5.0 Reactor Coolant System and Connected Systems

5.2.5 Reactor Coolant Pressure Boundary Leakage Detection

5.2.5.1 Regulatory Criteria

In this section the staff reviews and evaluates the applicant's proposed change to a combined license (COL) information item regarding reactor coolant pressure boundary (RCPB) leakage detection .

A COL applicant that references the General Electric-Hitachi (GEH) Advanced Boiling Water Reactor (ABWR) Design Certification (DC) will incorporate the RCPB requirements specified for the ABWR design and the COL applicant will develop and implement the applicable ABWR procedures to address detection and identification of reactor coolant boundary leakage to meet the applicable regulatory requirements.

In a letter dated July 20, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12125A385), the NRC staff identified 28 items for GEH's consideration as part of their application to renew the ABWR design certification. The applicant was requested in Item No. 12 to revise a COL information item to develop operating procedures to respond to prolonged low-level reactor coolant leakage below technical specification limits. GEH proposed revising an existing COL information item in the ABWR DCD to provide additional details regarding the procedures associated with low-level-reactor coolant leakage to be developed by COL applicants.

This change relates to an issue that is outside the scope of the DC, and a COL applicant addressing the issue would be subject to the requirements as they exist at the time the COL application is filed. Therefore, in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 52.59(c), this design change is an "amendment," as this term is defined in Chapter 1 of this supplement, and will correspondingly be evaluated using the regulations in effect at renewal.

The relevant requirements of the U.S. Nuclear Regulatory Commission (NRC) regulations for this area of review, and the associated acceptance criteria, are given in Section 5.2.5, Revision 2, "Reactor Coolant Pressure Boundary Leakage Detection," NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)," (SRP) and are summarized below.

1. GDC 30, "Quality of Reactor Coolant Pressure Boundary," as it relates to the components which are part of the RCPB being designed, fabricated, erected, and tested to the highest quality standards practical. 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.

Acceptance criteria to meet the above requirements include:

1. Regulatory Guide (RG) 1.45, Revision 1 (May 2008), “Reactor Coolant Pressure Boundary leakage Detection Systems,” as it relates to the selection of RCPB leakage detection systems

5.2.5.2 Summary of Technical Information

In a letter dated May 27, 2015 (ADAMS Accession No. ML15147A593), GEH proposed to revise an existing COL information item as shown below.

In the certified ABWR DCD, COL Information item 5.2.6.1 states:

> 5.2.6.1 Conversion of Indications
>
> Procedures and graphs will be provided by the COL applicant to operations for converting the various indicators into a common leakage equivalent (Subsection 5.2.5.9).

GEH proposed to revise COL Information item 5.2.6.1 as part of their application to renew the ABWR DCD to be consistent with updated staff guidance as follows:

> 5.2.6.1 Leak Detection Monitoring
>
> The COL Applicant will include in its operating procedure development program:
>
> - Procedures to convert different parameter indications for identified and unidentified leakage into common leak rate equivalents and leak rate rate-of-change values.
> - Procedures for monitoring, recording, trending, determining the source(s) of leakage, and evaluating potential corrective action plans.
> - A milestone for completing this category of operating procedures.

Based on the proposed COL information item, COL applicants referencing the renewed ABWR DCD will be responsible for the development of a procedure to convert different parameter indications for identified and unidentified leakage common leak rate equivalents (volumetric or mass flow) and leak rate rate-of-change values. Typical monitoring includes parameters such as sump pump run time, sump level, condensate transfer rate, and process chemistry/radioactivity. The monitored leakage equivalent provides information used by the plant operators to manage the leakage and establish whether the leakage rates are within the allowable Technical Specifications and determine the trend (Subsection 5.2.5.9).

The proposed change will also result in COL applicants being responsible for the development of procedures for monitoring, recording, trending, determining the source(s) of leakage, and evaluating potential corrective action plans in accordance with the latest staff guidance. An unidentified leakage rate-of-change alarm provides operators an early alert to initiate response actions prior to reaching the Technical Specifications limit.

In addition, the COL information item listing in Tier 2, Table 1.9-1 was updated to reflect the changes described above.

The NRC staff confirmed that the above changes were implemented in Revision 6 of DCD Tier 2, Table 1.9-1 and Section 5.2.6.1.

5.2.5.3 Technical Evaluation

Insights from operating experience indicate that prolonged low level unidentified reactor coolant leakage inside containment could cause corrosion and material degradation such that it could compromise the integrity of a system leading to the gross rupture of the RCPB. In RG 1.45, Revision 1, the Regulatory Position on "Operations-Related Positions," provides guidance to address the issue. A COL applicant should establish procedures for responding to prolonged low-level RCS leakage. The procedures should specify operator actions in response to prolonged low-level unidentified reactor coolant leakage conditions that exist above normal leakage rates and below the Technical Specification (TS) limits in order to provide operators sufficient time to take action before the TS limit is reached. These procedures would include identifying, monitoring, trending, and managing prolonged low-level leakage.

In Revision 6 of DCD Tier 2, the revised COL information item 5.2.6.1 identifies the need for a COL applicant to develop procedures to guide the operator's response for RCPB leakage in regards to monitoring, recording, trending, determining the sources of leakage, and evaluating potential corrective action plans.

Based on the above, the staff determined that the applicant's proposed approach is consistent with the guidance in RG 1.45, Revision 1, pertaining to managing the prolonged low-level RCS leakage. Therefore, the staff finds that the applicant's approach is acceptable.

5.2.5.4 Conclusion

Based on the evaluation provided in this SER section supplement, the staff concludes that the proposed amendment to the ABWR DCD associated with the revision of the COL information item meets the applicable guidance in RG 1.45, Revision 1, and meets the requirements of GDC 30 as reviewed by the staff in accordance with the associated SRP acceptance criteria in, Section 5.2.5, Revision 2, of NUREG–0800.