, D.2.2, and D.2.3, revised Actions E.1, E.2, and E.3, and new Actions F.1 and F.2, describe the Actions and provide the basis for the Actions.

The TS Bases change for SR 3.4.15.2 removes the alarm functions as part of the functions that the surveillance test ensures. This change reflects the DCPP RCS leakage detection system design being based on visual monitoring of control room indication and not alarms as initially described in Section 5.2.4, and Table 5.2-22 in Amendment 3, to the to the application for the operating license dated February 15, 1974, and as described in current FSAR, Section 5.2.7.2 and Table 5.2-16. The TS 3.4.15.c containment atmosphere gaseous radioactivity monitor has an alarm and setpoint. However, the alarm and setpoint is not required for operability since monitor indications are provided in the control room and the operators, as part of routine shift checks, perform a comparison of the monitor readings to the monitor reading from the previous shift.

4.0 REGULATORY EVALUATION

4.1 <u>No Significant Hazards Consideration</u>

PG&E 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. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed change reduces the time allowed for the plant to operate when the only Technical Specification (TS) 3.4.15 operable Reactor Coolant System (RCS) leakage instrumentation monitor is the containment atmosphere gaseous radioactivity monitor, and revises the basis for operability for the containment sump monitors, containment atmosphere particulate radioactivity monitor, containment atmosphere gaseous radioactivity monitor, and the containment fan cooler unit condensate collection monitor. The proposed change increases the allowed operating time when all RCS leakage detection system instrumentation is inoperable. The proposed change also removes the word "required" from TS 3.4.15 Condition A, Required Action A.2, Condition B, and Required Action B.2, revises TS 3.4.15 Condition A to apply to any containment sump monitor, and revises the name of the containment fan cooler unit (CFCU) condensate collection monitor in the TS 3.4.15 Actions. The monitoring of RCS leakage is not a precursor to any accident previously evaluated. The monitoring of RCS leakage is not used to mitigate the consequences of any accident previously evaluated.

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

2. Does the proposed change create the possibility of a new or different accident from any accident previously evaluated?

Response: No.

The proposed change does not involve a physical alteration of the plant or the addition of new or different type of equipment. The change does not involve a change in how the plant is operated.

Therefore, the proposed change does not create the possibility of a new or different accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The change that reduces the allowed time of operation with only the least accurate containment atmosphere gaseous radiation monitor operable increases the margin of safety by increasing the likelihood that an increase in RCS leakage will be detected before it potentially results in gross failure. For the change that allows a limited period of time to restore at least one RCS leakage detection monitor to operable status when all leakage detection monitors are inoperable, two sources of diverse leakage detection capability are required to be provided during the limited period.

Allowing a limited period of time to restore at least one RCS leakage detection instrument to operable status before requiring a plant shutdown avoids the situation of putting the plant through a thermal transient without RCS leakage monitoring. The change to TS 3.4.15 Condition A, Required Action A.2, Condition B, Required Action B.2, Condition C, and Required Action C.2.2 is consistent with TS LCO 3.4.15 and does not impact the RCS leakage instrumentation. The revision to the TS bases for operability of the RCS leakage instrumentation monitors does not involve a change in the leakage instrumentation and is consistent with the original design of the leakage instrumentation.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above evaluation, PG&E concludes that the proposed change 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.

4.2 Applicable Regulatory Requirements/Criteria

Federal Regulation 10 CFR 50, Appendix A, General Design Criterion (GDC) 30, requires means for detecting and to the extent practical, identifying the location of the source of RCS leakage.

Regulatory Guide (RG) 1.45, Revision 0, describes acceptable methods for selecting leakage detection systems.

Generic Letter 84-04 informed pressurized water reactor utilities of the NRC review of the Westinghouse topical reports to address the asymmetric blowdown loads on the Pressurizer Water Reactor primary systems that result from a limited number of discrete break locations, and discussed an acceptable technical basis such that asymmetric blowdown loads resulting from double-ended pipe breaks in main coolant loop piping need not be considered as a design basis for Westinghouse plants.

NUREG-1061, Volume 3, contained the results of the Piping Review Committee Pipe Break Task Group that performed a comprehensive review of the NRC requirements in the area of nuclear power plant piping and provided acceptance criteria for LBB submittals.

The proposed changes meet RG 1.45, Revision 0, Position C.3, since at least three separate detection methods are employed including sump level and flow monitoring, airborne particulate radioactivity monitoring, and airborne gaseous radioactivity monitoring or condensate flow rate monitoring from air coolers.

The proposed 4-hour response time that is the basis for OPERABILITY for the containment sump monitors, the particulate radioactivity monitor, the gaseous radioactivity monitor, and the CFCU condensate collection monitor does not meet RG 1.45, Revision 0, position C.5 to detect 1-gpm in less than 1 hour. However, the criterion of GL 84-04 Section 5.0, and NUREG-1061, Volume 3, Section 5.7, to have at least 1 leakage detection system that can detect a leak rate of 1-gpm in 4 hours is met.

4.3 Precedent

The staff has previously accepted TS required RCS leakage detection instrumentation response times greater than 1 hour in Amendment No. 179 to Facility Operating License No. DPR-72 for Crystal River Unit 3 on June 14, 1999, and for Arkansas Nuclear One Unit 2 on June 18, 1996. The staff has previously approved the addition of a new TS Action when all TS required RCS leakage detection systems are inoperable in Amendment Nos 306 and 244 to Renewed Facility Operating No. DPR 65 for the Millstone Power Station, Unit No. 2, and to Renewed Facility Operating License No. NPF-49 for the Millstone Power Station, Unit No. 3, respectively.

4.4 Conclusions

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.

5. ENVIRONMENTAL CONSIDERATION

PG&E has evaluated the proposed amendment and has determined that 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 effluents 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.

6. REFERENCES

1. Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," dated May 1973.
2. Regulatory Guide 1.45, Revision 1, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," dated May 2008.
3. Diablo Canyon Power Plant Safety Evaluation Report, "Safety Evaluation By the Directorate of Licensing U. S. Atomic Energy Commission In the Matter of Pacific Gas and Electric Company Diablo Canyon Nuclear Power Station, Units 1 and 2, San Luis Obispo County California Docket Nos. 50-275 and 50-323," dated October 16, 1974.
4. Atomic Energy Commission Letter from Karl R. Goller, Chief, Light Water Reactors Group 1-3, Directorate of Licensing, to Fredric T. Searls, Vice President and General Counsel, Pacific Gas and Electric Company, dated January 4, 1974.
5. PG&E letter to Atomic Energy Commission, Amendment 3 to Application for an Operating License for Diablo Canyon Units 1 and 2, dated February 15, 1974.
6. PG&E letter to Atomic Energy Commission, Amendment 4 to Application for an Operating License for Diablo Canyon Units 1 and 2, dated February 28, 1974.
7. PG&E letter to Atomic Energy Commission, Amendment 9 to Application for an Operating License for Diablo Canyon Units 1 and 2, dated May 28, 1974.
8. NUREG-1102, "Technical Specifications, Diablo Canyon Nuclear Power Plant, Unit No. 1, Docket No. 50-275, Appendix 'A' to License No. DPR-80," dated November 1984.
9. NUREG-1132, "Technical Specifications, Diablo Canyon Nuclear Power Plant, Unit No. 2, Docket No. 50-323, Appendix 'A' to License No. DPR-81," dated April 1985.
10. NUREG-1151, "Technical Specifications, Diablo Canyon Nuclear Power Plant, Units 1 and 2, Docket No. 50-275 and 50-323, Appendix 'A' to License Nos. DPR-80 and DPR-81," dated August 1985.
11. NRC Letter, "Safety Evaluation of Westinghouse Topical Reports Dealing With Elimination of Postulated Pipe Breaks in PWR Primary Main Loops (Generic Letter 84-04)," dated February 1, 1984.
12. PG&E Letter, DCL-92-059, "Transmittal of WCAP-13039 and WCAP-13038," dated March 16, 1992.
13. Westinghouse Electric Corporation Report WCAP-13039, "Technical Justification for Eliminating Large Primary Loop Rupture as the Structural Design Basis for the Diablo Canyon Units 1 and 2 Nuclear Power Plants," dated November 1991 (Westinghouse Proprietary).
14. NRC Letter "Leak-Before-Break Evaluation of Reactor Coolant System Piping for Diablo Canyon Nuclear Power Plant, Unit No. 1 (TAC No. M83283) and Unit No. 2 (TAC No. M83284)," dated February 3, 1993.
15. NUREG-1061, Volume 3, "Report of the U.S. Nuclear Regulatory Commission Piping Review Committee," dated November 1984.

16. NRC Letter, "Safety Assessment Regarding Containment Radiation Monitor Sensitivity at St. Lucie Plant, Units 1 and 2 and Turkey Point Plant, Units 3 and 4 (TAC No. M40294)," dated May 27, 1999.
17. PG&E Letter DCL 97-106, "License Amendment Request 97-09, Technical Specification Conversion License Amendment Request," dated June 2, 1997.
18. NRC Letter "Conversion to Improved Technical Specification for Diablo Canyon Power, Units 1 and 2 - Amendment 135 to Facility Operating License Nos. DPR-80 and DPR-82 (TAC Nos. M98984 and M98985)," dated May 28, 1999.
19. EPRI Report MRP-115, "Materials Reliability Program: Crack Growth Rates for Evaluating Primary Water Stress Corrosion Cracking (PWSCC) of Alloy 82, 182, and 132 Welds," dated November 2004.
20. NRC Letter, "Millstone Power Station, Unit Nos. 2 and 3 - Issuance of Amendment RE: Technical Specifications Regarding Reactor Coolant System Leakage Detection Systems (TAC Nos. MD6640 and MD6641)," September 30, 2008.
21. NRC Letter, "Crystal River Unit 3 - Issuance of Amendment Regarding Basis for Reactor Coolant System Leakage Detection Instrumentation (TAC No. MA3755)," dated June 14, 1999.
22. NRC Safety Evaluation for Arkansas Nuclear One, dated June 18, 1996.
23. NRC Information Notice 2005-24, "Nonconservatism in Leakage Detection Sensitivity," dated August 3, 2005.
24. NRC Letter, "Diablo Canyon Power Plant - NRC Integrated Inspection Report 05000275/2008004 and 05000323/2008004," dated November 3, 2008.
25. NRC Regulatory Issue Summary 2009-02, "Use of Containment Atmosphere Gaseous Radioactivity Monitors as Reactor Coolant System Leakage Detection Equipment at Nuclear Power Reactors," dated January 29, 2009.
26. NRC Regulatory Issue Summary 2009-02, Revision 1, "Use of Containment Atmosphere Gaseous Radioactivity Monitors as Reactor Coolant System Leakage Detection Equipment at Nuclear Power Reactors," dated May 8, 2009.

Proposed Technical Specification Changes (marked-up)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.15 RCS Leakage Detection Instrumentation

LCO 3.4.15 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Both containment structure sumps and the reactor cavity sump level and flow monitor system,

b. One containment atmosphere particulate radioactivity monitor and,

c. Either a containment fan cooler unit (CFCU) condensate collection monitor or the containment atmosphere gaseous radioactivity monitor.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ~~Required~~ Any containment sump monitor~~s~~ inoperable.	-------------------NOTE------------------ Not required until 12 hours after establishment of steady state operation. --	
	A.1 Perform SR 3.4.13.1.	Once per 24 hours
	AND	
	A.2 Restore ~~required~~ the containment sump monitor to OPERABLE status.	30 days
B. ~~Required~~ The containment atmosphere particulate radioactivity monitor inoperable.	B.1.1 Analyze grab samples of the containment atmosphere. OR	Once per 24 hours

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.1.2 -----------NOTE----------- Not required until 12 hours after establishment of steady state operation. ------------------------------- Perform SR 3.4.13.1.	Once per 24 hours
	AND	
	B.2 Restore ~~required~~ containment atmosphere particulate radioactivity monitor to OPERABLE status.	30 days
C. Required containment atmosphere gaseous radioactivity monitor inoperable. AND Required ~~containment air cooler condensate flow rate~~ [CFCU condensate collection] monitor inoperable.	C.1.1 Analyze grab samples of the containment atmosphere	Once per 24 hours
	OR	
	C.1.2 ---------NOTE--------- Not required until 12 hours after establishment of steady state operation. ------------------------------- Perform SR 3.4.13.1	Once per 24 hours
	AND	
	C.2.1 Restore required containment atmosphere gaseous radioactivity monitor to OPERABLE status.	30 days
	OR	
	C.2.2 Restore required ~~containment air cooler condensate flow rate~~ [CFCU condensate collection] monitor to OPERABLE status.	30 days

(continued)

Insert 1

Insert 2

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. F Required Action and associated Completion Time not met.	D.1 F Be in MODE 3. AND F D.2 Be in MODE 5.	6 hours 36 hours
~~E. All required monitors inoperable.~~	~~E.1 Enter LCO 3.0.3.~~	~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of the required containment atmosphere particulate and gaseous radioactivity monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.2	Perform CHANNEL FUNCTIONAL TEST of the required containment atmosphere particulate and gaseous radioactivity monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.3	Perform CHANNEL CALIBRATION of the required containment sump monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.4	Perform CHANNEL CALIBRATION of the required containment atmosphere particulate and gaseous radioactivity monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.5	Perform CHANNEL CALIBRATION of the required CFCU condensate collection monitors.	In accordance with the Surveillance Frequency Control Program

TS 3.4.15 Markup Inserts

Insert 1

D.	Any containment sump monitor inoperable. AND Containment atmosphere particulate radioactivity monitor inoperable. AND Required CFCU condensate collection monitor inoperable.	D.1	Analyze grab samples of the containment atmosphere.	Once per 12 hours
		AND		
		D.2.1	Restore containment sump monitor to OPERABLE status.	7 days
			OR	
		D.2.2	Restore containment atmosphere particulate radioactivity monitor to OPERABLE status.	7 days
			OR	
		D.2.3	Restore required CFCU condensate collection monitor to OPERABLE status.	7 days

Insert 2

E.	All required monitors inoperable.	E.1	Analyze grab samples of the containment atmosphere.	Once per 6 hours
		AND		
		E.2	Perform SR 3.4.13.1.	Once per 6 hours
		AND		
		E.3	Restore at least one RCS leakage detection monitor to OPERABLE status.	72 hours

Proposed Technical Specification Changes (retyped)

Remove Page	Insert Page
3.4-32	3.4-32
3.4-33	3.4-33
3.4-34	3.4-34
	3.4-34a

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.15 RCS Leakage Detection Instrumentation

LCO 3.4.15 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Both containment structure sumps and the reactor cavity sump level and flow monitor system,

b. One containment atmosphere particulate radioactivity monitor and,

c. Either a containment fan cooler unit (CFCU) condensate collection monitor or the containment atmosphere gaseous radioactivity monitor.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Any containment sump monitor inoperable.	-------------------NOTE----------------- Not required until 12 hours after establishment of steady state operation. ---	
	A.1 Perform SR 3.4.13.1.	Once per 24 hours
	<u>AND</u>	
	A.2 Restore containment sump monitor to OPERABLE status.	30 days
B. Containment atmosphere particulate radioactivity monitor inoperable.	B.1.1 Analyze grab samples of the containment atmosphere.	Once per 24 hours
	<u>OR</u>	
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.1.2	-----------NOTE------------ Not required until 12 hours after establishment of steady state operation. -------------------------------	
		Perform SR 3.4.13.1.	Once per 24 hours
	AND		
	B.2	Restore containment atmosphere particulate radioactivity monitor to OPERABLE status.	30 days
C. Required containment atmosphere gaseous radioactivity monitor inoperable. AND Required CFCU condensate collection monitor inoperable.	C.1.1	Analyze grab samples of the containment atmosphere	Once per 24 hours
		OR	
	C.1.2	---------NOTE------------- Not required until 12 hours after establishment of steady state operation. --------------------------------	
		Perform SR 3.4.13.1	Once per 24 hours
	AND		
	C.2.1	Restore required containment atmosphere gaseous radioactivity monitor to OPERABLE status.	30 days
		OR	
	C.2.2	Restore required CFCU condensate collection monitor to OPERABLE status.	30 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Any containment sump monitor inoperable. AND Containment atmosphere particulate radioactivity monitor inoperable. AND Required CFCU condensate collection monitor inoperable.	D.1 Analyze grab samples of the containment atmosphere.	Once per 12 hours
	AND	
	D.2.1 Restore containment sump monitor to OPERABLE status.	7 days
	OR	
	D.2.2 Restore containment atmosphere particulate radioactivity monitor to OPERABLE status.	7 days
	OR	
	D.2.3 Restore required CFCU condensate collection monitor to OPERABLE status.	7 days
E. All required monitors inoperable.	E.1 Analyze grab samples of the containment atmosphere.	Once per 6 hours
	AND	
	E.2 Perform SR 3.4.13.1.	Once per 6 hours
	AND	
	E.3 Restore at least one RCS leakage detection monitor to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time not met.	F.1 Be in MODE 3. AND F.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of the required containment atmosphere particulate and gaseous radioactivity monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.2	Perform CHANNEL FUNCTIONAL TEST of the required containment atmosphere particulate and gaseous radioactivity monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.3	Perform CHANNEL CALIBRATION of the required containment sump monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.4	Perform CHANNEL CALIBRATION of the required containment atmosphere particulate and gaseous radioactivity monitors.	In accordance with the Surveillance Frequency Control Program
SR 3.4.15.5	Perform CHANNEL CALIBRATION of the required CFCU condensate collection monitors.	In accordance with the Surveillance Frequency Control Program

Changes To Technical Specification Bases Pages

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.15 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of Appendix A to 10 CFR 50 (Ref. 1) requires means for detecting and, to the extent practical, identifying the location of the source of RCS LEAKAGE. Regulatory Guide 1.45, Revision 0, (Ref. 2) describes acceptable methods for selecting leakage detection systems.

Leakage detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE.

~~Industry practice has shown that water flow changes of 0.5 to 1.0 gpm can be readily detected in contained volumes by monitoring changes in water level, in flow rate, or in the operating frequency of a pump.~~ The containment sumps used to collect unidentified LEAKAGE and the containment fan cooling unit (CFCU) condensate collection monitors are capable of detecting increases ~~of 0.5 to 1.0 gpm in~~ above the normal flow rates. ~~This sensitivity is acceptable for detecting increases in unidentified LEAKAGE.~~

Each CFCU has an individual condensate collection monitor. The condensate from the cooling coils passes out from the CFCU to a containment sump. The condensate collection system design does not use an on-line flow monitor. The condensate drain flow can be collected, measured, and then using the elapsed time of the collection, the average flow rate can be determined. This monitoring can be done from the control room. Although multiple CFCUs may be operating, any individual CFCU condensate monitor may be employed to provide indication of the condensate flow rate.

The reactor coolant contains radioactivity that, when released to the containment, ~~can~~ may be detected by radiation monitoring instrumentation. ~~Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. Instrument sensitivities of 10^{-9} μCi/cc radioactivity for particulate monitoring and of 10^{-6} μCi/cc radioactivity for gaseous monitoring are practical for these leakage detection systems.~~ Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE.

(continued)

BASES

BACKGROUND (continued)	Other indications may be used to detect an increase in unidentified LEAKAGE; however, they are not required to be OPERABLE by this LCO. Air temperature and pressure monitoring methods may also be used to infer unidentified LEAKAGE to the containment. Containment temperature and pressure fluctuate slightly during plant operation, but a rise above the normally indicated range of values may indicate RCS leakage into the containment. The relevance of temperature and pressure measurements ~~are~~ is affected by containment free volume and, for temperature, detector location. Alarm signals from temperature and pressure ~~these~~ instruments can be valuable in recognizing rapid and sizable leakage to the containment. Temperature and pressure monitors are not required by this LCO. The above-mentioned LEAKAGE detection methods or systems differ in sensitivity and response time based on factors including leak location, RCS temperature, and RCS activity.
APPLICABLE SAFETY ANALYSES	The asymmetric loads produced by postulated breaks are the result of assumed pressure imbalance, both internal and external to the RCS. The internal asymmetric loads result from a rapid decompression that causes large transient pressure differentials across the core barrel and fuel assemblies. The external asymmetric loads result from the rapid depressurization of the annulus regions, such as the annulus between the reactor vessel and the shield wall, and cause large transient pressure differentials to act on the vessel. These differential pressure loads could damage RCS supports, core cooling equipment or core internals. This concern was first identified as Multiplant Action (MPA) D-10 and subsequently as Unresolved Safety Issue (USI) 2, "Asymmetric LOCA Loads" (Ref. 4). The resolution of USI-2 for Westinghouse PWRs was the use of fracture mechanics technology for RCS piping > 10 inches diameter. (Ref. 5). This technology became known as leak before-break (LBB). Included within the LBB methodology was the requirement to have leak detection systems capable of detecting a 1.0 gpm leak within four hours. This leakage rate is designed to ensure that adequate margins exist to detect leaks in a timely manner during normal operating conditions. The use of the LBB methodology is described in Reference 6. The need to evaluate the severity of an ~~alarm or an~~ indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary. ~~The system response times and sensitivities are described in the FSAR (Ref. 3).~~ The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring RCS LEAKAGE into the containment area is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE provides quantitative information to the operators, allowing

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

them to take corrective action should a leak occur that could be detrimental to the safety of the unit and the public.

RCS leakage detection instrumentation satisfies Criterion 1 of 10 CFR 50.36(c)(2)(ii).

LCO

~~One method of protecting against large RCS LEAKAGE derives from the ability of instruments to rapidly detect extremely small leaks.~~ This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide ~~a high degree of~~ confidence that small amounts of unidentified LEAKAGE ~~extremely small leaks~~ are detected in time to allow actions to place the plant in a safe condition when RCS LEAKAGE indicates possible RCPB degradation.

The LCO requires three instruments to be OPERABLE.

OPERABILITY of the containment sump monitor systems, the particulate radioactivity monitor, the gaseous radioactivity monitor, and the CFCU condensate collection monitor is based on the capability to indicate a 1 gpm leak rate within four hours. This allowable response time is based on the LBB methodology criterion for leakage detection systems, for plants with leakage detection systems that did not meet all of the provisions of Regulatory Guide 1.45, that at least one leakage detection system with sensitivity capable of detecting an unidentified leakage rate of one gpm in four hours should be operable (References 5 and 7).

The containment structure sumps and reactor cavity sump are used to collect unidentified LEAKAGE. The containment structure sumps and the reactor cavity sump have associated sump level and sump pump integrated flow monitors that are visually monitored to detect when there is an increase in LEAKAGE above the normal value. The identification of an increase in unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the sumps and it may take longer than one hour to detect a 1 gpm increase in unidentified LEAKAGE, depending on the origin and magnitude of the LEAKAGE. This sensitivity is acceptable for containment sump monitor OPERABILITY.

The reactor coolant contains radioactivity that, when released to the containment, may be detected by the gaseous or particulate containment atmosphere radioactivity monitor. Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE, but have recognized limitations. Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. If there are few fuel element cladding defects and low levels of activation products, it may not be possible for the gaseous or particulate containment atmosphere radioactivity monitors to detect a 1 gpm increase within four hours during normal operation. However, the gaseous or particulate containment atmosphere radioactivity monitor is OPERABLE when it is capable of detecting a 1 gpm increase in unidentified LEAKAGE within 1 hour given an RCS activity equivalent to that assumed in the design calculations for the monitors (Reference 3).

An increase in humidity of the containment atmosphere could indicate the release of water vapor to the containment. The condensate drain flow from the CFCUs is collected and the average flow rate is manually determined using the elapsed time to collect a constant volume of condensate. Elapsed times less than a predefined value indicate a 1 gpm increase in unidentified LEAKAGE. The time required to detect a 1 gpm or more increase above the normal value varies based on environmental and system conditions and may take longer than 1 hour and up to 4 hours. This sensitivity is acceptable for CFCU condensate collection monitor OPERABILITY.

OPERABILITY of the RCS leakage detection instrumentation includes the control room indication associated with the instrumentation but does not include control room alarms or alarm setpoints.

The LCO is satisfied when monitors of diverse measurement means are available. Thus, the containment sump monitoring systems, the particulate radioactivity monitor and either a CFCU condensate collection monitor or a gaseous radioactivity monitor provides an acceptable minimum.

APPLICABILITY

Because of elevated RCS temperature and pressure in MODES 1, 2, 3, and 4, RCS leakage detection instrumentation is required to be OPERABLE. In MODE 5 or 6, the temperature is to be ≤ 200°F and pressure is maintained low or at atmospheric pressure. Since the temperatures and pressures are far lower than those for MODES 1, 2, 3, and 4, the likelihood of leakage and crack propagation are much smaller. Therefore, the requirements of this LCO are not applicable in MODES 5 and 6.

ACTIONS

A.1 and A.2

With the required any containment sump monitors inoperable, RCS water inventory balance, the containment atmosphere particulate radioactivity monitor, and the CFCU condensate collection monitoring system will provide indications of changes in leakage. Together with the containment atmosphere radioactivity monitors, the periodic surveillance for RCS water inventory balance, SR 3.4.13.1, must be performed at an increased frequency of 24 hours to provide information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation as

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

defined in Bases of SR 3.4.13.1. The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Restoration of the ~~required~~ sump monitoring system to OPERABLE status within a Completion Time of 30 days is required to regain the function after the monitoring system failure. This time is acceptable considering the Frequency and adequacy of the RCS water inventory balance required by Required Action A.1.

B.1.1, B.1.2, and B.2

With the particulate containment atmosphere radioactivity monitor~~ing instrumentation channels~~ inoperable, alternative action is required. Either grab samples of the containment atmosphere must be taken and analyzed or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information.

With a sample obtained and analyzed or water inventory balance performed every 24 hours, the reactor may be operated for up to 30 days to allow restoration of the ~~required~~ containment atmosphere particulate radioactivity monitor. ~~Alternatively, continued operation is allowed if the air cooling condensate flow rate monitoring system is OPERABLE, provided grab samples are taken or water inventory balances are performed every 24 hours.~~

The 24 hour interval provides periodic information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation defined in Bases of SR 3.4.13.1. The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established. The 30 day Completion Time recognizes at least one other form of LEAKAGE detection is available.

C.1.1, C.1.2, C.2.1, and C.2.2

With the required containment atmosphere gaseous radioactivity monitor and the required CFCU condensate collection monitor inoperable, the means of detecting leakage are the containment sump monitoring system and the containment atmosphere particulate radioactivity monitor. This Condition does not provide all the required diverse means of leakage detection. With both gaseous containment atmosphere radioactivity monitoring and CFCU condensate monitoring instrumentation channels inoperable, alternate action is required. Either grab samples of the containment atmosphere must be taken and

(continued)

BASES

ACTIONS

C.1.1, C.1.2, C.2.1, and C.2.2 (continued)

analyzed or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information.

The follow-up Required Action is to restore either of the inoperable required monitors to OPERABLE status within 30 days to regain the intended leakage detection diversity. The 30 day Completion Time ensures that the plant will not be operated in a reduced configuration for a lengthy time period.

D.1, D.2.1, D.2.2, and D.2.3

With any containment sump monitor, the containment atmosphere particulate radioactivity monitor, and the CFCU condensate collection monitor inoperable, the only means of detecting LEAKAGE is the containment gaseous radioactivity monitor. The containment atmosphere gaseous radioactivity monitor typically cannot detect a 1 gpm leak within four hours when RCS activity is low. In addition, this configuration does not provide the required diverse means of leakage detection. Indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken and analyzed to provide alternate periodic information. The 12 hour interval is sufficient to detect increasing RCS leakage. The Required Action provides 7 days to restore another RCS leakage monitor to OPERABLE status to regain the intended leakage detection diversity. The 7 day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

E.1, E.2, and E.3

With all required monitors inoperable, (LCO a, b, and c) no TS 3.4.15 required means of monitoring leakage are available. Frequent use of indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken and analyzed and an RCS water inventory balance (SR 3.4.13.1) must be performed every 6 hours to provide alternate periodic information.

With a sample obtained and analyzed and a water inventory balance performed every 6 hours, 72 hours is provided to restore at least one RCS leakage monitor. The 72 hour Completion Time is reasonable, considering the low probability of a significant RCS leak occurring during this time and the avoidance of a plant shutdown in response to the loss of monitoring equipment, while providing a reasonable time to restore a monitor to OPERABLE status., and immediate plant shutdown in accordance with LCO 3.0.3 is required.

F.1 and F.2

If a Required Action of Condition A, B, C, D, or E cannot be met, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 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.

SURVEILLANCE REQUIREMENTS

SR 3.4.15.1

SR 3.4.15.1 requires the performance of a CHANNEL CHECK of the required containment atmosphere radioactivity monitors. The check gives reasonable confidence that the channels are operating properly. The Frequency of 12 hours is based on instrument reliability and is reasonable for detecting off-normal conditions.

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a CHANNEL FUNCTIONAL TEST (CFT) on the required containment atmosphere radioactivity monitors. The test ensures that the monitors can perform their function in the desired manner ~~including alarm functions~~. The Frequency of 92 days considers instrument reliability, and operating experience has shown that it is proper for detecting degradation.

SR 3.4.15.3, SR 3.4.15.4, and SR 3.4.15.5

These SRs require the performance of a CHANNEL CALIBRATION for each of the RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of 24 months

(continued)

BASES

SURVEILLANCE REQUIREMENTS	SR 3.4.15.3, SR 3.4.15.4, and SR 3.4.15.5 (continued) (except for the ~~required~~ containment atmosphere particulate and gaseous radioactivity monitors which have a frequency of 18 months) is consistent with refueling cycle and considers channel reliability. Again, operating experience has proven that this Frequency is acceptable.
REFERENCES	1. 10 CFR 50, Appendix A, Section IV, GDC 30. 2. Regulatory Guide 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973.. 3. FSAR, Section 5.2.7. 4. NUREG-609, "Asymmetric Blowdown Loads on PWR Primary System," 1981. 5. Generic Letter 84-04, "Safety Evaluation of Westinghouse Topical Reports Dealing with Elimination of Postulated Breaks in PWR Primary Main Loops." 6. FSAR, Section 3.6B. 7. NUREG-1061, Volume 3, "Report of the U.S. Nuclear Regulatory Commission Piping Review Committee," 1984.