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Subject: **Partial Response to NRC Request for Additional Information Letter No. 15 Related to ESBWR Design Certification Application – Leak Detection and Isolation System – RAI Numbers 5.2-1 through 5.2-5**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

If you have any questions about the information provided here, please let me know.

Sincerely,

David H. Hinds
Manager, ESBWR

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Enclosure:

1. MFN 06-085 - Partial Response to NRC Request for Additional Information Letter No. 15 for ESBWR Design Certification Application - Leak Detection and Isolation System - RAI Numbers 5.2-1 through 5.2-5

Reference:

1. MFN 06-102, Letter from U. S. Nuclear Regulatory Commission to Mr. David H. Hinds, *Request for Additional Information Letter No. 15 Related to ESBWR Design Certification Application,* March 30, 2006

| | | |
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| cc: | WD Beckner | USNRC (w/o enclosures) |
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# Enclosure 1

# MFN 06-085

# Partial Response to NRC Request for Additional Information Letter No. 15 for ESBWR Design Certification Application

## Leak Detection and Isolation System

## RAI Numbers 5.2-1 through 5.2-5

NRC RAI 5.2-1

*DCD Section 5.2.5 Item (3) indicates that the system is equipped with indicators and alarms for each leak detection system in the control room, and permits "qualitative" interpretations of such indicators. However, DCD Section 5.2.5.8 indicates that the monitoring instrumentation is designed to detect leakage rates of 1 gpm within one hour, satisfying Regulatory Guide (RG) 1.45, Position C.5. Leakage from unidentified sources inside drywell is collected in the floor drain sump to detect leakage of 1 gpm, thus satisfying RG. 1.45, Position C.2. Furthermore, DCD Section 5.2.5.8 indicates that the limit established for alarming unidentified leakage is 5 gpm, and the Technical Specification (TS) limit specified in Limiting Conditions for Operation (LCO) 3.4.2 for unidentified RCPB leakage is 5 gpm. The above DCD statements appear to be inconsistent in meeting 1 gpm guidance in RG 1.45. The following are the specific questions.*

(a) *Why does the system permit only "qualitative" rather than "quantitative" interpretations of such control room indicators? Qualitative control room indicators are not adequate in meeting RG 1.45.*

(b) *Explain how the proposed TS limit and alarm limit for the unidentified leakage of 5 gpm, which is consistent with neither the design capability of 1 gpm nor Positions C.2 and C.5 of RG 1.45, is justified?*

GE Response

(a) The term "qualitative" was quoted directly from SRP 5.2.5 Rev. 1 ("Area of Review") to provide acknowledgement that the design of the Leak Detection and Isolation system (LDIS) will be compliant with the guidance of the SRP in terms of information presented to the main control room operator. This information would be used for "interpretation" as the SRP implies. Nevertheless, the information presented to the main control room operator will be "quantitative" in the context that the operator can convert the various readings to an equivalent leakage rate. The sentence will be modified to indicate that information, which is "quantitative" in nature, will be provided.

(b) The proposed TS limit is not considered to be inconsistent with either position C.2 or C.5 of RG 1.45. Position C.2 is interpreted as providing guidance as to the "accuracy" of the measurement of unidentified leakage and not the TS limit. i.e., the "accuracy" of a device is not necessarily equivalent to the total quantity allowed by TS for the monitored parameter.

Position C.5 of RG 1.45 recommends that the "sensitivity and response time" of various instruments "employed for unidentified leakage should be adequate to detect a leakage rate, or its equivalent, of one gpm in less than one hour." Similar to this discussion above for C.2, the "sensitivity" of a detection method, does not necessarily imply, nor require, that it be the same as the limiting condition (or actionable TS limit) for the monitored parameter. The sensitivity of these detection methods to a specific leakage amount, i.e. tolerance of the instrument, is different from the value that is calculated to be significant in regards to the total leakage amount.

There is a long history of leakage detection/alarm limits as related to the BWRs. Early BWRs are designed and operated with instruments with a 1 gpm sensitivity and 5 gpm alarm limit, similar to what is included within the ESBWR design application. Given that earlier BWRs contain materials susceptible to IGSCC, a rate of change technical specification limitation was included, as required by Generic Letter 88-01, to detect increases in unidentified leakages inside of containment. The ESBWR however, does not use materials susceptible to IGSCC, therefore, the ESBWR technical specifications do not require a similar rate of change limitation.

Also, note that the Section 5.2.5.8 of the DCD addresses compliance to positions C.2 and C.5 of RG 1.45, specifically in regards to the 1 gpm limit.

As noted in the evaluation against Criterion 30 (DCD Section 3.1.4.1), the allowable leakage rates have been based on the predicted and experimentally determined behavior of cracks in pipes, the ability to provide makeup water to the RCS, the normally expected background leakage due to equipment design, and the detection capability of the various sensors and instruments. The proposed TS limit of 5 gpm for unidentified leakage is considered acceptable, because, as noted in DCD Section 5.2.5.5, it is sufficiently low so that, even if the entire leakage rate were coming from a single crack in the nuclear system process barrier, corrective action could be taken before barrier integrity is threatened. Additional rationale for the proposed TS limit is included in the Bases discussion for LCO 3.4.2, which is provided in DCD Chapter 16B.

Also, it is worth noting that the initial ABWR design included a 1 gpm limit. However, the sensitivity and accuracy of available measuring equipment is +/- 1 gpm. Therefore, to assure proper system functionality, the limit was changed from 1 gpm to 5 gpm for current ABWR design, which is under construction at Lungmen site. Any future ABWR plants will also use the 5 gpm limit.

<u>NRC RAI 5.2-2</u>

*All certified advanced reactor designs (CE System 80+, AP600, AP1000, ABWR) have Technical Specification (TS) limit of 1 gpm or less for unidentified reactor coolant system (RCS) operational leakage to satisfy RG 1.45. Standard Technical Specifications for current operating GE BWRs have the limit of 5 gpm for unidentified RCS operational leakage. ESBWR TS LCO 3.4.2 specifies a limit of 5 gpm (the criterion used by the last generation BWR technology) for unidentified RCS operational leakage, even though it has the design capability of 1 gpm for unidentified leakage.*

*Why would ESBWR TS LCO 3.4.2 need a more relaxed limit (5 gpm) for RCPB leakage detection than ABWR (1 gpm)? The more relaxed limit indicates higher operating RCPB leakage rates, less RCPB leakage control, potentially more humid environment inside containment, increased probability of abnormal leakage.*

(a) *Evaluate the adverse effects to instrument and degradation effects (such as corrosion) to components caused by the additional humidity.*

(b) *Specifying a leakage limit of 5 gpm instead if 1 gpm would allow a plant to operate in a potentially degraded condition longer. Provide compensatory measures to correct the degraded condition in accordance with the requirements of Criterion XVI of 10 CFR 50, Appendix B, as discussed in NRC Generic letter 91-18, Revision 1.*

GE Response

The equipment that is currently available can measure leakage with an accuracy of 1 gpm. It is considered to be unnecessarily restrictive with respect to plant operation and the avoidance of spurious alarms and presents an unnecessary hardship to the plant operator if the unidentified leakage limit is established at 1 gpm. Additionally, it should be noted that measures have been taken to reduce the likelihood of pipe cracks contributing to leakage. According to DCD section 3E.5, "the ESBWR plant design specifies use of austenitic stainless steel piping made of material (e.g., nuclear grade or low carbon type) that is recognized as resistant to Inter-Granular Stress Corrosion Cracking (IGSCC)". Therefore, the 5 gpm limit of ESBWR TS LCO 3.4.2 will provide detection in sufficient time to initiate corrective action.

(a) An evaluation of the effects of relative humidity including that which is attributable to the proposed leakage limits up to 5 gpm would be included as part of equipment qualification requirements in the procurement of equipment. Because this value, i.e., 5 gpm, has been acceptable for operating BWRs, GE does not anticipate any additional adverse effects because current installed equipment in operating BWRs would already be qualified to that limit.

(b) The BWR evolution has continued to reduce the likelihood of leaks because of Stress Corrosion Cracking (SCC) of austenitic stainless steels by reducing and limiting the use of austenitic stainless steel, eliminating large penetrations in the lower vessel region and using SCC resistant fabrication processes. Stainless steel piping continuously active during normal reactor operation is limited to the Reactor Water Cleanup System and the Isolation Condenser System return lines. Large penetrations in the lower vessel region have been avoided by the elimination of the external recirculation system and internal recirculation pumps and most vessel connections are above the core. Additional measures taken in the ESBWR to reduce challenges to the 5 gpm unidentified leakage limit are use of

SCC resistant materials for bottom head penetrations, CRD housings and in-core housings. The 5 gpm limit for unidentified RCS operational leakage is based on the behavior of pipe cracks. It has been shown that, for leakage even greater than 5 gpm, the probability is small that the associated imperfection or crack would grow rapidly. And, 5 gpm is a small fraction of the calculated flow from a critical crack in the primary system piping. Additionally, pipe cracks are addressed in DCD Table 1.11-1. According to the resolution for Action Plan Item/Issue number A-42 in this table, the RCS piping in the ESBWR design complies with NUREG-0313, Rev. 2 and Generic Letter (GL) 88-01 through the selection of materials and processes that avoid sensitization or susceptibility to IGSCC. According to DCD Section 5.2.3.4.1, the RCS piping is designed to avoid sensitization and susceptibility to IGSCC through the use of reduced carbon content material and process controls. During fabrication, solution heat treatment is utilized. During welding, heat input is controlled. Austenitic stainless steels that have become sensitized or susceptible to cracking because of IGSCC are not used in the ESBWR design.

Historically, good operator practice plays a role in the event of an anomaly in unidentified leakage. The duties and responsibilities of the operating staff to regularly observe and record data, monitor trends in plant parameters and detect abnormal conditions during their shift provide a means to alert the plant staff to a condition that warrants further scrutiny and assessment. For example, if leakage is observed to be more than the normal expected leakage, yet less than the 5 gpm limit, the plant operators typically will be alerted to investigate, record, and track pertinent data, evaluate trends in the data and make an assessment of the cause for any change that could ultimately lead to a reactor shutdown to make a drywell entry to take further action to locate, assess and potentially repair the source of leakage. Therefore, this typical practice identifies that utilities have established measures for taking action before reaching the 5 gpm leakage limit.

Based on the above considerations, the proposed TS values and required actions are considered to be proper and adequate to assure plant safety and, therefore, operation in compliance with the proposed TS would not constitute a degraded or non-conforming condition requiring corrective action in accordance with Criterion XVI of 10 CFR 50, Appendix B, as discussed in NRC Regulatory Issue Summary 2005-20, September 26, 2005 (Note: RIS 2005-20 superseded NRC Generic Letter 91-18, Revision 1).

NRC RAI 5.2-3

*In ESBWR TS B.3.4.2, RCS Operational Leakage, it refers to GDC 55 in the bases of the TS. GDC 55 discusses the requirements of containment isolation valves only, and has nothing to do with RCS leakage. On the other hand, DCD Section 5.2.5 indicates the design of the RCPB leakage detection systems conforms with GDC 30, but TS B.3.4.2* *does not mention GDC 30. Revise TS B.3.4.2 to reflect applicable regulatory requirements..*

GE Response

The ESBWR TS 3.4.2 Bases currently state: "This [LCO] protects the RCS pressure boundary described in 10 CFR 50.2, 10 CFR 50.55a ( c ) and GDC 55 of 10 CFR 50, Appendix A (Ref. 1, 2, and 3)."

The purpose of this statement is to reference the regulatory requirements that further describe the scope of piping and other components that comprise the reactor coolant pressure boundary and, thus, are subject to the LCO. Identical statements are included in the Bases for the RCS Operational LEAKAGE TS in NUREG-1433 and NUREG-1434 (LCOs 3.4.4 and 3.4.5, respectively).

10 CFR 50.2 defines the reactor coolant pressure boundary (in part) as "those pressure-containing components of boiling and pressurized water-cooled nuclear power reactors, such as pressure vessels, piping, pumps, and valves, which are: (1) Part of the reactor coolant system, or (2) Connected to the reactor coolant system, up to and including any and all of the following: (i) The outermost containment isolation valve in system piping which penetrates primary reactor containment...." GDC 55 provides additional regulatory description of the reactor coolant pressure boundary with respect to the isolation valves referred to in 10 CFR 50.2.

GDC 30 requires that "means shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage." This requirement is met by providing the RCS leakage detection instrumentation that is addressed in ESBWR TS 3.3.4.1. Accordingly, the Bases for TS 3.3.4.1 reference GDC 30. Because GDC 30 does not describe the reactor coolant pressure boundary and TS 3.4.2 does not contain requirements for leak detection instrumentation, GE proposes to retain the ESBWR TS 3.4.2 Bases discussion as currently written (i.e., without a reference to GDC 30 and consistent with the corresponding Bases discussions in NUREG-1433 and NUREG-1434).

NRC RAI 5.2-4

*In DCD Section 5.2.5.8, it states that procedures are provided to the Operator to convert the identified and unidentified leakage into a common leakage rate equivalent. Are the procedures to be generic for the ESBWR design and currently available for audit? Or are the plant-specific procedures to be developed by COL applicants, which should be a COL action item?*

GE Response

The procedures to convert different sources of leakage into a common rate equivalent will be provided by COL. This item will be added to the COL area of 5.2.6

NRC RAI 5.2-5

*In DCD Section5.2.5.8, it states that the leak detection system required to perform isolation function are classified as Class 1E, Seismic Category 1.*
*The airborne particulate radioactivity monitor is designed to operate during an SSE event. All the leak detection instrumentation and monitoring for RCPB are discussed in DCD Section 5.2.5.2; identify those leak detection instrumentation that are required to perform isolation function versus that are not required for isolation. Among these leak detection instrumentation that are not required for isolation function, their capability to maintain and perform their safety functions following an earthquake is not clear. Discuss their capability to maintain and perform their safety functions following an earthquake in meeting the guidelines of RG 1.29, Positions C-1 and C-2.*

GE Response

Section 5.2.5 will be modified to clearly identify the leak detection instruments that are utilized to automatically perform isolation functions. In addition, those leak detection instruments not utilized for automatic isolation will be clearly identified. The instruments that are needed to meet RG 1.29 "Seismic Classification Design" are discussed in Section 5.2.5.

It should be noted that, if a leak detection instrument is not required for providing an isolation function, then their capability to maintain and perform a safety function following an earthquake is not required. In the case of the drywell fission product radiation monitoring subsystem, since RG 1.45 distinctly provides information as to its earthquake qualification, it was listed separately.

percentages of examinations completed within each period of the interval shall correspond to Table IWB-2412-1 Inspection Program B provides for Inspection Intervals of a nominal length of 10 years with allowance for up to a year variation to coincide with refueling outages.

#### *5.2.4.5 Evaluation of Examination Results*

Examination results are evaluated in accordance with ASME Section XI, IWB-3000 with repairs based on the requirements of IWA-4000 and IWB-4000. Re-examination shall be conducted in accordance with the requirements of IWA-2200. The recorded results shall meet the acceptance standards specified in IWB-3400.

#### *5.2.4.6 System Leakage and Hydrostatic Pressure Tests*

**System Leakage Tests**

As required by Section XI, IWB-2500 for Category B-P, a system leakage test shall be performed in accordance with IWB-5200 on all Class 1 components and piping within the pressure-retaining boundary following each refueling outage. For the purposes of the system leakage test, the pressure-retaining boundary is defined in IWB-5222. The system leakage test shall include a VT-2 examination in accordance with IWA-5240. The system leakage test will be conducted at a pressure not less than that corresponding to 100% rated reactor power. The system hydrostatic test (described below), when performed, is acceptable in lieu of the system leakage test.

**Hydrostatic Pressure Tests**

A system hydrostatic test may be performed in lieu of a system leakage test, and when required for repairs, replacements, and modifications per IWA-4540. The test shall include all Class 2 or 3 pressure retaining components and piping within the boundaries defined by IWB-5230 or the boundary of a repair or replacement as applicable. The system hydrostatic test shall include a VT-2 examination in accordance with IWA-5240. For the purposes of determining the test pressure for the system hydrostatic test in accordance with IWB-5230, the nominal operating pressure shall be the maximum operating pressure indicated in the Process Flow Diagram (PFD) for the Nuclear Boiler System.

#### *5.2.4.7 Code Exemptions*

As provided in ASME Section XI, IWB-1220, certain portions of Class 1 systems are exempt from the volumetric and surface examination requirements of IWB-2500. Complete list will be provided in the plant-specific preservice inspection and inservice inspection program submitted by the Combined License applicant.

#### *5.2.4.8 Code Cases*

As applicable, the provisions of the Code Cases listed in Table 5.2-1 may be used for preservice and inservice inspections, evaluations, and repair and replacement activities.

### 5.2.5 Reactor Coolant Pressure Boundary (RCPB) Leakage Detection

As discussed in SRP 5.2.5, the Reactor Coolant Pressure Boundary (RCPB) leakage detection systems are designed to provide a means of detecting and, to the extent practical, identifying the source of the reactor coolant leakage. The system is designed to perform the detection and monitoring function to assure conformance with the requirements of General Design Criteria 2 and 30. The system design considers the following:

(1) The system is capable of identifying to the extent practical, the source of the reactor coolant leakage.

(2) The system is capable of separately monitoring and collecting leakage from both identifiable and unidentifiable sources.

(3) The system is adequately equipped with indicators and alarms for each leakage detection system in the main control room, and readily permits both qualitative and quantitative interpretations of such indicators.

(4) The system provides for the monitoring of systems connected to the RCPB for signs of intersystem leakage.

The design of the RCPB Leakage Detection Systems considers specific general design criteria and regulatory guides. The integrated design of the system is in accordance with the following criteria:

(5) General Design Criterion 2 as it relates to the capability of the systems to maintain and perform their safety functions following an earthquake, and meets the guidelines of Regulatory Guide 1.29, positions C-1 and C-2.

General Design Criterion 30 as it relates to the detection, identification and monitoring of the source of reactor coolant leakage, and meets the guidelines of Regulatory Guide 1.45, positions C-1 through C-9.

Leakage detection from the reactor coolant pressure boundary is the primary function of the Leak Detection and Isolation System (LD&IS). This system detects, monitors and alarms for leakage inside and outside the containment, and automatically initiates the appropriate protective action to isolate the source of the leak. The isolation function results in the closure of the appropriate containment inboard and outboard isolation valves to shut off leakage external to the containment. The system design for LD&IS control and instrumentation is described in Section 7.3.3. A simplified LD&IS system configuration is shown in Figure 7.3-3.

The leak detection system required to perform isolation functions is classified Class 1E, Seismic Category I.

The leak detection instruments that are utilized to automatically perform isolation functions are as follows:

- Drywell pressure monitoring
- Isolation Condenser Steamline and Condenser Return Line flow monitoring
- Main Steamline High Flow monitoring
- Reactor Vessel Low Water Level monitoring
- Reactor Water Cleanup/Shutdown Cooling System Flow monitoring
- Main Steamline Tunnel Area Temperature monitoring

- Isolation Condenser Radiation Leakage monitoring
- Main Steamline Low Pressure monitoring
- Main Condenser Low Vacuum monitoring

The leak detection instruments not utilized for automatic isolation are as follows:

- Drywell Floor Drain High Conductivity Waste (HCW) Sump monitoring
- Drywell Equipment Drain Low Conductivity (LCW) Sump monitoring
- Drywell Air Cooler Condensate Flow monitoring
- Drywell Temperature monitoring
- Drywell Fission Product monitoring
- Reactor Vessel Head Flange Seal monitoring
- Safety/Relief Valve (SRV) Leakage monitoring
- Valve Stem Packing Leakage monitoring
- Reactor Well Liner Leakage monitoring
- Reactor Building Floor and Equipment Drain Sump monitoring
- Intersystem Leakage monitoring
- Differential Temperature Monitoring in Equipment areas

Of the leak detection instruments not being utilized for automatic isolation, only Fission Product Radiation monitoring subsystem needs to be seismically qualified and needs to follow the guidance of positions C.1 and C.2 of RG 1.29. Information pertaining to Seismic Design Classification can be found in Section 3.2. All other instruments in the non-automatic isolation category, because they are not required to be operational after a design basis earthquake, do not need to apply RG 1.29.

Abnormal leakages from various sources within the containment and from areas outside the containment are detected, monitored, alarmed and isolated as indicated in Table 5.2-6 and Table 5.2-7. In the event of a Loss-of-Coolant Accident (LOCA) that results in either high drywell pressure, or low reactor water level (Level 2), the isolation logic initiates closure of the containment isolation valves. As a backup to the Level 2 isolation logic, a discrete, hard-wired reactor water level (Level 1) logic is provided for containment isolation logic.

### *5.2.5.1 Leakage Detection Methods*

The system is designed in conformance with Regulatory Guide 1.45 for leak-detection methods and functions, and with the applicable regulatory codes and standards that are listed for LD&IS in Table 7.1-1 for the isolation functions.

low so that, even if the entire leakage rate were coming from a single crack in the nuclear system process barrier, corrective action could be taken before barrier integrity is threatened.

The sumps instrumentation is capable of detecting unidentified leakage of 3.8 liters/min (1 gpm) in one hour within the drywell.

### *5.2.5.6 Separation of Identified and Unidentified Leakages in the Containment*

Identified and unidentified leakages from sources within the drywell are collected and directed to separate sumps, the LCW equipment drain sumps for identified leakages and the HCW floor drain sumps for unidentified leakages.

### *5.2.5.7 Testing, Calibration and Inspection Requirements*

The requirements for testing, calibration and inspection of the LD&IS are covered in Subsection 7.3.3.4.

### *5.2.5.8 Regulatory Guide 1.45 Compliance*

This Rregulatory Gguide (RG) specifies acceptable methods of implementing 10 CFR 50, Appendix A, GDC 30 with regard to the selection of leakage ~~leak~~ detection ~~methods and flow rate limits for use in monitoring and detecting leaks from~~ systems for the reactor coolant pressure boundary.

Leakage is collected separately in drain sumps ~~from~~ for identified and unidentified sources in the containment and total flow rate from each sump is independently monitored, thus satisfying ~~Regulatory Guide~~ 1.45, Position C.1.

Leakage from unidentified sources from inside the drywell is collected into the floor drain sump to detect leakage with an accuracy of 3.8 liters/min (1 gpm), thus satisfying ~~Regulatory Guide~~ 1.45, Position C.2.

Three separate detection methods are used for leakage monitoring: (1) the floor drain sump level and pump operating frequency, (2) radioactivity of the airborne particulates, and (3) the drywell air coolers condensate flow rate, thus satisfying ~~Regulatory Guide (~~RG~~)~~ 1.45, Position C.3.

Intersystem radiation leakage into the Reactor Component Cooling Water System is monitored as described in Subsection 5.2.5.2.2, thus satisfying RG 1.45, Position C.4.

The monitoring instrumentation of the drywell floor drain sump, the air particulate radioactivity, and the drywell air cooler condensate flow rate are designed to detect leakage rates of 3.8 liters/min (1 gpm) within one hour, thus satisfying RG 1.45, Position C.5.

~~The leak detection system required to perform isolation functions is classified Class 1E, Seismic Category I; and the system is designed to operate during and following seismic events, thus meeting the intent of 10 CFR 50, Appendix A, GDC 2~~ The monitoring instrumentation of the drywell floor drain sump, the air particulate radioactivity, and the drywell air cooler condensate flow rate are classified Class 1E, Seismic Category 1; and are designed to operate during and following seismic events. The airborne particulate radioactivity monitor is designed to operate during an SSE event. Thus, RG-1.45, Position C6 is satisfied.

Each monitored leakage parameter is indicated in the main control room and activates an alarm on abnormal indication. Procedures are provided to the operator to convert the identified and unidentified leakages into a common leakage rate equivalent to determine that the total leakage rate is within the technical specification limit. Calibration of ~~E~~each ~~monitored~~ leakage monitoring channel accounts for the necessary independent variables.~~of the LD&IS can be tested and calibrated separately during normal plant operation without causing a plant outage.~~ This ~~information~~ satisfies RG 1.45, Position C.7.

The monitoring instrumentation of the drywell floor drain sump, the air particulate radioactivity, and the drywell air cooler condensate flow rate ~~LD&IS sensors and channels are periodically~~ equipped with provisions to readily permit ~~tested~~ testing for operability and ~~calibrated~~ calibration during ~~reactor~~ plant operation, thus satisfying RG 1.45, Position C.8.

~~The following methods are used to verify operability:~~

~~simulation of signals to initiate trips;~~

~~channel to channel comparison of the same monitored leakage parameter;~~

~~operability checks by comparing one method with another; and~~

~~continuous monitoring of leakage parameters.~~

Limiting conditions for identified and unidentified leakage and for the availability of various types of leakage detection instruments are established in the technical specifications.~~The limits established for alarming unidentified and identified leakages are less than or equal to 19 liters/min (5 gpm) and 95 liters/min (25 gpm), respectively.~~ This satisfies Position C.9 of RG 1.45.

## 5.2.6 COL Information

### Overpressure Protection

The COL applicant is required to submit an overpressure protection analysis for core loadings different than the reference ESBWR core loading.

### Common Leakage Rate Equivalent

The COL applicant is required to provide a procedure to convert the identified and unidentified leakage into a common leakage rate equivalent for operator use.

### Preservice and Inservice Inspection Program Plan

The COL holder is responsible~~ility~~ for the development of the preservice and inservice inspection program plans that are based on the ASME Code, Section XI. The COL applicant is responsible for specifying the Edition of ASME Code Section XI to be used.

## 5.2.7 References

5.2-1 D. A. Hale, "The Effect of BWR Startup Environments on Crack Growth in Structural Alloys," Trans. Of ASME, Vol. 108, January 1986.

5.2-2 F. P. Ford and M. J. Povich, "The Effect of Oxygen/Temperature Combinations on the Stress Corrosion Susceptibility of Sensitized T-304 Stainless Steel in High Purity Water," Paper 94 presented at Corrosion 79, Atlanta, GA, March 1979.

5.2-3 "BWR Water Chemistry Guidelines - 2004 Revision," EPRI TR-1008192, October 2004.