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**TOKYO, JAPAN**

March 24, 2009

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

Attention: Mr. Jeffery A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-09103

**Subject:** MHI's Response to US-APWR DCD RAI No. 217-2025, Question 15

**Reference:** 1) "Request for Additional Information No. 217-2025 Revision 1, SRP Section: 03.06.03 – Leak-Before-Break Evaluation Procedures, Application Section: DCD, Tier 1 – Section 3.6.3," dated 2/26/2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 217-2025 Revision 1."

Enclosed is the response to question 15 of the RAI (Reference 1). The other question (16) of this RAI has a 60-day response time, as agreed to between the NRC and MHI, and will be issued at a later date by a separate transmittal.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this submittal. His contact information is provided below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosures:

1. Response to Request for Additional Information No. 217-2025, Revision 1

CC: J. A. Ciocco
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NRO

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Enclosure 1

UAP-HF-09103
Docket No. 52-021

Response to Request for Additional Information No. 217-2025,
Revision 1

March, 2009

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**3/24/2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
| **RAI NO.:** | **NO. 217-2025** |
| **SRP Section:** | **03.06.03 – Leak-Before-Break Evaluation Procedures** |
| **APPLICATION SECTION:** | **03.06.03** |
| **DATE OF RAI ISSUE:** | **02/26/09** |

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**QUESTION NO. : RAI 3.6.3-15**

DCD Tier 2 Section 3.6.3.1, "Application of LBB," indicates that the application of LBB includes RCL piping, RCL branch piping, and main steam piping in PCCV. DCD Section 3.6.3.4.1, "Leak Detection Capability," describes the leak detection methods for supporting LBB. In US APWR DCD, the leak detection capability to support LBB is one gpm within one hour regardless of different piping being used for LBB. DCD Section 3.6.3.4.1 states that leak rate of 10 times the capability of the leak detector is postulated for normal operating load combination. This margin of 10 leak detector capability for LBB is in accordance with SRP Section 3.6.3. AP 1000 and US EPR have demonstrated that the 1 gpm criterion may not be adequate to satisfy the LBB margin of 10. Depending on the piping (large size RCP piping, small size RCL piping, or main steam piping) being postulated for LBB application, the required leak detection capability can be 1 gpm, 0.5 gpm, or 0.1 gpm. The applicant is requested to demonstrate that the design of leak detector capability (one gpm within one hour) is adequate to support the margin of 10 for LBB application in RCL branch piping and for main steam piping.

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**ANSWER:**

For the LBB application in RCL piping, RCL branch piping, and main steam piping in PCCV, MHI recognized that leak detector capability (1 gpm) is not adequate to satisfy the LBB margin of 10 from analysis results of LBB application in the subject piping.

The leak rate and required leak detector capability will be changed to a minimum of 5 gpm and 0.5 gpm, respectively, as the leak detection instruments have a capability to detect leakage lower than 0.5 gpm within one hour of detector response time.

**Impact on DCD**

See Attachment 1 for the mark-up of DCD Tier 2, Subsection 3.6 and Appendix 3B, Revision 2, changes to be incorporated:

- Change the first sentence of the second paragraph of Subsection 3.6.3.4.1 to "Rated detection capability of the leak detector for reactor coolant in the containment is 0.5 gpm within one hour of detector response time."

- Change the third sentence of Subsection 3.6.3.4.3 to "The margin of two applies to the leakage crack size compared to the critical crack size with the size of the flaw large enough so that the leakage from the flaw, during normal operation, is 10 times greater than the minimum leakage the detector system is capable of sensing."
- Change the first and second sentences of the second paragraph of Subsection 3B.3, (2) Safety Factor, to: "The leak detection system for US-APWR is designed to detect a leak rate of 0.5 gpm. Consequently, the leak rate for the LBB evaluation is at least 5 gpm based on Item I mentioned above."

See Attachment 2 for the mark-up of DCD Tier 2, Subsection 5.2, Revision 2, changes to be incorporated:

- Change the third paragraph of Subsection 5.2.5.4 to "The sensitivity and response time of leakage detection equipment for unidentified leakage is such that a leakage rate, or its equivalent, of 0.5 gpm can be detected in less than an hour."
- Change the second paragraph of Subsection 5.2.5.4.1.1 to "A leak rate greater than or equal to 0.5 gpm is detectable within one hour, with an alarm actuating in the MCR to alert the operators as stated in positions 5 and 7 of regulatory guide 1.45."
- Change the fourth paragraph of Subsection 5.2.5.4.1.2 to "Assuming that corrosion and activation product concentration in the reactor coolant is $2x10^{-1}$Ci/g (Na-24, Cr-51, Zn-65, Mn-54,56, Co-58,60, Fe-55,59) and the distribution coefficient is 0.3, after leak occurrence, a leak rate of 0.5 gpm can be detected within one hour."
- Change the second sentence of the second paragraph of Subsection 5.2.5.4.1.4 to "During normal operation, leakage of 0.5 gpm can be detected within one hour of detector response time since containment recirculation fans sufficiently circulate the air inside the containment."

See Attachment 3 for the mark-up of DCD Tier 2, Chapter 16, Revision 2, changes to be incorporated:

- Change item b of the Limiting Condition for Operation (LCO), 3.4.13 to "b. 0.5 gpm unidentified LEAKAGE,"
- Change the first sentence of item b. (b. Unidentified LEAKAGE), of LCO of Bases B3.4.13 to "0.5 gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment can detect within a reasonable time period."
- Change the second sentence of the third paragraph of Background of Bases B3.4.15 to "The containment sump used to collect unidentified LEAKAGE and air cooler condensate flow rate monitor are instrumented to alarm for increases of greater than or equal to 0.5 gpm in the normal flow rates."

**Impact on COLA**

The COLA will be changed in Section B of Part 4 consistent with the Chapter 16 changes noted above and shown in Attachment 3.

**Impact on PRA**

There is no impact on the PRA.

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This completes MHI's response to this question.

### 3.6.3.4 Analytical Methods and Criteria

The method and criteria used for LBB analysis are consistent with the guidelines in NUREG-1061 (Reference 3.6-23) and Standard Review Plan 3.6.3, Rev. 1 (Reference 3.6-4).

LBB BACs are prepared for each applicable piping system. These curves provide the design guidelines meeting the allowable standards for stress limits and LBB acceptance criteria. The critical location having the highest stress point from piping analysis is determined and compared to the BAC. The maximum stress location must be on or below the BAC to satisfy the LBB criteria.

The bounding analysis methods are described in Appendix 3B. Preparation of BAC provides an evaluation method meeting the requirements and guidelines of the NRC documents.

Piping analysis boundary is from one terminal end or anchor to the other terminal end or anchor. Connection to a larger pipe or a component of larger diameter is generally considered a terminal end. LBB evaluation is based on the fracture mechanics of cracks and analysis of break mechanism which compares the selected leakage cracks with critical crack sizes. This analysis method is outlined below.

Crack stability is demonstrated by leak detection analysis on the assumption that postulated circumferential cracks are limited if the stresses are on or below the "LBB BAC."

#### 3.6.3.4.1 Leak Detection Capability

Leakage flaws are postulated for piping identified in Subsection 3.6.3.1 as following. Sizes of postulated flaws are sufficiently large so that leaks can be detected by a sufficient margin. Leak rate of 10 times the capability of the leak detector is postulated for normal operating load combinations.

Rated detection capability of the leak detector for reactor coolant in the containment is ~~1.0~~ 0.5 gpm within one hour of detector response time. The methods used for the reactor coolant are the containment sump water levels, inventory balance, and the radiation in the environment of containment. The method to detect leaks from the main steam pipe in containment is the containment sump water level. The condensate water flow rate of containment air cooler, containment environmental pressures, and temperatures also suggest the possibility of leakage.

#### 3.6.3.4.2 Stability and Critical Crack Sizes

The local and global break mechanisms are evaluated, as required, to provide a margin to the break size and load. Local mode of breaks deals with the behaviors of crack tips: slowdown, start, development, and instability. Mechanisms of local breaks are evaluated by using J integration method for ferritic steel pipes. Global break mode deals with the behaviors of all cross sections: initial yield, strain hardening, and plastic hinge formation. Global break mechanisms (critical loading method) are evaluated for the stainless steel pipes not containing the casting materials and shielded metal arc weld. From these

evaluations, the critical crack sizes are determined, so that the cracks larger than critical crack size have unstable features of growth.

#### 3.6.3.4.3 Allowable Standards

Crack size margin is determined by comparing the crack sizes determined above to the critical crack size. The critical crack size is determined by adding maximum individual loads by absolute summation. The margin of two applies to the leakage crack size compared to ~~margin between~~ the critical crack ~~flaw~~ size with the size of flaw large enough so that the leakage from the flaw during normal operation is 10 times greater than the minimum leakage the detection system is capable of sensing ~~and the 10 gpm leakage size flaw~~. The margin of 1.0 on the load is used, since the loads are added by absolute sum.

#### 3.6.3.4.4 Bounding Analysis Methods

BACs are developed for each different combination of material type, pipe size, pressure and temperature. These curves provide "Maximum crack stress" versus "Corresponding stress meeting LBB standards." These curves are used to satisfy the requirements for LBB.

Critical location is the maximum stress location determined by the results of pipe stresses.

At all critical locations, loads related to maximum stress calculation are added by using absolute sums. Loads are combined as shown below.

$$|\,Pressure\,| + |\,dead\ load\,| + |\,thermal\ (100\%\ power)^{*}\,| + |\,SSE\,|$$

* Including applicable (thermal) stratification loads

Standard stresses are calculated according to the following combinations of loads by using arithmetical sum method at critical location.

$$Pressure + dead\ load + thermal\ (100\%\ power)^{*}$$

* Including applicable (thermal) stratification loads

Stresses by longitudinal force and bending moment are calculated by the following formula.

$$\sigma = F/A + M/Z$$

where

| | | |
|---|---|---|
| $\sigma$ | = | Stress |
| $F$ | = | Longitudinal force |
| $M$ | = | Bending moment |
| $A$ | = | Cross-sectional area |
| $Z$ | = | Section modulus |

where, subscripts indicate the following loads.

*SSE* = Inertia load due to safe-shutdown earthquake (SSE)

*SAM* = Seismic anchor motion load due to SSE

(2) Safety factor

The safety factors required for the LBB evaluation of the US-APWR by the Reference 3B-2 are associated with the following items.

i. Leak rate ten times as large as detectable leak rate

ii. Critical crack length/leakage crack length ≧2

iii. Safety factor for the maximum load = 1 for absolute sum

1.4 for algebraic sum

The leak detection system for US-APWR is designed to detect a leak rate of ~~1~~0.5 gpm. Consequently, the leak rate for the LBB evaluation is ~~10~~at least 5 gpm based on Item i mentioned above. The applied load is evaluated by absolute sum; therefore, the safety factor of 1.0 is used for the maximum load.

LBB evaluation procedure to satisfy the above three safety factors is shown in Figure 3B-6. The procedure is as follows:

a. Obtain the crack opening area corresponding to the applied loads under normal operation.

b. Calculate leakage crack length $L_L$ from the crack opening area, the leak rate ten times as large as the detectable leak rate and the leak rate based on thermal hydraulics model.

c. Calculate the critical crack length $L_C$ from the fracture mechanics analysis of the applied load under the maximum load condition.

d. If the critical crack length $L_C$ is twice as large as or larger than the leakage crack length $L_L$, restraint is unnecessary because the leak is detectable before pipe rupture.

## 3B.3.1 Generation of BAC

### 3B.3.1.1 BAC Methodology

The BAC methodology is an LBB assessment diagram (Reference. 3B-3) used to satisfy the three safety factors identified in the previous section. In the BAC diagram, $\sigma_{nor}=P_m+P_b$, the sum of the membrane stress and the bending stress under normal operation is plotted along the abscissa, and $|\sigma_{max}| = |P_{m_max}| + |P_{b_max}|$, the absolute sum of the membrane stress and the bending stress under the maximum load is plotted along the ordinate. The plotting procedure on the diagram is as follows.

Item 1 Determine the leakage crack length with a leak rate 10 times as large as the detectable leak rate by applying abscissa's stress $\sigma_{nor} = P_m + P_b$.

E. RHR Emergency Letdown Lines

The RHR emergency letdown lines are isolated from the RCS by normally closed motor operated valves SIS-MOV-031B and -031D and SIS-MOV-032B and -032D. Leakage past these valves will increase the piping temperature. A surface mounted RTD which is located downstream these valves is installed on the bottom of each target pipe. Leakage past these valves is detected by these RTDs and alarms in the MCR.

F. Reactor Head Seal

Seal leakage is detected by means of two monitoring tubes in the upper shell flange, one located between the inner and outer O-rings, and one located outside the outer O-rings. Piping and associated valves direct any leakage to the C/V reactor coolant drain tank.

A surface mounted RTD, installed on the bottom of the common pipe, sends a high temperature alarm signal to the MCR indicating the possibility of a leakage from the Reactor Vessel head seal.

G. Component Cooling Water System

Leakage from the RCS to the component cooling water (CCW) system is detected by the CCW radiation monitors and/or increase in the CCW surge tank level.

### 5.2.5.4 Detection of Unidentified Leakage

Indications of unidentified coolant leakage into the containment are provided by an air particulate radioactivity monitor, an airborne gaseous radioactivity monitor, an air cooler condensate flow rate monitoring system, and a containment sump level and flow monitoring system.

In normal operation, these monitors show a background level that is indicative of the normal level of unidentified leakage inside the containment. Variations in airborne radioactivity or specific humidity above the normal level signify an increase in unidentified leakage rates and signal to the plant operators that corrective action may be required. Similarly, increases in containment sump level signify an increase in unidentified leakage.

The sensitivity and response time of leakage detection equipment for unidentified leakage is such that a leakage rate, or its equivalent, of ~~1~~0.5 gpm can be detected in less than an hour.

The methods employed for detecting leakage to the containment from unidentified sources are:

- Containment sump level
- Containment airborne particulate radioactivity
- Containment airborne gaseous radioactivity
- Condensate flow rate from air coolers.

Additionally, humidity, temperature, and pressure monitoring of the containment atmosphere are used for alarms and indirect indication of leakage to the containment. They do not quantify the reactor coolant leakage.

### 5.2.5.4.1 System Description of Unidentified Leakage detection

#### 5.2.5.4.1.1 Containment Sump Level and Flow Monitoring System

Any leakage inside the containment from the RCPB and other components, not otherwise identified, condenses and flows by gravity through the floor drains and other drains to the containment sump, where the sump level meter measures the increase in the sump level indicating the leak rates. Indication of increasing sump level is transmitted from the sump to the MCR by means of a sump level transmitter and recorded.

A leak rate greater than or equal to ~~1~~0.5 gpm is detectable within one hour, with an alarm actuating in the MCR to alert the operators as stated in positions 5 and 7 of regulatory guide 1.45.

The sump level monitoring system is qualified for seismic events not requiring a plant shutdown.

#### 5.2.5.4.1.2 Containment Airborne Particulate Radioactivity Monitor

In US-APWR, this monitor corresponds to the containment radiation monitor (RMS-RE-40). Refer to Chapter 11, Subsection 11.5.2. The containment airborne particulate radioactivity monitor performs continuous sampling of the containment air and measures the radiation level in the particulate. This monitor is qualified for a safe-shutdown earthquake (SSE). An air sample is drawn outside the containment and passed through a gamma monitor that monitors its gamma rays in radioactive particulate. After passing through the monitor, the sample is returned via the closed system to the containment atmosphere. The measuring range for the monitor is from $1 \times 10^{-10}$ $\mu$ Ci /cm$^3$. An indication of the monitor counting rate is provided to the MCR and electronically recorded.

The detection sensitivity of the airborne particulate radioactivity monitor for reactor coolant leak rate depends on conditions, such as radioactive concentration in the reactor coolant and a distribution coefficient of radioactive particles to the containment atmosphere.

In addition, provided that a radioactive concentration of airborne particulate in the containment is within the measuring range of the airborne particulate radioactivity monitor, an alarm is adjustable to actuate upon detection of a severalfold increase.

Assuming that corrosion and activation product concentration in the reactor coolant is $2 \times 10^{-1}$ $\mu$ Ci /g (Na-24,Cr-51,Z~~r~~n-65,Mn-54,56, Co-58,60, Fe-55,59) and the distribution coefficient is 0.3, after leak occurrence, a leak rate of ~~1~~0.5 gpm can be detected within one hour.

#### 5.2.5.4.1.3 Containment Airborne Gaseous Radioactivity Monitor

In US-APWR, this monitor corresponds to the containment radiation monitor (RMS-RE-41). Refer to Chapter 11, Subsection 11.5.2. The containment airborne gaseous radioactivity monitor measures the radiation level in the gas stream from the containment atmosphere. This monitor is equipped with the scintillation monitor, which performs continuous sampling taken from the air inside the containment to outside the containment and continuously measures the sample gas after passing through the containment airborne particulate radioactivity monitor. The measured gas returns to inside the containment. The sensitivity of the monitor is 5 $\times 10^{-7}$ $\mu$Ci /cm$^3$. The counting rate of the monitor is provided to the MCR and recorded.

Assuming that Xe-133 concentration in the reactor coolant is 3.2 $\mu$Ci /g, after leak occurrence, a leak rate of 1 gpm can be detected within one hour.

This monitor is qualified for seismic events not requiring a plant shutdown.

#### 5.2.5.4.1.4 Containment Air Cooler Condensate Flow Rate Monitoring System

The containment air cooler condensate flow rate monitoring system consists of a containment cooler drain collection header, a vertical standpipe, valves, and standpipe level instrumentation. The monitoring system collects the condensate from the cooling coils of the containment recirculation unit coolers and CRDM cooling unit and enables volume measurements. Both humidity in the containment and the collected condensate which start to increase are associated with indication of leakage. Under equilibrium state, the fluid volume, which condenses in HVAC units inside the containment, is equivalent to evaporated primary coolant volume at the leak source. The condensation from the containment air coolers flows via the collection header to the vertical standpipe. A differential pressure transmitter provides standpipe level signals. The system provides measurements of low leakages by monitoring standpipe level increase versus time. The condensate flow rate is recorded and high alarms are provided in the MCR.

The humidity at the inlet of the HVAC unit cooling coil inside the containment starts to increase by vapor generated from the leak source resulting in the condensate volume increase. During normal operation, leakage of ~~1~~0.5 gpm can be detected within one hour of ~~occurrence~~ detector response time since containment recirculation fans sufficiently circulate the air inside the containment.

This monitoring system is qualified for seismic events not requiring a plant shutdown.

#### 5.2.5.4.2 Additional Unidentified Leakage Detection Methods

A. Charging Pump Operation

During normal operation, one of the charging pumps is in operation. If a gross increase in reactor coolant leakage occurred, the flow rate of the charging pump would increase, indicating leakage from the RCS. This leakage would cause a decrease in the volume control tank level. The flow rate of the charging pump would automatically increase to

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

**ATTACHMENT 3**
to RAI 217-2025 - 15

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE,

b. ~~1~~0.5 gpm unidentified LEAKAGE,

c. 10 gpm identified LEAKAGE, and

d. 150 gallons per day primary to secondary LEAKAGE through any one steam generator (SG).

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

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE. | A.1 Reduce LEAKAGE to within limits. | 4 hours |
| B. Required Action and associated Completion Time of Condition A not met.<br><br>OR<br><br>Pressure boundary LEAKAGE exists.<br><br>OR<br><br>Primary to secondary LEAKAGE not within limit. | B.1 Be in MODE 3.<br><br>AND<br><br>B.2 Be in MODE 5. | 6 hours<br><br><br><br>36 hours |

**ATTACHMENT 3**
to RAI 217-2025 - 15

BASES

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for LOCA; the amount of leakage can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes that primary to secondary LEAKAGE from all steam generators (SGs) is 600 gallons per day. The LCO requirement to limit primary to secondary LEAKAGE through any one SG to less than or equal to 150 gallons per day is equivalent to the conditions assumed in the safety analysis.

The RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(d)(2)(ii).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

No pressure boundary LEAKAGE is allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable as the leak itself could cause further deterioration, resulting in higher LEAKAGE. Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.

b. Unidentified LEAKAGE

~~One~~0.5 gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment can detect within a reasonable time period. Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS Makeup System. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include pressure boundary LEAKAGE or controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). Violation of this LCO could result in continued degradation of a component or system.

d. Primary to Secondary LEAKAGE Through Any One SG

**ATTACHMENT 3**
to RAI 217-2025 - 15

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 (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 sump used to collect unidentified LEAKAGE and air cooler condensate flow rate monitor are instrumented to alarm for increases of greater than or equal to ~~1.0~~0.5 gpm in the normal flow rates. This sensitivity is acceptable for detecting increases in unidentified LEAKAGE.

The reactor coolant contains radioactivity that, when released to the containment, can 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.

An increase in humidity of the containment atmosphere would indicate release of water vapor to the containment. Dew point temperature measurements can thus be used to monitor humidity levels of the containment atmosphere as an indicator of potential RCS LEAKAGE. A 1°F increase in dew point is well within the sensitivity range of available instruments.