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U. S. Nuclear Regulatory Commission
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Washington, DC 20555

**SUSQUEHANNA STEAM ELECTRIC STATION**
**AMENDMENT REQUEST NO. 308 TO LICENSE NPF-14 AND**
**AMENDMENT REQUEST NO. 279 TO LICENSE NPF-22:**
**ADOPTION OF TECHNICAL SPECIFICATION TASK FORCE**
**TRAVELER TSTF-514, REVISION 3, "REVISE BWR OPERABILITY**
**REQUIREMENTS AND ACTIONS FOR RCS LEAKAGE**
**INSTRUMENTATION"** **Docket Nos. 50-387**
**PLA-6695** **and 50-388**

Reference: *Technical Specification Task Force Traveler TSTF-514, Revision 3, "Revise BWR Operability Requirements and Actions for RCS Leakage Instrumentation."*

In accordance with the provisions of Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), PPL Susquehanna, LLC (PPL) is submitting a request for amendments to the Technical Specifications (TS) for the Susquehanna Steam Electric Station, Units 1 and 2.

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 the NRC-approved Revision 3 to Standard Technical Specification (STS) Change Traveler TSTF-514, "Revise BWR Operability Requirements and Actions for RCS Leakage Instrumentation." The availability of this TS improvement was announced in the *Federal Register* on 12/17/2010 (75 FR 79048) as part of the consolidated line item improvement process (CLIIP).

- Attachment 1 provides an evaluation of the proposed changes.
- Attachment 2 provides the marked up pages of the existing TS to show the proposed changes.

- Attachment 3 provides the marked up pages of the existing TS Bases to show the proposed changes.

PPL requests approval of the proposed license amendment by 12/30/2011, with the amendment being implemented within 60 days of approval.

In accordance with 10 CFR 50.91(a)(1), "Notice for Public Comment," the analysis of No Significant Hazards Consideration, using the standards in 10 CFR 50.92, is provided to the Commission in accordance with the distribution requirements in 10 CFR 50.4. In accordance with 10 CFR 50.91(b)(1), "State Consultation," a copy of this application is provided to the designated Pennsylvania Official.

If you should have any questions about this submittal, please contact Ms. Margaret Rochester at (570) 542-3028.

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

Executed on 4/8/2011

Timothy S. Rausch

Attachment 1 – Evaluation of Proposed Changes
Attachment 2 – Markups of Existing Technical Specifications
Attachment 3 – Markups of Existing Technical Specification Bases

Copy: NRC Region I
Mr. P. W. Finney, NRC Sr. Resident Inspector
Mr. R. R. Janati, DEP/BRP
Mr. B. K. Vaidya, NRC Project Manager

# Attachment 1 to PLA-6695

# PPL Susquehanna, LLC, Unit 1 and Unit 2 Proposed Technical Specification Amendment for Adoption of Task Force Traveler TSTF-514, Revision 3, "Revise BWR Operability Requirements and Actions for RCS Leakage Instrumentation"


1. DESCRIPTION
2. PROPOSED CHANGES
3. BACKGROUND
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6. ENVIRONMENTAL CONSIDERATIONS
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# PPL EVALUATION

**Subject: PPL Susquehanna, LLC, Unit 1 and Unit 2 Proposed Technical Specification Amendment for Adoption of Task Force Traveler TSTF-514, Revision 3, Revise BWR 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-514, "Revise BWR Operability Requirements and Actions for RCS Leakage Instrumentation." The availability of this TS improvement was announced in the *Federal Register* on 12/17/2010 (75 FR 79048) 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 3.4.6, "RCS Leakage Detection Instrumentation" and revise the associated bases. New Condition C is applicable when the primary containment atmosphere gaseous radiation monitor is the only operable TS-required instrument monitoring RCS leakage, i.e., TS-required particulate and sump monitors are inoperable. New Condition C Required Actions require monitoring RCS leakage by obtaining and analyzing grab samples of the primary containment atmosphere every 12 hours, monitoring RCS leakage using administrative means every 12 hours, and taking action to restore monitoring capability using another monitor within 7 days.

Additionally, minor editorial revisions are proposed to ensure continuity of the TS format. These changes are the result of new Condition C and consist of re-lettering existing conditions C and D as conditions D and E respectively. Revisions to the TS Bases are also provided to clarify the specified safety function for each required instrument in Limiting Condition for Operation (LCO), delete discussion from the TS Bases that could be construed to alter the meaning of TS operability requirements, and reflect the proposed changes to TS 3.4.6.

PPL is not proposing variations or deviations from the TS changes described in TSTF-514, Revision 3, or the NRC staff's model safety evaluation (SE) published in the *Federal Register* on 12/17/2010 (75 FR 79048) as part of the CLIIP Notice of Availability.

## 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, in response to IN 2005-24, have taken action 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 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 IN 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 Required 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

PPL has reviewed TSTF-514, Revision 3, and the model Safety Evaluation (SE) published on 12/17/2010 (75 FR 79048) as part of the CLIIP Notice of Availability. PPL has concluded that the technical bases presented in TSTF Traveler-514, Revision 3, and the model SE prepared by the NRC staff are applicable to Susquehanna.

The RCPB and the leak detection system are designed to meet the requirements of Criterion 30. Means are provided for detecting reactor coolant leakage. The leak detection system consists of sensors and instruments to detect, annunciate, and in some cases, isolate the RCPB from potentially hazardous leaks before predetermined limits are exceeded. Small leaks are detected by temperature and pressure changes, increased frequency of sump pump operation, and by measuring fission product concentration. In addition to these means of detection, large leaks are detected by changes in flow rates in process lines, and changes in reactor water level. The allowable leakage rates have been based on the predicted and experimentally determined behavior of cracks in pipes, the ability to make up coolant system leakage, the normally expected background leakage due to equipment design, and the detection capability of the various sensors and instruments. The total leakage rate limit is established so that, in the absence of normal AC power with a loss of feedwater supply, makeup capabilities are provided by the RCIC

system. While the RCIC system provides protection from small leaks, the ECCS network provides protection for the complete range of discharges from ruptured pipes. Thus, protection is provided for the full spectrum of possible discharges.

Primary containment leak detection is discussed in the Susquehanna FSAR in section 5.2.5.1.2 "Detection of Abnormal Leakage Within the Primary Containment (Non-NSSS)." Leakage through the reactor coolant pressure boundary within the primary containment is detected by monitoring temperatures, pressures, airborne gaseous and particulate radioactivity, and changes of levels in the floor drain sumps. The following systems are used to monitor unidentified primary coolant pressure boundary leakage.

- Primary containment atmosphere monitoring system (containment radiation detection)
- Drywell floor drain sump level monitoring and drywell equipment drain tank level monitoring system

These leak detection systems are designed in accordance with recommendations of Regulatory Guide 1.45, Revision 0.

The primary containment atmosphere monitoring system includes a noble gas radiation monitor, and a particulates radiation monitor. The two radiation monitors sample the drywell for activity levels on the assumption that flashing coolant leakage will result in radioactivity in the atmosphere.

The administrative means of monitoring include diverse alternative mechanisms from which appropriate indicators may be selected based on plant conditions. PPL will utilize the following method or methods as appropriate considering current plant conditions and historical or expected sources of unidentified leakage: primary containment pressure, primary containment temperature, component cooling water system outlet temperatures, component cooling water system makeup, reactor recirculation system pump seal pressure and temperature, reactor recirculation system pump motor cooler temperatures, primary containment cooling fan outlet temperatures, reactor building chiller amperage, control rod drive system flange temperatures, safety relief valve tailpipe temperature, flow, pressure, or other approved methods.

The proposed Required Actions to analyze primary containment atmospheric grab samples and monitor RCS leakage by the administrative means above are sufficient to alert the operating staff to an unexpected increase in RCS leakage.

## 5.0 REGULATORY SAFETY ANALYSIS

### 5.1 No Significant Hazards Consideration Determination

PPL 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 3.4.6, "Reactor Coolant System (RCS) Leakage Detection Instrumentation" by adding Condition C and Required Actions and the licensing basis for the primary containment atmospheric gaseous radiation monitor. Additionally, existing Conditions C and D would be re-lettered as Conditions D and E. Revisions to the associated TS Bases for TS 3.4.6 are also included.

Basis for proposed no significant hazards consideration determination: As required by 10 CFR 50.91(a), the PPL 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 and reduces the time allowed for the plant to operate when the only TS-required operable RCS leakage detection instrumentation monitor is the primary containment atmospheric gaseous radiation monitor. The monitoring of RCS leakage is not a precursor to any accident previously evaluated. The monitoring of RCS leakage is not used to mitigate the consequences of any accident previously evaluated. Therefore, it is concluded that this 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 primary containment atmospheric 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. 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 primary containment atmospheric gaseous radiation monitor. Reducing the amount of time the plant is allowed to operate, with only the primary containment atmospheric gaseous radiation monitor operable, increases the margin of safety by limiting continued plant operation during the timeframe of reduced monitoring capabilities. Therefore, it is concluded that the proposed change does not involve a significant reduction in a margin of safety.

Based upon the above analysis, PPL 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 12/17/2010 (75 FR 79048). PPL 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 Susquehanna.

The RCPB and the leak detection system are designed to meet the requirements of Criterion 30. Means are provided for detecting reactor coolant leakage. The leak detection system consists of sensors and instruments to detect, annunciate, and in some cases, isolate the RCPB from potentially hazardous leaks before predetermined limits are exceeded. Small leaks are detected by temperature and pressure changes, increased frequency of sump pump operation, and by measuring fission product concentration. In addition to these means of detection, large leaks are detected by changes in flow rates in process lines, and changes in reactor water level. The allowable leakage rates have been based on the predicted and experimentally determined behavior of cracks in pipes, the ability to make up coolant system leakage, the normally expected background leakage due to equipment design, and the detection capability of the various sensors and instruments. The total leakage rate limit is established so that, in the absence of normal AC power with a loss of feedwater supply, makeup capabilities are provided by the RCIC system. While the RCIC system provides protection from small leaks, the ECCS network

provides protection for the complete range of discharges from ruptured pipes. Thus, protection is provided for the full spectrum of possible discharges.

Primary containment leak detection is discussed in the Susquehanna FSAR in section 5.2.5.1.2 "Detection of Abnormal Leakage Within the Primary Containment (Non-NSSS)." Leakage through the reactor coolant pressure boundary within the primary containment is detected by monitoring temperatures, pressures, airborne gaseous and particulate radioactivity, and changes of levels in the floor drain sumps. The following systems are used to monitor unidentified primary coolant pressure boundary leakage

- Primary containment atmosphere monitoring system (containment radiation detection)
- Drywell floor drain sump level monitoring and drywell equipment drain tank level monitoring system

The primary containment atmosphere monitoring system includes a noble gas radiation monitor, and a particulates radiation monitor. The two radiation monitors sample drywell for the activity levels on the assumption that flashing coolant leakage will result in radioactivity in the atmosphere.

These leak detection systems are designed in accordance with recommendations of Regulatory Guide 1.45, Revision 0.

## 6.0 ENVIRONMENTAL CONSIDERATIONS

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

7.1 Susquehanna FSAR section 5.2
7.2 Susquehanna FSAR section 3.1
7.3 Susquehanna FSAR section 3.13

# Attachment 2 to PLA-6695

# PPL Susquehanna, LLC, Unit 1 and Unit 2

# Markups of Existing Technical Specifications

## 3.4 REACTOR COOLANT SYSTEM (RCS)

### 3.4.6 RCS Leakage Detection Instrumentation

LCO 3.4.6 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Drywell floor drain sump monitoring system; and

b. One channel of either primary containment atmospheric particulate or atmospheric gaseous monitoring system.

APPLICABILITY: MODES 1 and 2, and 3.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. Drywell floor drain sump monitoring system inoperable. | A.1 Restore drywell floor drain sump monitoring system to OPERABLE status. | 30 days |

(continued)

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| B. Required primary containment atmospheric monitoring system inoperable. | B.1 Analyze grab samples of primary containment atmosphere.<br><br>AND<br><br>B.2 Restore required primary containment atmospheric monitoring system to OPERABLE status. | Once per 12 hours<br><br><br><br>30 days |
| ----------NOTE----------<br><br>Only applicable when the primary containment atmospheric gaseous radiation monitor is the only OPERABLE monitor.<br>----------<br><br>C. Drywell floor drain sump monitoring system inoperable | C.1 Analyze grab samples of the primary containment atmosphere.<br><br>AND<br><br>C.2 Monitor RCS LEAKAGE by administrative means.<br><br>AND<br><br>C.3. Restore drywell floor drain sump monitoring system to OPERABLE status. | Once per 12 hours<br><br><br><br>Once per 12 hours<br><br><br><br>7 days |
| ~~C~~D. Required Action and associated Completion Time of Condition A ~~or~~ ,B, or C not met. | ~~C~~D.1 Be in MODE 3.<br><br>AND<br><br>~~C~~D.2 Be in MODE 4. | 12 hours<br><br><br><br>36 hours |
| ~~D~~E. All required leakage detection systems inoperable. | ~~D~~E.1 Enter LCO 3.0.3. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.6.1 | Perform a CHANNEL CHECK of required primary containment atmospheric monitoring system. | 12 hours |
| SR 3.4.6.2 | Perform a CHANNEL FUNCTIONAL TEST of required leakage detection instrumentation. | 31 days |
| SR 3.4.6.3 | Perform a CHANNEL CALIBRATION of required leakage detection instrumentation. | 24 months |

## 3.4 REACTOR COOLANT SYSTEM (RCS)

### 3.4.6 RCS Leakage Detection Instrumentation

LCO 3.4.6 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Drywell floor drain sump monitoring system; and

b. One channel of either primary containment atmospheric particulate or atmospheric gaseous monitoring system.

APPLICABILITY: MODES 1 and 2, and 3.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. Drywell floor drain sump monitoring system inoperable. | A.1 Restore drywell floor drain sump monitoring system to OPERABLE status. | 30 days |

(continued)

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| B. Required primary containment atmospheric monitoring system inoperable. | B.1 Analyze grab samples of primary containment atmosphere.<br><br>AND<br><br>B.2 Restore required primary containment atmospheric monitoring system to OPERABLE status. | Once per 12 hours<br><br>30 days |
| ----------NOTE----------<br><br>Only applicable when the primary containment atmospheric gaseous radiation monitor is the only OPERABLE monitor.<br>----------<br><br>C. Drywell floor drain sump monitoring system inoperable | C.1 Analyze grab samples of the primary containment atmosphere.<br><br>AND<br><br>C.2 Monitor RCS LEAKAGE by administrative means.<br><br>AND<br><br>C.3 Restore drywell floor drain sump monitoring system to OPERABLE status. | Once per 12 hours<br><br>Once per 12 hours<br><br>7 days |
| ~~C~~D. Required Action and associated Completion Time of Condition A, ~~or~~ B, or C not met. | ~~C~~D.1 Be in MODE 3.<br><br>AND<br><br>~~C~~D.2 Be in MODE 4. | 12 hours<br><br>36 hours |
| ~~D~~E. All required leakage detection systems inoperable. | ~~D~~E.1 Enter LCO 3.0.3. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.6.1 | Perform a CHANNEL CHECK of required primary containment atmospheric monitoring system. | 12 hours |
| SR 3.4.6.2 | Perform a CHANNEL FUNCTIONAL TEST of required leakage detection instrumentation. | 31 days |
| SR 3.4.6.3 | Perform a CHANNEL CALIBRATION of required leakage detection instrumentation. | 24 months |

# Attachment 3 to PLA-6695

# PPL Susquehanna, LLC, Unit 1 and Unit 2

# Markups of Existing Technical Specification Bases

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.6 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

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

Limits on LEAKAGE from the reactor coolant pressure boundary (RCPB) are required so that appropriate action can be taken before the integrity of the RCPB is impaired (Ref. 2). Leakage detection systems for the RCS are provided to alert the operators when leakage rates above normal background levels are detected and also to supply quantitative measurement of leakage rates. The Bases for LCO 3.4.4, "RCS Operational LEAKAGE," discuss the limits on RCS LEAKAGE rates.

Systems for separating the LEAKAGE of an identified source from an unidentified source are necessary to provide prompt and quantitative information to the operators to permit them to take immediate corrective action.

LEAKAGE from the RCPB inside the drywell is detected by at least one of two or three independently monitored variables, such as sump level changes and drywell gaseous and particulate radioactivity levels. The primary means of quantifying LEAKAGE in the drywell is the drywell floor drain sump monitoring system which consists of two drywell floor drain sump level Channels. Both Channels are required to be Operable to satisfy the LCO.

The drywell floor drain sump monitoring system monitors the LEAKAGE collected in the floor drain sump. This unidentified LEAKAGE consists of LEAKAGE from control rod drives, valve flanges or packings, floor drains, the Closed Cooling Water System, and drywell air cooling unit condensate drains, and any LEAKAGE not collected in the drywell equipment drain tank.

The level of each drywell sump is continuously recorded in the Main Control Room. The change in

(continued)

BASES

BACKGROUND (continued)

sump level per unit time determines the leak rate and is calculated from the recorder.

The floor drain sump level indicators have switches that start and stop the sump pumps when required. If the sump fills to the high high level setpoint, an alarm sounds in the control room.

The primary containment air monitoring systems continuously monitor the primary containment atmosphere for airborne particulate and gaseous radioactivity. A sudden increase of radioactivity, which may be attributed to RCPB steam or reactor water LEAKAGE, is annunciated in the control room. ~~The primary containment atmosphere particulate and gaseous radioactivity monitoring systems are not capable of quantifying LEAKAGE rates. These monitors provide an alternate means of leak detection to that supplied by the sump level monitors, and although they cannot ensure detection of a 1 gpm leak in 1 hour in all cases, they provide a diverse means of leak detection (Ref. 3).~~

APPLICABLE SAFETY ANALYSES

A threat of significant compromise to the RCPB exists if the barrier contains a crack that is large enough to propagate rapidly. LEAKAGE rate limits are set low enough to detect the LEAKAGE emitted from a single crack in the RCPB (Refs. ~~4~~3 and ~~5~~4). ~~Each of the leakage detection systems inside the drywell is designed with the capability of detecting LEAKAGE less than the established LEAKAGE rate limits.~~ The allowed LEAKAGE rates are well below the rates predicted for critical crack sizes (Ref. ~~6~~5). Therefore, these limits ~~actions~~ provide adequate response before a significant break in the RCPB can occur.

RCS leakage detection instrumentation satisfies Criterion 1 of the NRC Policy Statement (Ref. 7).

LCO

This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide confidence that small amounts of unidentified LEAKAGE are detected in time to allow actions to place the plant in a safe condition, when RCS LEAKAGE indicates possible RCPB degradation.

The LCO requires two instruments to be OPERABLE.

(continued)

BASES

LCO (continued)

The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE rate from the RCS. Thus, for the system to be considered OPERABLE, the sump level monitoring portion of the system must be OPERABLE and capable of determining the leakage rate. The identification of an increase in unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the drywell floor drain 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 primary containment sump monitor OPERABILITY.

The reactor coolant contains radioactivity that, when released to the primary containment, can be detected by the gaseous or particulate primary containment atmospheric 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 primary containment atmospheric radioactivity monitors to detect a 1 gpm increase within 1 hour during normal operation. However, the gaseous or particulate containment primary atmospheric radioactivity monitor is OPERABLE when it is capable of detecting a 1 gpm increase in unidentified LEAKAGE within 1 hour given an RCS activity equivalent to that assumed in the design calculations for the monitors (Reference 6).

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

~~The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE from the RCS. Thus, for the system to be considered OPERABLE, the system must be capable of measuring reactor coolant leakage. The other monitoring systems provide early alarms to the operators so closer examination of other detection systems will be made~~

(continued)

BASES

LCO (continued)

~~to determine the extent of any corrective action that may be required. With the leakage detection systems inoperable, monitoring for LEAKAGE in the RCPB is degraded~~.

APPLICABILITY

In MODES 1, 2, and 3, leakage detection systems are required to be OPERABLE to support LCO 3.4.4. This Applicability is consistent with that for LCO 3.4.4.

ACTIONS

A.1

With the drywell floor drain sump monitoring system inoperable, the primary containment atmospheric activity monitor will provide indication of changes in leakage.

With the drywell floor drain sump monitoring system inoperable, operation may continue for 30 days. However, RCS unidentified and total LEAKAGE is still required to be determined every 12 hours (SR 3.4.4.1). The 30 day Completion Time of Required Action A.1 is acceptable, based on operating experience, considering the multiple forms of leakage detection that are still available.

B.1 and B.2

With both gaseous and particulate primary containment atmospheric monitoring channels inoperable, grab samples of the primary containment atmosphere must be taken and analyzed to provide periodic leakage information. Provided a sample is obtained and analyzed once every 12 hours, the plant may be operated for up to 30 days to allow restoration of at least one of the required monitors.

The 12 hour interval provides periodic information that is adequate to detect LEAKAGE. The 30 day Completion Time for restoration recognizes that at least one other form of leakage detection is available.

(continued)

BASES

ACTIONS (continued)

C.1, C.2, and C.3.

With the drywell floor drain sump monitoring system inoperable, the only means of detecting LEAKAGE is the primary containment atmospheric gaseous radiation monitor. A Note clarifies this applicability of the Condition. The primary containment atmospheric gaseous radiation 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 primary containment atmosphere must be taken and analyzed and monitoring of RCS leakage by administrative means must be performed every 12 hours to provide alternate periodic information.

Administrative means of monitoring RCS leakage include monitoring and trending parameters that may indicate an increase in RCS leakage. There are diverse alternative mechanisms from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of unidentified leakage. The administrative methods are primary containment pressure, temperature, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, Safety Relief Valve tailpipe temperature, flow, pressure, or other approved methods. These indications, coupled with the atmospheric grab samples, are sufficient to alert the operating staff to an unexpected increase in unidentified LEAKAGE.

The 12 hour interval is sufficient to detect increasing RCS leakage. The Required Action provides 7 days to restore another RCS leakage monitor to OPERABLE status to regain the intended leakage detection diversity. The 7 day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

(continued)

BASES

ACTIONS (continued)

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

If any Required Action of Condition A, ~~or~~ B or C cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to perform the actions in an orderly manner and without challenging plant systems.

~~D~~E.1

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

SURVEILLANCE REQUIREMENTS

SR 3.4.6.1

This SR is for the performance of a CHANNEL CHECK of the required primary containment atmospheric monitoring system. 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.

SR 3.4.6.2

This SR is for the performance of a CHANNEL FUNCTIONAL TEST of the required RCS leakage detection instrumentation. The test ensures that the monitors can perform their function in the desired manner. The Frequency of 31 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.6.3

This SR is for the performance of a CHANNEL CALIBRATION of required leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of 24 months is a typical refueling cycle and considers channel reliability.

(continued)

BASES

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.

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

~~3. FSAR, Section 5.2.5.1.2.~~

~~4~~3. GEAP-5620, April 1968.

~~5~~4. NUREG-75/067, October 1975.

~~6.~~5. FSAR, Section 5.2.5.4.

6. FSAR, Section 5.2.7.2.1.

7. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.6 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

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

Limits on LEAKAGE from the reactor coolant pressure boundary (RCPB) are required so that appropriate action can be taken before the integrity of the RCPB is impaired (Ref. 2). Leakage detection systems for the RCS are provided to alert the operators when leakage rates above normal background levels are detected and also to supply quantitative measurement of leakage rates. The Bases for LCO 3.4.4, "RCS Operational LEAKAGE," discuss the limits on RCS LEAKAGE rates.

Systems for separating the LEAKAGE of an identified source from an unidentified source are necessary to provide prompt and quantitative information to the operators to permit them to take immediate corrective action.

LEAKAGE from the RCPB inside the drywell is detected by at least one of two or three independently monitored variables, such as sump level changes and drywell gaseous and particulate radioactivity levels. The primary means of quantifying LEAKAGE in the drywell is the drywell floor drain sump monitoring system which consists of two drywell floor drain sump level Channels. Both Channels are required to be Operable to satisfy the LCO.

The drywell floor drain sump monitoring system monitors the LEAKAGE collected in the floor drain sump. This unidentified LEAKAGE consists of LEAKAGE from control rod drives, valve flanges or packings, floor drains, the Closed Cooling Water System, and drywell air cooling unit condensate drains, and any LEAKAGE not collected in the drywell equipment drain tank.

The level of each drywell sump is continuously recorded in the Main Control Room. The change in

(continued)

BASES

BACKGROUND (continued)

sump level per unit time determines the leak rate and is calculated from the recorder.

The floor drain sump level indicators have switches that start and stop the sump pumps when required. If the sump fills to the high high level setpoint, an alarm sounds in the control room.

The primary containment air monitoring systems continuously monitor the primary containment atmosphere for airborne particulate and gaseous radioactivity. A sudden increase of radioactivity, which may be attributed to RCPB steam or reactor water LEAKAGE, is annunciated in the control room. ~~The primary containment atmosphere particulate and gaseous radioactivity monitoring systems are not capable of quantifying LEAKAGE rates. These monitors provide an alternate means of leak detection to that supplied by the sump level monitors, and although they cannot ensure detection of a 1 gpm leak in 1 hour in all cases, they provide a diverse means of leak detection (Ref. 3).~~

APPLICABLE SAFETY ANALYSES

A threat of significant compromise to the RCPB exists if the barrier contains a crack that is large enough to propagate rapidly. LEAKAGE rate limits are set low enough to detect the LEAKAGE emitted from a single crack in the RCPB (Refs. ~~4~~3 and ~~5~~4). ~~Each of the leakage detection systems inside the drywell is designed with the capability of detecting LEAKAGE less than the established LEAKAGE rate limits.~~ The allowed LEAKAGE rates are well below the rates predicted for critical crack sizes (Ref. 6). Therefore, these limits ~~actions~~ provide adequate response before a significant break in the RCPB can occur.

RCS leakage detection instrumentation satisfies Criterion 1 of the NRC Policy Statement (Ref. 7).

LCO

This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide confidence that small amounts of unidentified LEAKAGE are detected in time to allow actions to place the plant in a safe condition, when RCS LEAKAGE indicates possible RCPB degradation

The LCO requires two instruments to be OPERABLE.

(continued)

BASES

LCO (continued)

The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE rate from the RCS. Thus, for the system to be considered OPERABLE, the sump level monitoring portion of the system must be OPERABLE and capable of determining the leakage rate. The identification of an increase in unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the drywell floor drain 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 primary containment sump monitor OPERABILITY.

The reactor coolant contains radioactivity that, when released to the primary containment, can be detected by the gaseous or particulate primary containment atmospheric 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 primary containment atmospheric radioactivity monitors to detect a 1 gpm increase within 1 hour during normal operation. However, the gaseous or particulate containment primary atmospheric radioactivity monitor is OPERABLE when it is capable of detecting a 1 gpm increase in unidentified LEAKAGE within 1 hour given an RCS activity equivalent to that assumed in the design calculations for the monitors (Reference 6).

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

~~The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE from the RCS. Thus, for the system to be considered OPERABLE, the system must be capable of measuring reactor coolant leakage. The other monitoring systems provide early alarms to the operators so closer examination of other detection systems will be made~~

(continued)

BASES

LCO (continued)

~~to determine the extent of any corrective action that may be required. With the leakage detection systems inoperable, monitoring for LEAKAGE in the RCPB is degraded.~~

APPLICABILITY

In MODES 1, 2, and 3, leakage detection systems are required to be OPERABLE to support LCO 3.4.4. This Applicability is consistent with that for LCO 3.4.4.

ACTIONS

A.1

With the drywell floor drain sump monitoring system inoperable, the primary containment atmospheric activity monitor will provide indication of changes in leakage.

With the drywell floor drain sump monitoring system inoperable, operation may continue for 30 days. However, RCS unidentified and total LEAKAGE is still required to be determined every 12 hours (SR 3.4.4.1). The 30 day Completion Time of Required Action A.1 is acceptable, based on operating experience, considering the multiple forms of leakage detection that are still available.

B.1 and B.2

With both gaseous and particulate primary containment atmospheric monitoring channels inoperable, grab samples of the primary containment atmosphere must be taken and analyzed to provide periodic leakage information. Provided a sample is obtained and analyzed once every 12 hours, the plant may be operated for up to 30 days to allow restoration of at least one of the required monitors.

The 12 hour interval provides periodic information that is adequate to detect LEAKAGE. The 30 day Completion Time for restoration recognizes that at least one other form of leakage detection is available.

(continued)

BASES

ACTIONS (continued)

C.1, C.2, and C.3.

With the drywell floor drain sump monitoring system inoperable, the only means of detecting LEAKAGE is the primary containment atmospheric gaseous radiation monitor. A Note clarifies this applicability of the Condition. The primary containment atmospheric gaseous radiation 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 primary containment atmosphere must be taken and analyzed and monitoring of RCS leakage by administrative means must be performed every 12 hours to provide alternate periodic information.

Administrative means of monitoring RCS leakage include monitoring and trending parameters that may indicate an increase in RCS leakage. There are diverse alternative mechanisms from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of unidentified leakage. The administrative methods are primary containment pressure, temperature, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, Safety Relief Valves tailpipe temperature, flow, pressure, or other approved methods. These indications, coupled with the atmospheric grab samples, are sufficient to alert the operating staff to an unexpected increase in unidentified LEAKAGE.

The 12 hour interval is sufficient to detect increasing RCS leakage. The Required Action provides 7 days to restore another RCS leakage monitor to OPERABLE status to regain the intended leakage detection diversity. The 7 day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

(continued)

BASES

ACTIONS (continued)

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

If any Required Action of Condition A~~, or~~ B or C cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to perform the actions in an orderly manner and without challenging plant systems.

~~D~~E.1

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

SURVEILLANCE REQUIREMENTS

SR 3.4.6.1

This SR is for the performance of a CHANNEL CHECK of the required primary containment atmospheric monitoring system. 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.

SR 3.4.6.2

This SR is for the performance of a CHANNEL FUNCTIONAL TEST of the required RCS leakage detection instrumentation. The test ensures that the monitors can perform their function in the desired manner. The Frequency of 31 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.6.3

This SR is for the performance of a CHANNEL CALIBRATION of required leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of 24 months is a typical refueling cycle and considers channel reliability.

(continued)

BASES

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.

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

~~3. FSAR, Section 5.2.5.1.2.~~

~~4~~3. GEAP-5620, April 1968.

~~5~~4. NUREG-75/067, October 1975.

~~6~~5. FSAR, Section 5.2.5.4.

6. FSAR, Section 5.2.5.1.2.

7. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).