WOLF CREEK
NUCLEAR OPERATING CORPORATION

Terry J Garrett
Vice President, Engineering

November 18, 2005

ET 05-0022

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Reference: Letter ET 05-0007, dated August 26, 2005, from T. J. Garrett, WCNOC, to the NRC

Subject: Docket No. 50-482: Response to Request for Additional Information – Reactor Coolant System Leakage Detection Instrumentation

Gentlemen:

The Reference provided Wolf Creek Nuclear Operating Corporation's (WCNOC) application 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," Updated Safety Analysis Report (USAR) 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 WCGS.

On October 3, 2005, a teleconference was held between the NRC Project Manager, WCNOC personnel, and AmerenUE 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.

The Attachment to this letter provides WCNOC's 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 the Reference. In accordance with 10 CFR 50.91, a copy of this submittal is being provided to the designated Kansas State official.

A001

There are no commitments associated with this submittal. If you have any questions concerning this matter, please contact me at (620) 364-4084, or Mr. Kevin Moles at (620) 364-4126.

Very truly yours,

Terry J. Garrett

TJG/rlg

Attachment

cc: T. A. Conley (KDHE), w/a
J. N. Donohew (NRC), w/a
W. B. Jones (NRC), w/a
B. S. Mallett (NRC), w/a
Senior Resident Inspector (NRC), w/a

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Terry J. Garrett, of lawful age, being first duly sworn upon oath says that he is Vice President Engineering of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the contents thereof; that he has executed the same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By _____
Terry J. Garrett
Vice President Engineering

SUBSCRIBED and sworn to before me this 18 day of Nov, 2005.

NOTARY PUBLIC STATE OF KANSAS
RHONDA L. GLEUE
My Appt. Exp. 5-11-2006

Rhonda L. Gleue
Notary Public

Expiration Date May 11, 2006

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION

This Attachment provides Wolf Creek Nuclear Operating Corporation's (WCNOC's) 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.

WCNOC letter ET 05-0007, dated August 26, 2005, states, in part:

> "Given the level of radioactivity in the reactor coolant at WCGS 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 1) the statistical variation of the minimum detector background count rate, and 2) the Ar-41 activation activity rendering reliable detection of a 1 gpm leak in one hour uncertain."

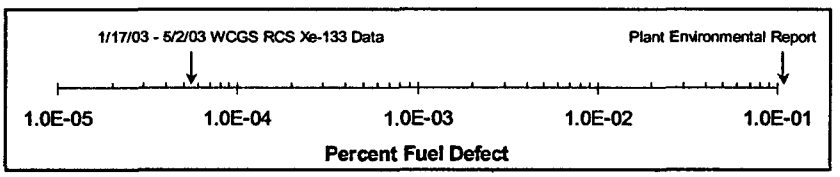
The Wolf Creek Generating Station (WCGS) Technical Specification (TS) Bases B 3.4.15, "RCS Leakage Detection Instrumentation," states, in part:

> "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. USAR Section 5.2.6, provides a reference to WCAP-7503, Rev. 1, "Determination of Design Pipe Breaks for the Westinghouse Reactor Coolant System." This WCAP 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 assumption 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 a period in 2003 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 ~3.4E-08 μCi/cm^3 (see Figure 1 below). This evaluation confirmed the insensitivity of the containment atmosphere gaseous channels to low RCS activity.

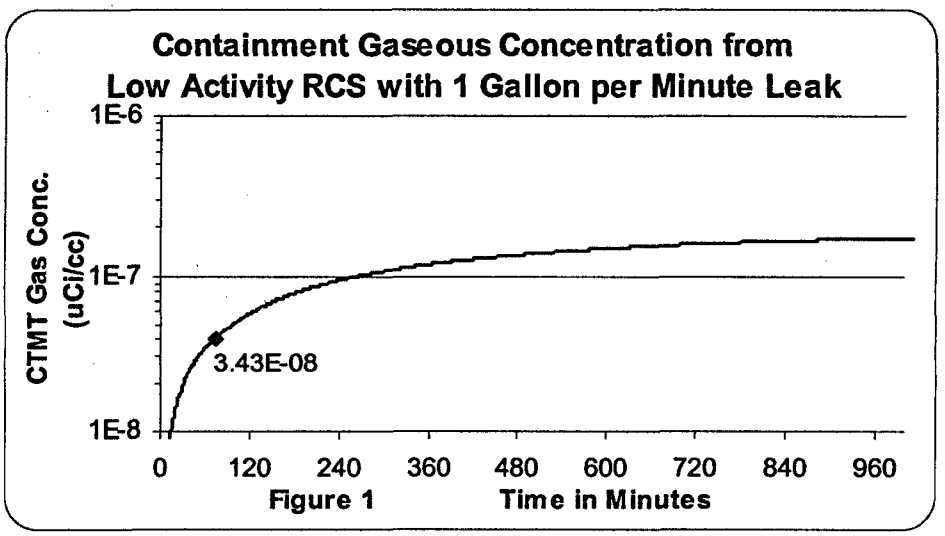
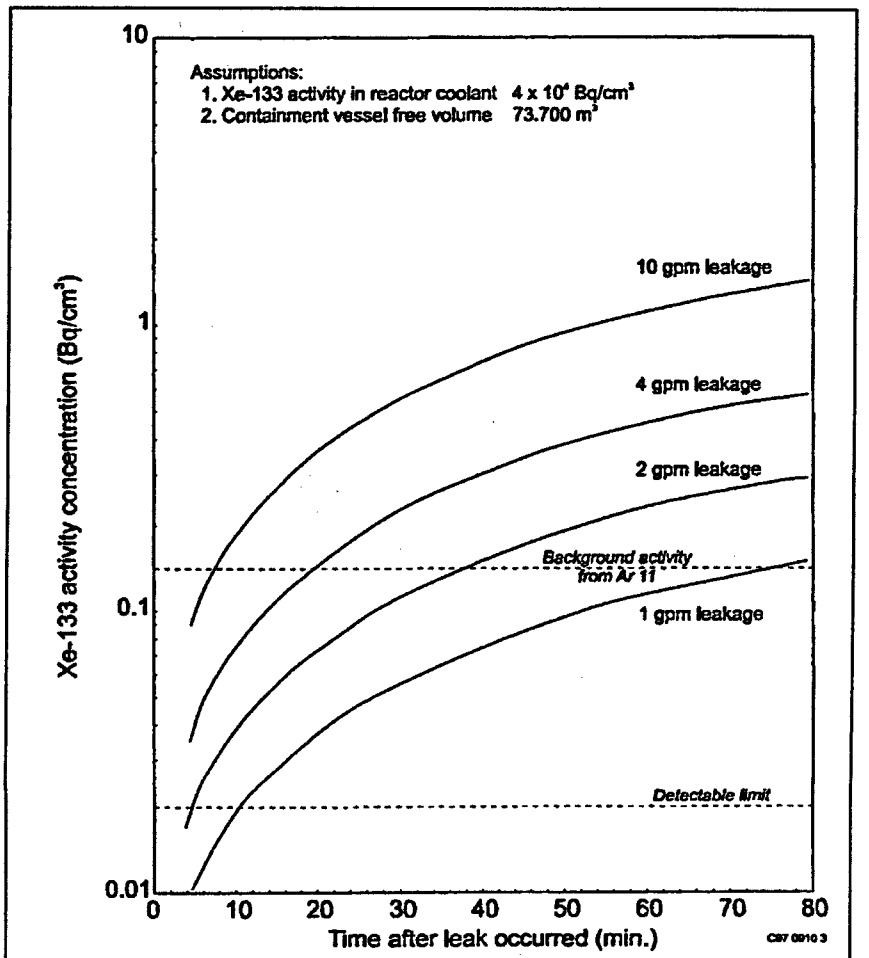


Figure 1

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, which varies with RCS leakage and fuel rod failures, and corrosion products concentration.

The gaseous activity in the containment atmosphere increases with the duration of the leak as shown in the below figure (Figure 10-7 from NUREG/CR-6582). Figure 10-7 also illustrates the masking effect of the Ar-41 background activation in air. The data in this figure is shown for activity of Xe-133 in reactor coolant equal to 4E+4 Bq/cm^3 (~1.0 µCi/cm^3) and containment free volume equal to 73,700 m^3. The figure shows that a 2 gpm leak may be detected in about 40 minutes and a one gpm leak in about 80 minutes. In the absence of fuel failures, the corresponding leak detection time would be longer. (Note: the Y-axis of 0.01 to 10 Bq/cm^3 corresponds to 2.7E-07 to 2.7E-04 µCi/cm^3)



10-7. Time-dependent gaseous activity increases resulting from reactor coolant leakage
1991). Copyright Elsevier Science Publishers; reprinted with permission.

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/Ē 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 WCGS 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 WCGS Technical Specifications (NUREG-1136) were issued on March 11, 1985. 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.