VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

April 27, 2011

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Serial No. 11-221
NLOS/ETS R0
Docket Nos. 50-338/339
License Nos. NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
LICENSE AMENDMENT REQUEST FOR ADOPTION OF TECHNICAL SPECIFICATION TASK FORCE (TSTF)-513, REVISION 3, "REVISE PWR OPERABILITY REQUIREMENTS AND ACTIONS FOR RCS LEAKAGE INSTRUMENTATION"

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company (Dominion) requests amendments, in the form of changes to the Technical Specifications (TS) to Facility Operating License Numbers NPF-4 and NPF-7 for North Anna Power Station Units 1 and 2, respectively. The proposed amendment would revise the TS to define a new time limit for restoring inoperable Reactor Coolant System (RCS) leakage detection instrumentation to operable status; establish alternate methods of monitoring RCS leakage when one or more required monitors are inoperable; and make TS Bases changes which reflect the proposed changes and more accurately reflect the contents of the facility design basis related to operability of the RCS leakage detection instrumentation. These changes are consistent with NRC-approved Revision 3 to TSTF Improved Standard Technical Specification (STS) Change Traveler TSTF-513, *Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation*. The availability of this TS improvement was announced in the *Federal Register* on January 31, 2011 (76 FR 189) as part of the consolidated line item improvement process (CLIIP).

A discussion of the proposed changes and the technical basis for the proposed changes is provided in Attachment 1. The marked-up and typed proposed TS pages are provided in Attachments 2 and 3, respectively. Attachments 4 and 5 provide the TS Bases changes and the applicable UFSAR Section, respectively, which are provided for information only.

We have evaluated the proposed amendment and have determined that it does not involve a significant hazards consideration as defined in 10 CFR 50.92. The basis for our determination is included in Attachment 1. We have also determined that operation with the proposed change will not result in any significant increase in the amount of effluents that may be released offsite and no significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment is eligible for categorical exclusion from an environmental assessment as set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed change. The basis for our determination is also included in Attachment 1. The proposed amendment has been reviewed and approved by the Facility Safety Review Committee.

In accordance with 10 CFR 50.91(b)(1), "State Consultation," a copy of this application and its reasoned analysis about no significant hazards considerations is being provided to the designated Virginia Official.

Dominion requests approval of the proposed license amendment by May 31, 2012 with the amendment being implemented within 60 days of approval.

Should you have any questions or require additional information, please contact Mr. Thomas Shaub at (804) 273-2763.

Sincerely,

J. Alan Price
Vice President – Nuclear Engineering

Attachments
1. Discussion of Change
2. Proposed Technical Specifications Pages (Mark-Up)
3. Proposed Technical Specifications Pages (Typed)
4. Technical Specification Bases Changes (Information Only)
5. UFSAR Section 5.2.4 (Information Only)

Commitments: None

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mr. J. Alan Price, who is Vice President – Nuclear Engineering, of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 27th day of April, 2011.

My Commission Expires: 4/30/13.

GINGER LYNN MELTON
Notary Public
Commonwealth of Virginia
310847
My Commission Expires Apr 30, 2013

Notary Public

I was commissioned a notary as Ginger L. Alligood.

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ATTACHMENT 1

DISCUSSION OF CHANGE

Virginia Electric and Power Company
(Dominion)
North Anna Power Station Units 1 and 2

DISCUSSIONOF PROPOSED CHANGES

License Amendment Request for Adoption of TSTF-513, Revision 3, "Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation"

1.0 DESCRIPTION

The proposed amendment would revise the Technical Specifications (TS) to define a new time limit for restoring inoperable Reactor Coolant System (RCS) leakage detection instrumentation to operable status; establish alternate methods of monitoring RCS leakage when one or more required monitors are inoperable; and make conforming TS Bases changes. These changes are consistent with NRC-approved Revision 3 to Technical Specification Task Force (TSTF) Standard Technical Specification (STS) Change Traveler TSTF-513-A, *Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation*. The availability of this TS improvement was announced in the *Federal Register* on January 3, 2011, Vol. 76, No. 1, pages 189-190 as part of the consolidated line item improvement process (CLIIP).

2.0 PROPOSED CHANGES

The proposed changes revise and add a new Condition C to TS 3.4.15, "RCS Leakage Detection Instrumentation," and revise the associated bases. New Condition C is applicable when the containment atmosphere gaseous radioactivity monitors are the only operable TS-required monitor (i.e., all other monitors are inoperable). New Condition C Required Actions require analyzing grab samples of the containment atmosphere every 12 hours and restoring another monitor within 7 days. Additionally, the TS Bases, which summarize the reasons for the specifications, are revised to clarify the specified safety function for each required instrument in the limiting condition for operation (LCO) Bases, delete discussion from the Bases that could be construed to alter the meaning of TS operability requirements, and reflect the changes made to TS 3.4.15.

Dominion is not proposing variations or deviations from the TS changes described in TSTF-513, Revision 3, or the NRC staff's model safety evaluation (SE) referenced in the *Federal Register* on January 3, 2011 Vol. 76, No. 1, pages 189-190, as part of the CLIIP Notice of Availability. Dominion proposes minor editorial changes to ensure continuity of the TS format. These changes re-letter current Condition C, which applies when the required action and the associated completion time are not satisfied, to Condition D and current Condition D, which applies when all monitors are inoperable, to Condition E. Similar changes were made to the associated Required Actions.

3.0 BACKGROUND

NRC Information Notice (IN) 2005-24, *Nonconservatism in Leakage Detection Sensitivity*, dated August 3, 2005, informed addressees that the reactor coolant activity assumptions for primary containment atmosphere gaseous radioactivity monitors may be non-conservative. This means the monitors may not be able to detect a one gallon per minute leak within one hour. Some licensees have taken action in response to IN 2005-24 to remove the gaseous radioactivity monitor from the TS list of required monitors. However, industry experience has shown that the primary containment atmosphere gaseous radiation monitor is often the first monitor to indicate an increase in Reactor Coolant System (RCS) leak rate. As a result, the TSTF and the NRC staff met on April 29, 2008, and April 14, 2009, to develop an alternative approach to address the issue identified in Information Notice 2005-24. The agreed solution is to retain the primary containment atmosphere gaseous radiation monitor in the LCO list of required equipment, revise the specified safety function of the gas monitor to specify the required instrument sensitivity level, revise the Actions to require additional monitoring, and provide less time before a plant shutdown is required when the primary containment atmosphere gaseous radiation monitor is the only operable monitor.

4.0 TECHNICAL ANALYSIS

Dominion has reviewed TSTF-513, Revision 3, and the model SE referenced in the Federal Register Notice dated January 3, 2011, Vol. 76, No. 1, pages 189-190 as part of the CLIIP Notice of Availability. Dominion has concluded that the technical bases presented in TSTF Traveler-513, Revision 3, and the model SE prepared by the NRC staff are applicable to North Anna Units 1 and 2.

The proposed amendment revises the language in the TS Bases that describes when the gaseous and particulate containment atmosphere radioactivity monitors are operable. The proposed amendment requires analyzing grab samples of the containment atmosphere as an additional requirement for RCS leakage monitoring when the primary containment atmosphere gaseous radiation monitor is the only operable monitoring capability. This additional requirement provides an RCS leakage detection capability similar to the TS-required method. The grab sample has an RCS leakage detection capability that is comparable to that of the containment particulate radiation monitor. The proposed Actions and Completion Times for grab samples are adequate because use of frequent grab samples provides additional assurance (in addition to the mass balances required by Conditions A and B) that any significant RCS leakage will be detected prior to significant reactor coolant pressure boundary (RCPB) degradation.

The North Anna leakage detection instrumentation is not specifically designed to meet 10 CFR 50, Appendix A, General Design Criterion (GDC) 30, "Quality of Reactor Coolant Pressure Boundary." Since North Anna Units 1 and 2 construction permits preceded the development of the GDC, the Units were designed and constructed to meet the Atomic Energy Commission's proposed General Design Criteria published in 1966. Section 5.2 discusses the regulatory requirements in more detail.

5.0 REGULATORY SAFETY ANALYSIS

5.1 NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Dominion has evaluated the proposed changes to the TS using the criteria in 10 CFR 50.92 and has determined that the proposed changes do not involve a significant hazards consideration. An analysis of the issue of no significant hazards consideration is presented below:

Description of Amendment Request:

The proposed amendment would revise TS 3.4.15, "Reactor Coolant System (RCS) Leakage Detection Instrumentation" Conditions and Required Actions and the licensing basis for the gaseous radiation monitor, as well as make associated TS Bases changes for TS 3.4.15.

Basis for proposed no significant hazards consideration determination:

As required by 10 CFR 50.91(a), the Dominion analysis of the issue of no significant hazards consideration using the standards in 10 CFR 50.92 is presented 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 clarifies the operability requirements for the RCS leakage detection instrumentation presently installed in the plant and reduces the time allowed for the plant to operate when the only TS-required operable RCS leakage detection instrumentation monitor is the containment atmosphere gaseous radiation monitor. Monitoring for RCS leakage does not contribute to the probability of an accident, Furthermore, the monitoring of RCS leakage is not a precursor to any accident previously evaluated. Monitoring RCS leakage is not used to mitigate the consequences of any accident previously evaluated. Therefore, it is concluded that 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 Kind of Accident from any Accident Previously Evaluated?

   Response: No

   The proposed change clarifies the operability requirements for the RCS leakage detection instrumentation and reduces the time allowed for the plant to operate when the only TS-required operable RCS leakage detection instrumentation monitor is the containment atmosphere gaseous radiation monitor. The proposed change does not involve a physical alteration of the plant (no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. The proposed change maintains sufficient continuity and diversity of leak detection capability that the probability of piping evaluated and approved for Leak-Before-Break progressing to pipe rupture remains extremely low. Therefore, it is concluded that the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the Proposed Change Involve a Significant Reduction in a Margin of Safety?

   Response: No

   The proposed change clarifies the operability requirements for the RCS leakage detection instrumentation and reduces the time allowed for the plant to operate when the only TS-required operable RCS leakage detection instrumentation monitor is the containment atmosphere gaseous radiation monitor. Reducing the amount of time the plant is allowed to operate with only the containment atmosphere gaseous radiation monitor operable has a positive impact on the margin of safety by limiting the time of plant operation in this configuration, which increases the likelihood that an increase in RCS leakage will be detected before it potentially results in gross failure.

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

Based upon the above analysis, Dominion concludes that the requested change does not involve a significant hazards consideration, as set forth in 10 CFR 50.92(c), "Issuance of Amendment."

5.2 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA

A description of the proposed TS change and its relationship to applicable regulatory requirements were published in the *Federal Register* Notice of Availability on January 3, 2011, Vol. 76, No. 1, pages 189-190. Dominion has reviewed the NRC staff's model SE referenced in the CLIIP Notice of Availability and concluded that the regulatory evaluation section is applicable to North Anna Units 1 and 2. The following provides a discussion of the current licensing basis for North Anna Units 1 and 2:

North Anna Units 1 and 2 construction permits were issued in February of 1971 based on the station design being in conformance with the General Design Criteria (GDC) for Power Plants," published in 1966. However, North Anna's RCS leakage detection instrumentation meets the intent of the GDC 30 requirement published in 1971, in that "means shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage."

Title 10 CFR Part 50, Appendix A, GDC 30, "Quality of reactor coolant pressure boundary" requires "Means shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage." Although not specifically designed to meet GDC 30, North Anna, through its meeting the requirement of "General Design Criteria for Power Plants," published in 1971, and through various methods in place to identify RCS leakage sources, meets the intent of GDC 30.

Regulatory Guide 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973, describes acceptable methods of implementing the GDC 30 requirements with regard to the selection of leakage detection systems for the reactor coolant pressure boundary. As part of North Anna's submittal to be allowed to use leak-before-break methodology to remove large bore snubbers from the reactor coolant pumps and steam generators, the North Anna RCS leakage detection instrumentation system was evaluated against each of the regulatory positions contained in Regulatory Guide 1.45. In the subsequent NRC Safety Evaluation (Reference 1) it was determined North Anna RCS leakage detection system satisfied Regulatory Guide 1.45.

In order to support the elimination of augmented inspections on the RCS loop bypass lines, a plant specific leak-before-break (LBB) analysis was performed and submitted to the NRC (Reference 2). This plant specific LBB analysis was approved by the NRC on August 31, 1999 (Reference 3). However, to maintain the same analysis margins required by NUREG-1061 and Draft Standard Review Plan (SRP) Section 3.6.3, "Leak-Before-Break Evaluation Procedure," the North Anna leakage detection system was required to be capable of detecting a 0.5 gpm leak from the reactor coolant pressure boundary in one hour consistent with the assumptions of Regulatory Guide 1.45 with a source term of 0.2% failed fuel (Reference 4).

North Anna Updated Final Safety Analysis Report, Section 5.2.4, "Reactor Coolant Pressure Boundary Leak Detection System" further highlights the design requirements for North Anna RCS leakage detection instrumentation. UFSAR Section 5.2.4 is included as an attachment to this letter.

6.0 ENVIRONMENTAL CONSIDERATION

The proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, and would change an inspection or surveillance requirement. However, the proposed change 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 change 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 change.

7.0 REFERENCES

1. Letter from the USNRC to W. R. Cartwright, *North Anna Units 1 and 2 - Issuance of Amendments Re: Reactor Coolant Pump and Steam Generator Supports* (TAC NOS. 63577 AND 63578), dated December 5, 1988.

2. Letter from USNRC to J. P. O'Hanlon, *North Anna Power Station, Unit 1 and Unit 2 Containment Gaseous and Particulate Radiation Monitors,* dated March 18, 1997.

3. Letter from J. P. O'Hanlon to USNRC, *Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Protection Against Dynamic Effects Associated with a Loss of Coolant Accident,* dated June 23, 1998, Serial No. 98-013.

4. Letter from USNRC to J. P. O'Hanlon, *North Anna Power Station, Unit 1 and Unit 2 Protection Against Dynamic Effects Associated with a Loss-of-Coolant Accident (TAC NOS. MA2301 AND MA2302),* dated August 31, 1999.

ATTACHMENT 2

PROPOSED TECHNICAL SPECIFICATIONS PAGES (MARK-UP)

Virginia Electric and Power Company
(Dominion)
North Anna Power Station Units 1 and 2

3.4 REACTOR COOLANT SYSTEM (RCS)

For information only no changes

3.4.15 RCS Leakage Detection Instrumentation

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

a. One containment sump (level or discharge flow) monitor; and

b. One containment atmosphere radioactivity monitor (gaseous or particulate).

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Required containment sump monitor inoperable.	A.1	---------NOTE--------- Not required until 12 hours after establishment of steady state operation. ---------------------- Perform SR 3.4.13.1.	Once per 24 hours
	AND		
	A.2	Restore required containment sump monitor to OPERABLE status.	30 days

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. Required containment atmosphere radioactivity monitor inoperable.	B.1.1	Analyze grab samples of the containment atmosphere.	Once per 24 hours
	<u>OR</u>		
	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
	<u>AND</u>		
Insert A	B.2	Restore required containment atmosphere radioactivity monitor to OPERABLE status.	30 days
~~C.~~ D Required Action and associated Completion Time not met.	~~C~~D.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	~~C~~D.2	Be in MODE 5.	36 hours
~~D.~~ E All required monitors inoperable.	~~D~~E.1	Enter LCO 3.0.3.	Immediately

Insert A - New Condition for RCS Leakage Instruments

CONDITION	REQUIRED ACTION	COMPLETION TIME
------------- NOTE -------------- Only applicable when the containment atmosphere gaseous radiation monitor is the only OPERABLE monitor. ------------------------------------	C.1 Analyze grab samples of the containment atmosphere.	Once per 12 hours
C. Required containment sump monitor inoperable.	<u>AND</u>	
	C.2 Restore required containment sump monitor to OPERABLE status.	7 days

ATTACHMENT 3

PROPOSED TECHNICAL SPECIFICATIONS PAGES (TYPED)

Virginia Electric and Power Company
(Dominion)
North Anna Power Station Units 1 and 2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required containment atmosphere radioactivity monitor inoperable.	B.1.1 Analyze grab samples of the containment atmosphere. OR B.1.2 ---------NOTE--------- Not required until 12 hours after establishment of steady state operation. ---------------------- Perform SR 3.4.13.1. AND B.2 Restore required containment atmosphere radioactivity monitor to OPERABLE status.	Once per 24 hours Once per 24 hours 30 days
---------NOTE--------- Only applicable when the containment atmosphere gaseous radiation monitor is the only OPERABLE monitor. ---------------------- C. Required containment sump monitor inoperable.	C.1 Analyze grab samples of the containment atmosphere. AND C.2 Restore required containment sump monitor to OPERABLE status.	Once per 12 hours 7 days
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours
E. All required monitors inoperable.	E.1 Enter LCO 3.0.3.	Immediately

ATTACHMENT 4

TECHNICAL SPECIFICATION BASES CHANGES (INFORMATION ONLY)

Virginia Electric and Power Company
(Dominion)
North Anna Power Station Units 1 and 2

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.15 RCS Leakage Detection Instrumentation

Revision 0

BASES

BACKGROUND

UFSAR, Chapter 3 (Ref. 1) requires compliance with Regulatory Guide 1.45. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting RCS 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 in the control room is necessary to permit proper evaluation of all unidentified LEAKAGE.

In addition to meeting the OPERABILITY requirements, the monitors are typically set to provide the most sensitive response without causing an excessive number of spurious alarms. These leakage detection methods or systems differ in sensitivity and response time.

~~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 includes two sump level monitors that provide level indication. The "A" train level indicator provides input to a calculated discharge flow rate determined by the plant computer. Either level indication or the calculated containment sump discharge flow rate is acceptable for detecting increases in unidentified LEAKAGE.

The reactor coolant ~~contains~~ may contain 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 in accordance with Regulatory Guide 1.45 (Ref. 2) particulate and 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. One Containment Air Recirculation Fan (CARF) provides enough air flow for the operation of the radiation detectors.

(continued)

BASES

BACKGROUND (continued)

Air temperature and pressure monitoring methods may also be used to infer unidentified LEAKAGE to the containment. Containment temperature and pressure fluctuate slightly during unit 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 affected by containment free volume and, for temperature, detector location. Alarm signals from these instruments can be valuable in recognizing rapid and sizable leakage to the containment. Temperature and pressure monitors are not required by this LCO.

APPLICABLE SAFETY ANALYSES

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. Multiple instrument locations are utilized, if needed, to ensure that the transport delay time of 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 leakage occur 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

small amounts of unidentified LEAKAGE

~~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 unit in a safe condition, when RCS LEAKAGE indicates possible RCPB degradation.

Insert additional LCO Basis (Insert B)

The LCO is satisfied when monitors of diverse measurement means are available. Thus, the containment sump monitor, in combination with a gaseous or particulate radioactivity monitor, provides an acceptable minimum.

BASES

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

containment

radioactivity

With the required containment sump monitor inoperable, no other form of sampling can provide the equivalent information; however, the containment atmosphere radioactivity monitor will provide indications of changes in leakage. Together with the atmosphere monitor, 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 (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flow). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable unit conditions are established.

Restoration of the required sump monitor to OPERABLE status within a Completion Time of 30 days is required to regain the function after the monitor's 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 both gaseous and particulate containment atmosphere radioactivity monitoring 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.

(continued)

BASES

ACTIONS

B.1.1, B.1.2, and B.2 (continued)

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 radioactivity monitors.

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 (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flow). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable unit conditions are established. The 30 day Completion Time recognizes at least one other form of leakage detection is available.

Insert New C .1 and C.2 Action (Insert C)

~~C~~.1 and ~~C~~.2 D

If a Required Action of Condition A or B cannot be met, the unit must be brought to a MODE in which the requirement does not apply. To achieve this status, the unit 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 unit conditions from full power conditions in an orderly manner and without challenging unit systems.

~~D~~.1 E

With all required monitors inoperable, no required automatic means of monitoring leakage are available, and immediate unit shutdown in accordance with LCO 3.0.3 is required.

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 monitor. The check gives reasonable confidence that the channel is operating properly. The Frequency of 12 hours is based on instrument reliability and is reasonable for detecting off normal conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a COT every 92 days on the required containment atmosphere radioactivity monitor. The test ensures that the monitor can perform its function in the desired manner. The test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency is based on the staff recommendation for increasing the availability of radiation monitors according to NUREG-1366 (Ref. ~~3~~ 4).

SR 3.4.15.3 and SR 3.4.15.4

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 18 months is a typical refueling cycle and considers channel reliability. Again, operating experience has proven that this Frequency is acceptable.

REFERENCES

1. UFSAR, Chapter 3.

2. Regulatory Guide 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," dated May, 1973.

3. UFSAR, Chapter 5.2.4

~~3~~ 4. NUREG-1366, dated December, 1992.

LCO Bases - Insert B

The LCO requires two instruments to be OPERABLE.

The containment sump used to collect unidentified LEAKAGE includes two sump level monitors that provide level indication. *The "A" train level indicator provides input to a calculated discharge flow rate* determined by the plant computer. Either level indication or the calculated containment sump discharge flow rate is acceptable for detecting increases in unidentified LEAKAGE. The identification of an increase in unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the containment sump 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, can be detected by the gaseous or particulate containment atmosphere radioactivity monitor. Only one of the two detectors is required to be OPERABLE. 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 0.5 gpm increase within 1 hour during normal operation. However, the gaseous or particulate containment atmosphere radioactivity monitor is OPERABLE when it is capable of detecting a 0.5 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).

The LCO is satisfied when monitors of diverse measurement means are available. Thus, the containment sump monitor, in combination with a gaseous or particulate radioactivity monitor provides an acceptable minimum.

Action Bases - C.1 and C.2 - Insert C

C.1, and C.2

With the required containment sump monitor inoperable, the only means of detecting LEAKAGE is the required containment atmosphere radiation monitor. A Note clarifies that this Condition is applicable when the only OPERABLE monitor is the containment atmosphere gaseous radiation monitor. The containment atmosphere gaseous radioactivity monitor typically cannot detect a 1 gpm leak within one hour 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 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 capability. The 7 day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

ATTACHMENT 5

UFSAR Section 5.2.4

RCS LEAKAGE DETECTION INSTRUMENTATION

(INFORMATION ONLY)

**Virginia Electric and Power Company
(Dominion)
North Anna Power Station Units 1 and 2**

In general, all of the material listed in Tables 5.2-22 and 5.2-23 that are used in principal pressure-retaining applications and are subject to elevated temperature during system operation are in contact with thermal insulation that covers their outer surfaces.

The thermal insulation used on the reactor coolant boundary is specified to be either reflective stainless steel type or to be made of compounded materials that yield low leachable chloride and/or fluoride concentrations. The compounded materials in the form of blocks, boards, cloths, tapes, adhesives, cements, etc., are silicated to provide the protection of austenitic stainless steels against stress corrosion associated with results from accidental wetting of the insulation by spillage, minor leakage, or other contamination. Each lot of insulation material is qualified and analyzed in accordance with Westinghouse PWR process specification 83336 KA to ensure that all of the materials provide a compatible combination for the reactor coolant boundary.

The reactor vessel closure head metal reflective insulation used on NAPS Unit 1 and Unit 2 was qualified and analyzed in accordance with Framatome ANP design specifications 08-5023496 and 08-5021646 (References 24 & 25).

In the event of coolant leakage, the ferritic materials will show increased general corrosion rates. Where minor leakage is expected from service experience (valve packing, pump seals, etc.), materials compatible with the coolant are used. These are shown in Table 5.2-22 and 5.2-23. Ferritic materials exposed to coolant leakage can be observed as part of the inservice visual and/or nondestructive inspection program to ensure the integrity of the component for subsequent service.

5.2.4 Reactor Coolant Pressure Boundary Leakage Detection Systems

5.2.4.1 Leakage to the Containment

5.2.4.1.1 Leakage Detection

Leakage from the reactor coolant pressure boundary (RCPB) to the containment atmosphere is detected and is indicated in the main control room by one or more of the following methods:

1. Containment gaseous radioactivity monitor (measurement range: $10\text{-}10^6$ cpm).
2. Containment particulate radioactivity monitor (measurement range: $10\text{-}10^6$ cpm).
3. Containment structure leakage monitoring system.
4. Containment sump monitoring.
5. Reactor coolant system makeup rate.

Indications and alarms are provided for all of the above systems in the control room.

The RCS leakage detection systems monitor and detect leakage from the reactor coolant pressure boundary during normal plant operations and after seismic events to provide prompt and quantitative information to the operators to permit immediate corrective actions should the reactor coolant pressure boundary leak be detrimental to the safety of the facility.

These detection systems are generally consistent with the recommendations of Regulatory Guide 1.45, *Reactor Coolant Pressure Boundary Leakage Detection Systems,* May 1973. The containment atmospheric particulate and gaseous radioactivity monitoring system is not fully seismically qualified. Consistent with Regulatory Guide 1.45 these monitors can perform their intended function during normal plant operations. To ensure the safety function of detecting reactor coolant pressure boundary leakage is maintained after a seismic event the operability of these monitors is required to be verified immediately following a seismic event or the affected unit(s) will be shut down and cooled down to Cold Shutdown.

Generic Letter 84-04, *Safety Evaluation of Westinghouse Topical Reports Dealing with Elimination of Postulated Pipe Breaks in PWR Primary Main Loops*, dated February 1, 1984 permitted the elimination of the asymmetric blowdown loads resulting for double ended pipe breaks in the main coolant loop piping from the design basis of Westinghouse Owner's Group plants with two conditions. The second condition required leakage detection systems at the facility sufficient to provide adequate margin to detect the leakage from a postulated circumferential throughwall flaw utilizing the guidance of Regulatory Guide 1.45 with the exception that seismic qualification of the airborne particulate radiation monitor was not necessary. At least one leakage detection system with a sensitivity capable of detecting 1 gpm in 4 hours must be operable.

To eliminate the need for a robust support system on the Reactor Coolant System (RCS) loop bypass lines to protect against the dynamic effect of pipe rupture an augmented inspection program was established and implemented for the RCS bypass lines. In order to support the elimination of augmented inspections on the Reactor Coolant System loop bypass lines, a plant specific Leak-Before-Break (LBB) analysis was performed and submitted to the NRC (Reference 28). This plant specific LBB analysis was approved by the NRC on August 31, 1999 (Reference 29). However, to maintain the same analysis margins required by NUREG-1061 and Draft Standard Review Plan (SRP) Section 3.6.3, "Leak-Before-Break Evaluation Procedure," the leakage detection system (radiation monitoring) is required to be capable of detecting a 0.5 gpm leak from the reactor coolant pressure boundary in one hour with an assumed 0.2% failed fuel.

Based on NRC's generic *Safety Evaluation Report for Elimination of Postulated Pipe Breaks in PWR Primary Main Loops* and the North Anna specific Safety Evaluation Report (amendment numbers 107 for Unit 1 and 93 for Unit 2 dated December 5, 1988), it is no longer necessary to have the containment airborne particulate radiation monitor seismically qualified for the detection of reactor coolant system pressure boundary leakage after a safe shutdown earthquake.

Following a seismic event, the leakage detection systems will continue to operate with the exception of the containment gaseous and particulate radioactivity monitors and heat load determination from the containment recirculation system coolers.

1. Containment Gas and Particulate Radiation Monitors - Experience has shown that these monitors respond rapidly to reactor coolant system leakage and provide a sensitive indication of such leakage. The time required to detect reactor coolant leakage depends on the size of the break, reactor coolant activity level, and containment background activity.

   The sensitivities of the gaseous and particulate monitors are shown in Figure 5.2-11 along with a graph of the time required for the minimum detectable concentration associated with a given leak rate to reach the detector. Both the gaseous radioactivity monitor and the particulate radioactivity monitor have sensitivities such that a 0.5 gpm leak from the reactor coolant pressure boundary can be detected within an hour under the following conditions:

   a. There is not prior reactor coolant leakage into the containment.

   b. The reactor coolant activities are based on the expected failed fuel values for 0.2% failed fuel.

   It has been demonstrated that the radiation monitors have the ability to detect RCS leakage down to 0.5 gpm within one hour threshold range consistent with the assumptions of RG 1.45 for source term (0.2% failed fuel) (Reference 30).

   Early in plant life, in conditions of low failed fuel (below 0.01%), the system is not capable of detecting the 0.5 gpm leak within 1 hour, as required by the NRC SER (Reference 29). This inability to meet the sensitivity of the SER holds true for conditions of prior leakage with high-percent failed fuel where existing containment activity could mask any activity increase resulting from a 0.5 gpm increase in leakage.

2. Containment Structure Leakage Monitoring System - Sensitivity of the leakage monitoring system (Section 6.2.7) to leakage from the RCPB is dependent on the sensitivity of the instrumentation.

   Instrumentation in the leakage monitoring system that can be used to detect increases in containment temperature and pressure consists of pressure instruments with an uncertainty of 1.055 psi and temperature instruments with an uncertainty of 0.788°F.

   The information provided by these instruments can be used to detect increases in containment pressure and temperature that is indicative of a leak from the RCS.

3. Containment Sump - Leakage from unidentified sources will pass to the containment structure in the liquid and vapor phases and will be collected in the containment sump. The containment structure has areas that may temporarily hold up small amounts of liquid and thus prevent the liquid from immediately reaching the containment sump. In addition, the

containment sump also collects liquid from sources other than the RCPB. The determination of exact RCPB leakage by measuring collected water in the containment sump is not accurate to 1 gpm within 1 hour but is capable of 1 gpm in 4 hours.

Leakage from the RCPB by identified sources is collected in portions of the vent and drain system within the containment. These sources include valve packing leakoffs and reactor coolant seal leakoffs. These systems are piped separately and maintained isolated from potential unidentified sources. This system is described in Section 9.3.3.

4. Reactor Coolant System Makeup Rate - Any leakage from the RCPB causes an increase in the amount of makeup water required to maintain normal level in the pressurizer. The demineralized water and concentrated boric acid makeup flow rates are both recorded and alarmed in the main control room.

5. Normal Leakage - Valve stem, seal, and flange systems that are part of the reactor coolant pressure boundary and from which normal design leakage is expected are provided with drains or auxiliary sealing systems. Section 9.3 describes those components from which the leakage is collected either in the primary drain transfer tank or pressurizer relief tank.

   a. The reactor coolant pump seal leakoff is described in Section 5.5.1.3.

   b. Leakage from the pressurizer safety valves will be identified by temperature sensors that transmit to the main control room. Any temperature increase above the containment ambient temperature that is detected by these sensors will indicate safety valve leakage.

   c. Leakage from the reactor vessel flange gasket is piped to the primary drain transfer tank.

Operating experience from the R. E. Ginna plant has indicated that the average total leakage from the reactor coolant system, including the charging and letdown portion of the chemical and volume control system, was about 0.5 gpm. Major sources of this leakage were the reciprocating charging pump seals, averaging about 0.2 gpm, and the valves in the pressurizer spray and spray bypass system, which averaged between 0.2 gpm and 0.5 gpm between repackings.

The North Anna Power Station, Units 1 and 2, uses valves which eliminate the large valve leakages experienced at the R. E. Ginna plant. The pressurizer spray valves are rotary vee ball type control valves, which have less stem leakage than globe type valves, and the pressurizer spray valves bypass valves are weir type diaphragm valves.

Also, the design does not include any reciprocating charging pump (there are three centrifugal charging pumps), so there is no leakage from this source.

Intersystem leakage, such as leakage from the reactor coolant system to the steam generators or from the reactor coolant system to the component cooling system, can be detected by continuous radiation monitors in these two systems. These detection systems are described in Section 11.4.

While the leakage detection system is not capable of detecting a 1-gpm leak in 1 hour under all conditions, the system is capable of detecting a 5-gpm leak in 1 hour under all conditions. A 1 gpm leak in 4 hours can also be determined during steady state operation. The identification of leakage sources and the required sensitivity relative to critical cracks are discussed in Section 5.2.4.1.2. Reference 1 discusses critical cracks in piping systems. The results of this report can be used to show that for pipes greater than 4 inches in diameter a crack capable of leaking at 5 gpm is smaller than a critical crack. Therefore, catastrophic failure of the piping system is not expected for this 5-gpm leak. For lines 4 inches and smaller, core cooling analysis shows that breaks of this equivalent cross-sectional area will not result in reactor fuel clad damage; therefore, the sensitivity of 5 gpm under all conditions is justified.

5.2.4.1.2 Identification of Leak Sources

Leakage is collected from all components from which significant leakage is expected. Other leakage sources can be roughly located by abnormal changes in temperature or humidity in any specific region of the containment.

Reference 1 shows that, for lines 3 inches or more in diameter, leakage through a critical through-wall crack is considerably greater than the minimum detectable leak.

Reference 1 also provides the length of a critical through-wall crack for lines 2 inches or greater in diameter and the ratio of this crack length to that of a crack permitting 2-gpm leakage for pipe diameters 4 inches and greater. The mathematical model used for this analysis is also given in Reference 1.

5.2.4.1.3 Testing

The RCPB leak detection systems are tested periodically as outlined in the Technical Specifications.

5.2.4.1.4 Maximum Allowable Leakage

Maximum allowable leakage rates from the RCPB have been established in the Technical Specifications.

5.2.4.2 **N-16 Primary to Secondary Leakage Detection System**

There are four N-16 leak detection systems per unit. Three of the detectors are located adjacent to each of the main steam lines where they enter the Mechanical Equipment Room (MER) and one at the main steam header in the turbine building. They continuously monitor main steam and provide a digital indication and recorder input to the control room. All four N-16 indicators have been located in the existing Westinghouse Radiation Monitoring Cabinets. They provide a digital indication of 1 to 1000 gallons per day of primary to secondary leakage. The recorder display is a 3 decade log scale. Alarm inputs are representative of an alert condition (10 gpd), hi (50 gpd), hi-hi (100 gpd) of leakage above base line data. A system failure alarm also alerts the operator of an internal malfunction. All central processing units (CPUs) are housed in an

19. Letter from L. N. Hartz to USNRC, *Virginia Electric and Power Company, North Anna Power Station Unit 2, Application of Sequoyah 2 Surveillance Data to North Anna Unit 2 Reactor Vessel Weld Material Fabricated from Weld Wire Heat 4278,* Serial No. 01-262, dated April 27, 2001.

20. Framatome ANP Document No. 38-1290372, *RCCM/ASME Equivalency Report—Base Materials for North Anna Unit 2 Reactor Vessel Closure Head.*

21. Framatome ANP Document No. 38-1290373, *RCCM/ASME Equivalency Report—Filler Materials for North Anna Unit 2 Reactor Vessel Closure Head.*

22. Framatome ANP Document No. 38-1290441, *RCCM/ASME Equivalency Report—Base Materials for North Anna Unit 1 Reactor Vessel Closure Head.*

23. Framatome ANP Document No. 38-1290448, *RCCM/ASME Equivalency Report—Filler Materials for North Anna Unit 1 Reactor Vessel Closure Head.*

24. Framatome ANP Document 08-5021646, *Replacement RVCH Insulation North Anna 2,* Revision 01, December 2002.

25. Framatome ANP Document 08-5023496, *Replacement RVCH Insulation North Anna 1,* Revision 00, February 2003.

26. Letter from W.R. Matthews to USNRC, *Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Proposed Technical Specifications Change Request, Reactor Coolant System Pressure/Temperature Limits, LTOPS Setpoints and LTOPS Enable Temperatures,* Serial No. 04-380, dated July 1, 2004.

27. Letter from USNRC to D.A. Christian, *North Anna Power Station, Unit Nos. 1 and 2 (North Anna 1 and 2)—Approval of Proposed Reactor Vessel Material Surveillance Capsule Withdrawal Schedule (TAC Nos. MC6412 and MC6413),* Serial No. 06-271, dated March 15, 2006.

28. Letter from J. P. O'Hanlon, *Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Protection Against Dynamic Effects Associated with a Loss of Coolant Accident*, dated June 23, 1998, Serial No. 98-013.

29. Letter from USNRC to J. P. O'Hanlon, *North Anna Power Station, Unit 1 and Unit 2, Protection Against Dynamic Effects Associated with a Loss-of-Coolant Accident (TAC Nos. MA2301 and MA2302)*, dated August 31, 1999.

30. Letter from D. A. Christian, *Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Request for Additional Information, Leak Detection System Sensitivity for Leak-Before-Break Application on Reactor Coolant Loop Bypass Lines*, dated July 9, 1999, Serial No. 99-331.