AmerenUE
Callaway Plant

PO Box 620
Fulton, MO 65251

December 16, 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop P1-137
Washington, DC 20555-0001

ULNRC-05242

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REACTOR COOLANT SYSTEM LEAKAGE DETECTION INSTRUMENTATION

Ref: ULNRC-05197, dated August 26, 2005

The Reference provided Union Electric (AmerenUE) application to requesting approval of a change to Reactor Coolant System (RCS) leak detection instrumentation system methodology. The proposed change would revise the Bases for Technical Specification (TS) 3.4.13, "RCS Operational LEAKAGE," Bases for TS 3.4.15, "RCS Leakage Detection Instrumentation," Final Safety Analysis Report (FSAR) Appendix 3A, Section 5.2.5.2.3 and Table 5.2-6. This change would clarify the requirements of the containment atmosphere gaseous radioactivity monitor with regard to its RCS leak detection capability and provide clarification that the monitor can be considered OPERABLE (in compliance with TS Limiting Condition for Operation (LCO) 3.4.15) during all applicable MODES even when reactor coolant radioactivity levels are below the levels assumed in the original licensing basis for Callaway.

On October 3, 2005, a teleconference was held between the NRC Project Manager, AmerenUE personnel, and WCNOC personnel. As a result of the teleconference, on October 12, 2005, the NRC Project Manager provided by electronic mail a request for additional information to provide clarifying information provided by the Reference.

A001
A053

Enclosure 1 to this letter provides AmerenUE response to the request for additional information. The additional information provided in the Attachment does not impact the conclusions of the No Significant Hazards Consideration provided in Reference 1.

In addition, Enclosure 2 and 3 transmits the correct Technical Specification Bases and FSAR markup pages to replace those shown in Attachment 2 and 3 of the reference letter which did not show the electronic markups.

In accordance with 10 CFR 50.91, a copy of this submittal is being provided to the designated Missouri State official.

This letter does not contain new commitments.

If you have any questions concerning this matter, please contact Mr. Keith Young at (573) 676-8659, or Dave Shafer at (314) 554-3104.

I declare under penalty that the foregoing is true and correct.

Sincerely,

Executed on: December 16, 2005

Keith D. Young
Manager - Regulatory Affairs

Enclosure:
1. RAI Responses
2. Markup of Technical Specification Bases
3. Markup of FSAR

cc: Mr. Bruce S. Mallett
Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-4005

Senior Resident Inspector
Callaway Resident Office
U.S. Nuclear Regulatory Commission
8201 NRC Road
Steedman, MO 65077

Mr. Jack N. Donohew (2 copies)
Licensing Project Manager, Callaway Plant
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop 7E1
Washington, DC 20555-2738

Missouri Public Service Commission
Governor Office Building
200 Madison Street
PO Box 360
Jefferson City, MO 65102-0360

Mr. Ron Reynolds
Director
Missouri State Emergency Management Agency
P.O. Box 116
Jefferson City, MO 65102

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION

This Attachment provides Union Electric's (AmerenUE) response to an electronic request dated October 12, 2005 from the NRC Project Manager for additional information.

1. Given the discussion in the application on the containment atmosphere (gaseous) radioactivity monitor not being able to detect 1 gpm reactor coolant leakage in any way close to 1 hour for the current normal radioactivity levels in the reactor coolant, explain why this monitor is being retained in Limiting Condition for Operation (LCO) 3.4.15.

Response:

Technical Specification 3.4.15, "RCS Leakage Detection Instrumentation," has a fundamental objective to support 10 CFR 50, Appendix A, General Design Criteria (GDC) 30, "Quality of Reactor Coolant Pressure Boundary." Implementing guidance recognized that a diverse set of detection methods are necessary to assure effective monitoring. Diversity for this specification, contributes to redundancy under varying plant conditions.

AmerenUE letter ULNRC-05197, dated August 26, 2005, states, in part:

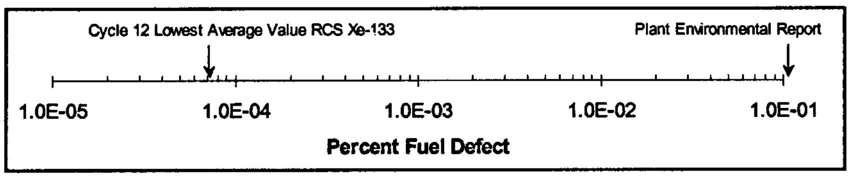
> "Given the level of radioactivity in the reactor coolant at Callaway Plant with no or minor fuel cladding defects, evaluation has shown that the containment atmosphere gaseous radioactivity monitors would not promptly detect a one gpm leak in one hour. This conclusion is based on a realistic nominal detector background level, with the typical RCS gaseous activity associated with no fuel cladding defects. For these lower RCS activity levels, the increase in detector count rate due to leakage will be partially masked by the statistical variation of the minimum detector background count rate, rendering reliable detection of a 1 gpm leak in one hour uncertain. At elevated RCS activity/failed fuel conditions as discussed in Regulatory Guide 1.45, a one gpm leak would be detectable within one hour, even at higher detector background."

The Callaway Plant Technical Specification (TS) Bases B 3.4.15, "RCS Leakage Detection Instrumentation," states, in part:

> "This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide a high degree of confidence that 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."

Diverse monitoring principles are necessary because one monitored parameter will always lead the others depending on the actual or postulated plant conditions. WCAP-7503, Rev. 1, "Determination of Design Pipe Breaks for the Westinghouse Reactor Coolant System." indicates that the knowledge of the existence of a leak inside containment is obtained from the induced variations of particulate activity, gaseous activity, and specific humidity in containment atmosphere. These three functions are assumed to have reached a steady state. With the initiation of a leak, a transient will take place, followed by a new steady state. The values of the particulate activity, gaseous activity, and specific humidity that define these different states are functions of the leakage, the time, and parameters like containment volume and temperature, activity concentrations in the coolant for the considered isotopes, cooling coil heat removal capacity, and fan flows. The performance of any means of detection depends on the way the function is affected by the leak and the sensitivity of the instrument which measures it.

Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," defines the source term as: "In analyzing the sensitivity of leak detection systems using airborne particulate or gaseous radioactivity, a realistic primary coolant radioactivity concentration assumptions should be used. The expected values used in the plant environmental report would be acceptable. The chart below provides a comparison of the RCS activity level during cycle 12 to the values specified in the plant environmental report.



An evaluation performed in 2003 using current RCS activity levels resulted in a containment gaseous concentration at the end of 60 minutes to be ~5.1E-08 $\mu Ci/cm^3$ (see Figure 1 below). This evaluation confirmed the insensitivity of the containment atmosphere gaseous channels to low RCS activity.

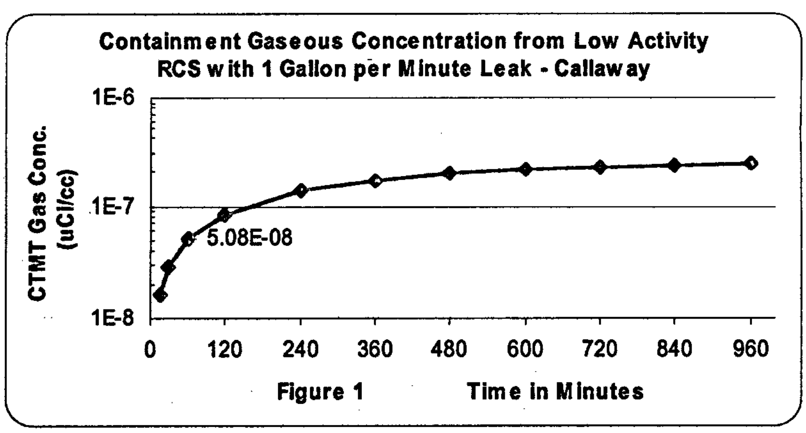


Figure 1

NUREG/CR-6582, "Assessment of Pressurized Water Reactor Primary System Leaks," December 1998, recognized that the containment atmosphere gaseous monitor is inherently less sensitive than the containment air-particulate monitor and functions in the event that significant reactor coolant gaseous activity exists as a result of fuel cladding defects. Sensitivity and response time depend on several factors, including containment vessel free volume; containment background activity, TS Limiting Condition for Operation (LCO) 3.4.16, "RCS Specific Activity," contains specific activity limits for both DOSE EQUIVALENT I-131 and gross specific activity. The specific activity limits are intended to limit the 2-hour dose at the site boundary to a small fraction of the 10 CFR 100 dose guideline limits. The TS B 3.4.16 Bases indicates that the noble gas activity in the reactor coolant assumes 1% failed fuel, which closely equals the LCO limit of $100/\bar{E}$ μCi/gm for gross specific activity. While TS 3.4.16 basis is to limit the 2-hour dose at the site boundary, it would allow plant operation at a reactor coolant activity level in which the containment atmosphere gaseous radiation monitor would be capable of detecting a 1 gpm leak in one hour.

Regulatory Guide 1.45, Section B, "Discussion," suggest that since the methods differ in sensitivity and response time, prudent selection of detection methods should include sufficient systems to assure effective monitoring during periods when some detection systems may be ineffective or inoperable. Some of these systems should serve as early alarm systems signaling the operators that closer examination of other detection systems is necessary to determine the extent of any corrective action that may be required. Position 5 in Section C, "Regulatory Position," of the regulatory guide 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, or one gpm in less than one hour." Regulatory position 9 of the regulatory guide further states: "The technical specifications should include the limiting conditions for identified and unidentified leakage and address the availability of various types of instruments to assure adequate coverage at all times."

Based upon the above information, the proposed license amendment to maintain the containment atmosphere gaseous radiation monitor in Technical Specification 3.4.15 provides for sufficient diversity for detecting leakage during plant operation with licensed levels of RCS activity as a result of minor fuel cladding defects which could potentially occur in the future.

2. If it is unlikely that the containment atmosphere (gaseous) radioactivity monitor will detect 1 gpm reactor coolant leakage in any way close to 1 hour, provide the basis for listing this monitor in LCO 3.4.15.c together with the containment air cooler condensate monitoring system which, by the application, can detect this leakage in 1 hour.

Response:

Regulatory Position 3. of Regulatory Guide 1.45 states:

> "At least three separate detection methods should be employed and two of these methods should be (1) sump level and flow monitoring and (2) airborne particulate radioactivity monitoring. The third method may be selected from the following:
>
> a. monitoring of condensate flow rate from air coolers,
>
> b. monitoring of airborne gaseous radioactivity.
>
> Humidity, temperature, or pressure monitoring of the containment atmosphere should be considered as alarms or indirect indication of leakage to the containment."

The Callaway Plant Technical Specifications were based on NUREG-0452, Revision 4, "Standard Technical Specifications for Westinghouse Pressurized Water Reactors." LCO 3.4.6.1 of the standard technical specifications stated:

> "The following Reactor Coolant System Leakage Detection Systems shall be OPERABLE:
>
> a. The Containment Atmosphere [Gaseous or Particulate] Radioactivity Monitoring System,
>
> b. The Containment Pocket Sump Level and Flow Monitoring System, and
>
> c. Either the [containment air cooler condensate flow rate] or a Containment Atmosphere [Gaseous or Particulate] Radioactivity Monitoring System."

The Callaway Plant Technical Specifications (NUREG-1058) were issued on October 18, 1984. LCO 3.4.6.1 of the specifications stated:

> "The following Reactor Coolant System Leakage Detection Systems shall be OPERABLE:
>
> a. The Containment Atmosphere Particulate Radioactivity Monitoring System,

b. The Containment Normal Sump Level Measurement System, and

c. Either the Containment Air Cooler Condensate Flow Rate or the Containment Atmosphere Gaseous Radioactivity Monitoring System."

WCAP-7503, Rev. 1, states in part: "In regard to leakage detection, the earliest indication would be given by particulate activity detectors, assuming primary coolant leakage, corrosion product activity in the coolant, and a background below the threshold of detectibility. High condensate flow and a gaseous activity equal to twice the background would follow successively.

Therefore, the basis for listing the containment atmosphere gaseous radioactivity monitor with the containment air cooler condensate flow rate is based on and consistent with the standard technical specifications (NUREG-0452, Rev. 4) and the information in WCAP-7503, Rev. 1.

MARKUP OF TECHNICAL SPECIFICATION BASES

BASES

ACTIONS

B.1 and B.2 (continued)

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. In MODE 5, the pressure stresses acting on the RCPB are much lower, and further deterioration is much less likely.

SURVEILLANCE REQUIREMENTS

SR 3.4.13.1

Verifying RCS LEAKAGE to be within the LCO limits ensures the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. It should be noted that LEAKAGE past seals, gaskets, and instrumentation lines is not pressure boundary LEAKAGE. Unidentified LEAKAGE and Identified LEAKAGE are determined by performance of an RCS water inventory balance. Primary to secondary LEAKAGE is also measured by performance of an RCS water inventory balance in conjunction with secondary side sampling and monitoring.

The RCS water inventory balance must be met with the reactor at steady state operating conditions (stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows). Therefore, a Note is added allowing that this SR is not required to be performed until 12 hours after establishing steady state operation. The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Steady state operation is preferred to perform a proper inventory balance since calculations during non-steady state conditions must account for the changing parameters. For RCS operational LEAKAGE determination by water inventory balance, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

An early warning of pressure boundary LEAKAGE or unidentified LEAKAGE is provided by the automatic systems that monitor the containment atmosphere [particulate] radioactivity and the containment sump level. It should be noted that LEAKAGE past seals, gaskets, and instrumentation lines is not pressure boundary LEAKAGE. These leakage detection systems are specified in LCO 3.4.15, "RCS Leakage Detection Instrumentation."

(continued)

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 level and flow monitoring system, used to collect unidentified LEAKAGE, and containment cooler condensate monitoring system are instrumented to alarm for increases of 0.5 to 1.0 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.

Insert 1 →

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.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

the leakage from its source to an instrument location yields an acceptable overall response time.

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

RCS leakage detection instrumentation satisfies Criterion 1 of 10CFR50.36(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 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.

This LCO is satisfied when diverse monitoring methods are available. Thus, the containment sump level and flow monitoring system, one containment atmosphere particulate radioactivity monitor, and either the containment cooler condensate monitoring system or one containment atmosphere gaseous radioactivity monitor provide an acceptable minimum.

Insert 2 →

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 required 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

The Actions are modified by a Note that indicates that the provisions of LCO 3.0.4 are not applicable. As a result, a MODE change is allowed when: the required containment sump level and flow monitoring system is inoperable; the required containment atmosphere particulate radioactivity monitor is inoperable; or the required containment atmosphere gaseous radioactivity monitor and the required containment cooler condensate

(continued)

Insert 1

The sensitivity of the containment air particulate monitors for primary coolant leakage detection is dependent on both the primary coolant activity level and the background radiation level in containment which is dependent upon the power level, percent failed fuel, crud bursts, iodine spiking, and natural radioactivity brought in by the containment purge.

Shortly after startup and also during steady operation with low levels of fuel defects, the level of radioactivity in the reactor coolant is lower than what was assumed in the original design bases calculation. Using a reactor coolant source term based on representative real-time data, with no fuel defects, it was determined that the containment air particulate monitors are capable of detecting a one gpm leak in one hour.

The measurement of containment atmosphere gaseous radioactivity is less sensitive than the measurement of particulate radioactivity for the purpose of detecting RCS leakage. Analyses have shown that the pre-existing containment radioactive gaseous background levels for which reliable detection is possible is dependent upon the reactor power level, percent failed fuel in the reactor, and natural radioactivity brought into the containment by the containment purge system. With primary coolant radionuclide concentrations less than equilibrium levels, such as during startup and operation with no fuel defects, the increase in detector count rate due to leakage will be partially masked by the statistical variation of the minimum detector background count rate, rendering reliable detection of a 1 gpm leak uncertain.

Operating experience has shown gaseous background radiation levels in containment that would partially mask the detection of a 1 gpm leak from the RCS with low radioactivity concentrations in the reactor coolant. However, the monitor is capable of detecting an RCS-to-containment atmosphere leak if elevated reactor coolant gaseous activity is present.

Insert 2

The measurement of containment atmosphere gaseous radioactivity is less sensitive than the measurement of particulate radioactivity for the purpose of detecting RCS leakage under very low RCS activity conditions. However, it will provide a positive indication of leakage in the event that high levels of reactor coolant gaseous activity exist as a result of fuel cladding defects. Given the potential limitations of the containment atmosphere gaseous radioactivity monitor at conditions when low radioactivity levels are present in the reactor coolant, OPERABILITY is based on the monitor's ability to meet the required surveillances and not on its ability to indicate a 1 gpm RCS boundary leakage in one hour.

MARKUP OF FSAR

DISCUSSION:

Westinghouse practices achieve the same purpose as Regulatory Guide 1.43 by requiring qualification of any "high heat input" processes, such as the submerged-arc wide-strip welding process and the submerged-arc 6-wire process used on ASME SA-508, Class 2, material, with a performance test as described in Regulatory Position C.2 of the guide. No qualifications are required by the regulatory guide for ASME SA-533 material and equivalent chemistry for forging grade ASME SA-508, Class 3, material.

The fabricator monitors and records the weld parameters to verify agreement with the parameters established by the procedure qualification as stated in Regulatory Position C.3.

Stainless steel weld cladding of low-alloy steel components is not employed on components outside the NSSS.

REGULATORY GUIDE 1.44 REVISION 0 DATED 5/73

Control of the Use of Sensitized Stainless Steel

DISCUSSION:

The recommendations of this regulatory guide are met as described in Table 6.1-4.

REGULATORY GUIDE 1.45 REVISION 0 DATED 5/73

Reactor Coolant Pressure Boundary Leakage Detection Systems

DISCUSSION:

The recommendations of this regulatory guide are met as described in Table 5.2-6 ***with the exception noted.***

REGULATORY GUIDE 1.46 REVISION 0 DATED 5/73

Protection Against Pipe Whip Inside Containment

DISCUSSION:

The recommendations of this regulatory guide are met as described in Table 3.6-2 for the balance of plant and Section 3.6.1 for the NSSS.

REGULATORY GUIDE 1.47 REVISION 0 DATED 5/73

Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems concentration above background, due to an abnormal leak and natural decay, increases almost linearly with time for the first several hours after the beginning of a leak. As shown in Figure 5.2-2, with 0.1-percent failed fuel, containment background airborne particulate radioactivity equivalent to 10^{-4} percent/day, and a partition factor equal to 0.2, a 1-gpm leak would be detected in 1 hour. Larger leaks would be detected in proportionately shorter times (exclusive of sample transport time, which remains constant). The detection capabilities and response times are shown on Figure 5.2-2.

The leakage flow rate can be determined from the count rate when the specific background radioactivity present before the leakage begins is known. The background activity is dependent upon the power level, percent failed fuel, crud bursts, iodine spiking, and natural radioactivity brought in by the containment purge.

CONTAINMENT GASEOUS RADIOACTIVITY MONITOR Gaseous radioactivity is *Insert A* determined from the containment free volume and the gaseous activity concentration of the reactor coolant. Any increase more than two standard deviations above the count rate for background would indicate a possible leak. The total gaseous activity level above background (after 1 year of normal operation) increases almost linearly for the first several hours after the beginning of the leak. As specified in Figure 5.2-2, with 0.1-percent failed fuel, containment background airborne gaseous radioactivity equivalent to 0.1 percent/day, and a partition factor equal to 1 (NUREG-0017 assumptions), a 1-gpm leak would be detected within 1 hour. Larger leaks would be detected in proportionately shorter times (exclusive of the sample transport time which remains constant). The detection capabilities and response times are shown on Figure 5.2-2.

Insert B →

The leakage flow rate can be determined from the count rate when the specific background radioactivity present before the leakage begins is known. ~~The background activity is dependent upon the power level, percent failed fuel, and natural radioactivity brought in by the containment purge.~~ *Insert C*

CONTAINMENT PURGE MONITORS - The containment purge monitors function the same as the containment air particulate and gaseous radioactivity monitors, except that the purge monitors sample from the containment purge exhaust line.

CONTAINMENT COOLER CONDENSATE MONITORING SYSTEM - The condensate flow rate is a function of containment humidity, essential service water temperature leaving the coolers, and containment purge rate. The water vapor dispersed by a 1 gpm leak is much greater than the water vapor brought in with the outside air. Air brought in from the outside is heated to 50°F before it enters the containment.

After the air enters the containment, it is heated to 100-120°F so that the relative humidity drops. The water vapor brought in with the outside air does not build up in the containment since it is continually purged. The most important factor in condensing the water vapor is the temperature of the essential service water which is provided to the

Insert A

The containment atmosphere gaseous radioactivity monitor is less sensitive than the containment air particulate monitor but provides a positive indication of leakage in the event that reactor coolant gaseous activity exists as a result of fuel-cladding defects.

Insert B

Analyses have shown that the pre-existing containment radioactive gaseous background levels for which reliable detection is possible is dependent upon the reactor power level, percent failed fuel, and natural radioactivity brought in by the containment purge. With primary coolant concentrations less than equilibrium levels, such as during reactor startup and operation with no fuel defects, the increase in detector count rate due to leakage will be partially masked by the statistical variation of the minimum detector background count rate, rendering reliable detection of a 1 gpm leak uncertain.

Operating experience has shown gaseous background radiation levels in containment that would partially mask the detection of a 1 gpm leak. However, the monitor is capable of detecting an RCS to containment atmosphere leak if elevated reactor coolant gaseous activity is present.

Insert C

This method is limited by the fact that large uncertainties are possible when determining the associated leak rate by calculation. Therefore, in the event of an alarm or increasing trend on these monitors, a water inventory balance is normally performed to determine the equivalent RCS leak rate.

TABLE 5.2-6 (Sheet 2)

Regulatory Guide 1.45 Position	Union Electric
3. At least three separate detection methods should be employed and two of these methods should be (1) sump level and flow monitoring and (2) airborne particulate radioactivity monitoring. The third method may be selected from the following: a. monitoring of condensate flow rate from air coolers, b. monitoring of airborne gaseous radioactivity. Humidity, temperature, or pressure monitoring of the containment atmosphere should be considered as alarms or indirect indication of leakage to the containment.	3. Complies. The methods provided are sump-level and flow (level versus time) monitoring, airborne particulate radioactivity monitoring, airborne gaseous radioactivity monitoring, and containment cooler condensate monitoring. Containment atmosphere humidity monitoring is also available as an indirect indication of leakage to the containment. As such, periodic testing of the sensitivity of the humidity monitoring system is not required.
4. Provisions should be made to monitor systems connected to the RCPB for signs of intersystem leakage. Methods should include radioactivity monitoring and indicators to show abnormal water levels or flow in the affected area.	4. Complies. Refer to Sections 5.2.5.2.1, 9.3.3, and 11.5
5. 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.	5. Complies, as described in Section 5.2.5.2.3 and as shown on Figure 5.2-2. ***with the following exception. For the containment gaseous radioactivity monitors reliable leak detection is possible provided that the equilibrium activity of the containment atmosphere is below the level that would mask the change in radioactivity corresponding to a 1 gpm leak in one hour from the reactor coolant system. Given the above limitations, the intent of the leak detection requirements of Regulatory Guide 1.45 is met in the following manner. The minimum sensitivities of the containment gaseous radioactivity monitors is 2 x 10-7 µCi/ml (reference nuclide Xe-133). This sensitivity meets or exceeds the sensitivities required of these monitors by Section B of Regulatory Guide 1.45.***