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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

U.S. Advanced Boiling Water Reactor Design Certification

Design Input Requirements for Main Steam Line Seismic Analysis

Dear Sir or Madam:

This letter provides information pursuant to an evaluation conducted in accordance with Title 10, Part 21 of the Code of Federal Regulations (10 CFR 21), "Reporting of Defects and Noncompliance." During detailed design of the South Texas Project Units 3 and 4 (STP 3 and 4) Turbine Buildings, the design criteria for the main steam lines (MSLs) within the turbine building contained in the U.S. Advanced Boiling Water Reactor (ABWR) Design Control Document (DCD) approved by the Nuclear Regulatory Commission (NRC) in 10 CFR 52, Appendix A, "Design Certification Rule for the U.S. Advanced Boiling Water Reactor," was compared to the results of detailed design activities performed for STP 3 and 4. As described below, the turbine building floor response spectra developed during the ongoing design of the STP 3 and 4 Turbine Buildings are not completely enveloped by the MSL design inputs specified in the DCD. While the 10 CFR 21 evaluation was inconclusive, this information is provided for the NRC Staff's use and consideration to ensure that the ABWR DCD specifies adequate inputs to the seismic analysis of the MSLs within the turbine building. This issue does not involve a current safety concern since no plants have been licensed or constructed referencing the ABWR DCD.

Fluor Nuclear Power (FNP) is currently performing work as part of the Engineering, Procurement, and Construction (EPC) team for STP 3 and 4. FNP's scope of work includes, in part, design of the turbine buildings for STP 3 and 4. The turbine building is a non-safety related structure which is part of the Certified Design. Although the turbine building structure is not safety related, the turbine building is required to be designed to prevent damage to adjacent safety related structures, and it houses certain equipment that is safety related or important to safety.

Important to safety equipment within the turbine building includes the MSLs. The MSLs serve an accident mitigation role in the event of a loss of coolant accident by reducing the offsite doses associated with potential leakage through the outboard main steam isolation valves (MSIVs). To fulfill this mitigation function, the ABWR DCD requires that the non-safety related portion of the MSLs downstream of the outboard MSIVs be designed to remain intact following a postulated safe shutdown earthquake (SSE).

The ABWR DCD provides limited detail on the design of the turbine building and does not specify calculated floor response spectra for the turbine building. Absent this information, ABWR DCD Tier 2, Section 3.2.5.3, "Main Steam Line Leakage Path," requires, in part, that for the turbine building operating level or turbine deck level, the MSLs and associated seismic anchors shall be designed using floor response spectra that are the same as that used at the reactor building end of the main steam tunnel.

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As noted in the STP 3 and 4 Combined License Application (COLA), Part 7, Section 3.0 (STP DEP 1.2-2, "Turbine Building"), South Texas Project Nuclear Operating Company (STPNOC) has taken a departure from the turbine building design described in the DCD. The STP 3 and 4 Turbine Building design differs significantly from the turbine building described in the ABWR DCD. In the course of detailed design of the STP 3 and 4 Turbine Buildings, FNP performed a dynamic analysis and generated floor response spectra which are specific to this design. FNP compared these floor response spectra with the floor response spectra specified in DCD Tier 2, Section 3.2.5.3 for input to the MSL seismic analysis. This comparison revealed that the dynamic analysis for the STP 3 and 4 Turbine Buildings yielded higher floor response spectra than the floor response spectra required by DCD Section 3.2.5.3. Since the STP 3 and 4 COLA is the only pending application referencing the ABWR DCD, FNP has no basis for comparison to other turbine building detailed designs and cannot conclude whether or not the issue described above is limited to the STP 3 and 4 Turbine Building design.

FNP also considered the potential extent of condition of this issue. This issue is limited to the design of the MSLs within the turbine building addressed by DCD Section 3.2.5.3 and does not call into question the design of other safety related or important to safety Structures, Systems, and Components (SSCs). Unlike Seismic Category I structures, such as the reactor building and control building, the turbine building is unique in that a dynamic analysis of the building design was not available at the time of design certification and results of such a dynamic analysis were not included in the ABWR DCD. The ABWR DCD requires that the turbine building structure be designed such that damage to safety related functions does not occur under seismic loads corresponding to the SSE ground acceleration, and provides Tier 1 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) to confirm that the turbine building structure is adequately designed and constructed (ABWR DCD Tier 1, Table 2.15.11, "Turbine Building"). The limited number of safety related or other important to safety SSCs housed in the turbine buildings are being designed considering the results of the dynamic analysis described above, as appropriate, during the detailed design of the STP 3 and 4 Turbine Buildings. In the case of the MSLs within the turbine building, however, the ABWR DCD specified required design input values for seismic analysis of the MSLs independent of turbine building seismic analysis that might be performed by a COL applicant.

FNP staff identified this issue on July 1, 2010, and FNP initiated an evaluation for potential reporting in accordance with FNP procedures established pursuant to 10 CFR 21. Specifically, FNP has attempted to determine if the floor response spectra obtained during the STP 3 and 4 detailed design might indicate a potential error, omission or other circumstance in a design certification, or standard design approval that, on the basis of an evaluation, could create a substantial safety hazard and thus constitute a defect as defined in 10 CFR 21.3 Item [5].

Despite considerable review effort and support from other member companies of the STP 3 and 4 EPC team, FNP is unable to determine with certainty that this issue is unique to the STP 3 and 4 Turbine Building design associated with the plant specific departure described in the STP 3 and 4 COLA. FNP is also unable to determine with certainty whether or not the design input for the MSLs specified in the ABWR DCD would envelope other turbine building designs. There are two primary reasons for the inconclusive result:

- The analyses described above were obtained during the detailed design of the STP 3 and 4 Turbine Buildings, which differ from the turbine building design described in the DCD. Future applicants referencing the ABWR DCD may develop a range of turbine building design implementation details without departing from the requirements of the ABWR DCD. However, no other turbine building designs, fully compliant with the DCD, have been subjected to similar analysis.

- Review of the ABWR DCD Docket indicates that the appropriate design inputs for the MSLs within the turbine building were the subject of a number of discussions and correspondence between the NRC Staff and the U.S. ABWR design certification applicant, General Electric (GE). The GE Standard Safety Analysis Report and/or supporting design calculations and information approved by the NRC in the ABWR design certification process might provide the basis for the acceptability of the dynamic input loads specified in DCD Section 3.2.5.3. However, much of this information is not publically available.

FNP does not plan to perform further evaluations or analyses relative to 10 CFR 21 in regards to the adequacy of the DCD specified design inputs for the MSL design. This issue is being addressed in the STP 3 and 4 design by use of conservative floor response spectra generated during detailed design in order to ensure that the MSLs are fully capable of meeting their intended safety function. Should the NRC Staff require additional information regarding this issue, please contact me, or Lansing Dusek, FNP Director of Regulatory Affairs at 864-517-1386.

Sincerely,

Chris Tye

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