

## 7.0 Instrumentation and Control Systems

### 7.7.1.2.1 Control Rod Ganged Withdrawal Sequence Restrictions

#### 7.7.1.2.1.1 Regulatory Criteria

In the GE-Hitachi Nuclear Energy (GEH), U.S. Advanced Boiling Water Reactor (ABWR) Design Control Document (DCD), Revision 6, the applicant proposed a change to correct an error in the originally certified DCD that stated the incorrect sequence for ganged control rod withdrawal for the reactor start up evolution. This supplemental evaluation documents the staff's review of the correction to the control rod ganged withdrawal sequence restrictions in DCD, Tier 2, Section 7.7.1.2.1(5)(b)(iii).

In a letter dated July 20, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12125A385), the U.S. Nuclear Regulatory Commission (NRC) staff identified 28 items for GEH's consideration as part of its application to renew the ABWR Design Certification (DC). The applicant was requested by the staff in Item No. 22, of the July 20, 2012 staff letter to address an apparent ABWR DCD wording error related to the ganged control rod withdrawal sequence.

Because the applicant's proposed change is a correction to an error in the DC, it is a "modification," as this term is defined in Chapter 1 of this supplement and must comply with the Atomic Energy Act of 1954, as amended, (AEA) and the Commission's regulations applicable and in effect at the time the certification was originally issued. Therefore, the proposed change is evaluated using the regulations in effect at the time the certification was originally issued. The following regulatory requirements provide the acceptance criteria for the staff's review:

- 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 28, "Reactivity limits": "The reactivity control systems shall be designed with appropriate limits on the potential amount and rate of reactivity increase to assure that the effects of postulated reactivity accidents can neither (1) result in damage to the reactor coolant pressure boundary greater than limited local yielding nor (2) sufficiently disturb the core, its support structures or other reactor pressure vessel internals to impair significantly the capability to cool the core. These postulated reactivity accidents shall include consideration of rod ejection (unless prevented by positive means), rod dropout, steam line rupture, changes in reactor coolant temperature and pressure, and cold-water addition."

#### 7.7.1.2.1.2 Summary of Technical Information

The originally certified ABWR DCD Tier 2, Section 7.7.1.2.1(5)(b)(iii), Revision 4, states: "Groups 1-4 may only be withdrawn before groups 5 –10 are in the full-in position."

The NRC staff discovered that this statement was in error during the South Texas Project (STP) Units 3 and 4 combined license (COL) application review, and the error was corrected by the COL applicant. Revision 5 of the ABWR DCD submitted by GEH for design certification renewal contained the same erroneous statement in DCD Tier 2, Section 7.7.1.2.1(5)(b)(iii). The staff issued a request for additional information (RAI) dated April 20, 2015 (ADAMS Accession No. ML15110A122), and in question 07-01 noted that if the ganged withdrawal sequence is performed as described in the DCD Tier 2, Section 7.7.1.2.1(5)(b)(iii) as cited above, the ganged control rod sequence steps could create a potentially unsafe operating condition through inappropriate limits on the amount and rate of reactivity increase. The staff concluded

that the ganged withdrawal sequence, as described in ABWR DCD, Tier 2, Section 7.7.1.2.1(5)(b)(iii), does not appear to comply with GDC 28, as currently written, and appears to be contrary to generally accepted BWR operating practices. The staff asked the applicant to correct the ganged withdrawal sequence description in Section 7.7.1.2.1(5)(b)(iii) or provide a technical basis and further explanation as to why this section, as currently written, is correct and accurate. In response to the staff RAI, the applicant in a letter dated May 19, 2015 (ADAMS Accession No. ML15139A210), provided its response in Enclosure 1 and presented the DCD markups to DCD Revision 5 in Enclosure 2. GEH has subsequently incorporated this change in Revision 6 of the ABWR DCD. The revised language states, "Groups 1-4 must be fully withdrawn before groups 5 –10 can be withdrawn from the full-in position."

#### *7.7.1.2.1.3 Technical Evaluation*

The staff in question 07-01 of its RAI noted a wording error in the DCD related to the control rod ganged withdrawal sequence in ABWR DCD Tier 2, Section 7.7.1.2.1(5)(b)(iii), Revision 5. In response to the staff RAI, GEH revised the wording used in the ABWR DCD Tier 2, Section 7.7.1.2.1(5)(b)(iii), Revision 6, as follows:

Groups 1-4 must be fully withdrawn before groups 5-10 can be withdrawn from the full-in position.

The staff finds that with this correction to the DCD wording, the ganged control rod withdrawals will be performed in the correct sequence and the ABWR Rod Control and Information System design is in compliance with GDC 28. The staff also finds that this DCD wording correction does not otherwise affect the staff's specific findings and evaluation documented in Section 7.7.2, "Specific Findings and Evaluations," of NUREG-1503 (ADAMS Accession No. ML080670592), "Final Safety Evaluation Report Related to Certification of the Advanced Boiling Water Reactor Design" on July 13, 1994, the final safety evaluation report (FSER) for the original certification of the ABWR design.

The staff verified that the proposed DCD correction described above was incorporated into DCD Revision 6. Therefore, this issue is resolved.

#### *7.7.1.2.1.4 Conclusion*

The applicant has corrected the ganged withdrawal sequence wording in the ABWR DCD, Tier 2, Section 7.7.1.2.1(5)(b)(iii) as stated above, which the staff finds acceptable. With this wording correction the staff finds that the ABWR Rod Control and Information System design is in compliance with GDC 28.