



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
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August 16, 2011

MEMORANDUM TO: Robert A. Nelson, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

FROM: Steven A. Reynolds, Director /RA/
Division of Reactor Safety

SUBJECT: FINAL - TASK INTERFACE AGREEMENT (TIA) – EVALUATION OF
POINT BEACH NUCLEAR PLANT TORNADO MISSILE PROTECTION
LICENSING BASIS (TIA 2011-011)

INTRODUCTION

The Nuclear Regulatory Commission (NRC) completed a Component Design Bases Inspection (CDBI) at the Point Beach Nuclear Plant (PBNP) on October 3, 2006, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML063200093). The inspection identified safety-related components that are not protected from tornado missiles. The licensee contends that no positive tornado missile protection is required for the identified components.

This TIA documents the regulatory position as determined through consultation between staff from Region III and staff from the Office of Nuclear Reactor Regulation (NRR) regarding the licensing basis for tornado missile protection at PBNP.

BACKGROUND

During the CDBI, the inspectors reviewed the design and configuration of the G-01 and G-02 emergency diesel generators (EDGs). These EDGs are considered one train for both Unit 1 and Unit 2 while the other EDGs (EDG-03 and EDG-04) are considered another train. The inspectors identified two potential concerns:

1. Tornado generated missiles could rupture the condensate storage tanks (CSTs), resulting in a release of the contents of the CSTs. The CSTs have not been analyzed for the effects of tornado missiles. The CSTs are located in the turbine building at the 26-foot elevation, directly above the EDGs G-01 and G-02 rooms. The EDG room exhaust fan “doghouses” are located in the turbine building adjacent to the CSTs at elevation 26-feet. The concern is that contents of a ruptured CST could enter the louvered openings in the “doghouses” and damage the EDG room exhaust fans located directly below. The fans appear to be susceptible to damage due to close tolerances used in the vane-axial design.

Docket Nos. 50-266; 50-301; 72-005
License Nos. DPR-24; DPR-27

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2. The exhaust stacks for EDGs G-01 and G-02 are routed vertically from the EDG rooms, on the outside of the turbine building wall. The stacks are approximately 100 feet high and 26 inches in diameter. The inspectors discovered that the exhaust stacks had not been analyzed for the effects of tornado missiles. The inspectors raised a concern that tornado induced missiles could damage the exhaust stacks to a sufficient extent that the exhaust flow would be restricted and the EDGs would not be capable of performing their required safety function.

LICENSEE POSITION

With respect to the first concern, the licensee addressed the failure of the CSTs as follows (References 5 and 6):

- An analysis shows that the CSTs are capable of withstanding the required design basis tornado winds, and
- A probability assessment estimated that the probability of a tornado driven missile impacting a CST is low ($1.3\text{E-}6/\text{yr}$). When additional factors are included, the resulting core damage frequency from a resulting water stream failing EDGs G-01 or G-02 is estimated to be of very low safety significance.

With respect to the second concern, at the time of the CDBI and as documented in References 1 through 4, the licensee believed that there were "...no explicit design criteria in the licensing basis for components to withstand tornado-induced missiles." Specifically:

- Based on FSAR Section 1.3, Table 1.3-1, General Design Criterion 2 – Performance Standards, and FSAR 1.3.1, "Overall Plant Requirements (GDC 1 – GDC 5)," protection to withstand tornado-induced missiles at the component level was not required; and
- Although the G-01 and G-02 diesel exhaust stacks are susceptible to being struck and damaged, based on the methodology documented in the PBNP Individual Plant Examination for External Events (IPEEE, dated June 30, 1995), with the probability estimates based on an analysis documented in Appendix G to NUREG/CR-4458, "Shutdown Decay Heat Removal Analysis of a Westinghouse 2-Loop Pressurized Water Reactor," dated March 1987, the probability of a tornado-driven missile impacting the stacks is low ($1.97\text{E-}7/\text{yr}$). This is considered to be of very low safety significance.

Subsequent to the CDBI, the licensee modified the exterior runs of EDG day tank vent piping associated with all four EDGs. These were replaced by a single down-turned breakable elbow to prevent the lines from being struck by a tornado missile and crimping or closing the pipes (Reference 2).

EVALUATION

Concern 1: Condensate Storage Tanks

After further review, the staff concluded the effects of CST rupture on EDGs G01 and G02 were addressed in previous correspondences and the current design is consistent with the license bases. Specifically, in the Safety Evaluation (SE) dated September 16, 1986, (Reference 15) for the licensee's response to GL 81-14, the staff raised concern that the CST rupture could introduce water into the diesel generator room and subsequently into the diesel generator voltage regulator cabinets via the room air exhausts located on Elevation 26' adjacent to the CSTs. The licensee responded to this concern in a letter dated October 31, 1986, (Reference 16) and stated that modifications were completed at Point Beach to address the effects of the rupture of CSTs on the diesel generator room and its voltage generator cabinets. The letter also confirmed that all activities necessary for compliance with GL 81-14 were considered to be complete. In a letter dated January 21, 1987, (Reference 17), the staff acknowledged that the modifications implemented at Point Beach to protect the diesel generator voltage regulator cabinets adequately addressed the staff's concerns identified in the SE resulting from a postulated condensate storage tank rupture. The inspectors shared this new insight with the NRR staff in February 2011. Based on subsequent discussions, the staff concluded that the effects of CST rupture on EDGs G01 and G02 were addressed adequately and this portion of the URI can be closed without further action.

Concern 2: G01 and G02 Diesel Exhaust Stacks

Licensing Bases

- Licensing Basis at the Granting of the Operating License

Section 1.3.3, "Overall Plant Requirements (GDC 1 – GDC 5)," of the Final Facility Description and Safety Analysis Report (FFDSAR) (predecessor to the Final Safety Analysis Report) at the time the Atomic Energy Commission issued the operating license, states, in part:

All systems and components of the facility are classified according to their importance. Those items vital to safe shutdown and isolation of the reactor or whose failure might cause or increase the severity of an accident or result in an uncontrolled release of excessive amounts of radioactivity are designated Class I...

Class I systems and components are essential to the protection of the health and safety of the public...

All systems and components designated Class I are designed so that there is no loss of function in the event of the maximum hypothetical ground acceleration acting in the horizontal and vertical direction simultaneously. The working stress for both Class I and Class II items are kept within code allowable values for the design earthquake. Similarly, measures are taken in the plant design to protect against high winds, flooding, and other natural phenomena. The Containments, and Class I portions of the Auxiliary Building, the turbine hall, and the pump house are designed to withstand the effects of a tornado.

In addition, the Performance Standards in Section 8.0.1, "Principal Design Criteria," (Electrical Systems) states:

Those systems and components of reactor facilities which are essential to the prevention or to the mitigation of the consequences of nuclear accidents which could cause undue risk to the health and safety of the public shall be designed, fabricated, and erected to performance standards that will enable such systems and components to withstand, without undue risk to the health and safety of the public the forces that might reasonably be imposed by the occurrence of an extraordinary natural phenomena such as earthquake, tornado, flooding condition, high wind or heavy ice. The design bases so established shall reflect:

(a) appropriate consideration of the most severe of these natural phenomena that have been officially recorded for the site and its surrounding area and (b) an appropriate margin for withstanding forces greater than those recorded to reflect uncertainties about the historical data and their suitability as a design basis for design.

- Safety Evaluation Issued With the Operating License (July 15, 1970)

The safety evaluation (SE) in Section 3.4, "Design of Class I Structures and Components," states, in part:

All Class I (seismic) structures at Point Beach including the containment structures, auxiliary building, and the intake structure are designed to withstand the wind loading and the potential missiles resulting from a tornado having a tangential velocity of 300 mph plus a forward progress of 60 mph and a concurrent pressure drop of 3 psi. We conclude that the plant is adequately protected against the effects of tornadoes.

- Current Licensing Basis

The Current Licensing Basis (CLB) for protection against tornado missiles is contained in the 2010 Point Beach Updated Final Safety Analysis Report (UFSAR), as provided by the licensee, Table 1.3-1, "Point Beach General Design Criteria," and states:

Those systems and components of reactor facilities which are essential to the prevention or to the mitigation of the consequences of nuclear accidents which could prevent undue risk to the health and safety of the public shall be designed, fabricated, and erected to performance standards that will enable such systems and components to withstand, without undue risk to the health and safety of the public, the forces that might reasonably be imposed by the occurrence of an extraordinary natural phenomena such as earthquake, tornado, flooding condition, high wind or heavy ice. The design bases so established shall reflect: (a) appropriate consideration of the most severe of these natural phenomena that have been officially recorded for the site and its surrounding area; and (b) an appropriate margin for withstanding forces greater than those recorded to reflect uncertainties about the historical data and their suitability as a design basis for design.

This criterion is repeated in UFSAR Section 8.0.1, "Principal Design Criteria," for electrical distribution systems.

Region III Determination

With respect to the licensing bases, the staff concluded the performance standards for electrical systems are the same in both the FFDSAR and the CLB. Both require that components "...which are essential to the prevention and mitigation of the consequences of nuclear accidents which could prevent undue risk to the health and safety of the public shall be designed, fabricated, and erected to performance standards that enable such systems and components to withstand, without undue risk to the health and safety of the public, the forces that might reasonably be imposed by the occurrence of an extraordinary natural phenomena such as earthquake, tornado..." This indicates that the licensee committed to have all components protected from the forces caused by tornadoes, which includes tornado missiles. The statement in the operating license SE which only identifies structures as being designed to withstand the consequences of tornado missiles does not replace or supersede the commitment contained in the FFDSAR or the CLB. It appears that the licensee failed to fully evaluate and identify components required to withstand the forces exerted by natural phenomena located outside of structures that were designed to withstand tornado missiles.

This position is supported by the FFDSAR "Overall Plant Requirements (GDC 1 – GDC 5) which states that "...Similar measures are taken in the plant design to protect against high winds, flooding, and other natural phenomena..." where natural phenomena include tornadoes and tornado generated missiles.

With respect to the use of the Individual Plant Examination of External Events (IPEEE) (Reference 7), the inspectors had several discussions with the NRR staff. In summary, the conclusions documented in the IPEEE regarding risk of a design or equipment performance attribute does not replace the need to meet a regulatory requirement or standard.

The purpose of the IPEEE was:

- (1) to develop an appreciation of severe accident behavior;
- (2) to understand the most likely severe accident sequences that could occur at its plant under full power operating conditions;
- (3) to gain a qualitative understanding of the overall likelihood of core damage and radioactive material release; and
- (4) if necessary, to reduce the overall likelihood of core damage and radioactive material release by modifying hardware and procedures that would help prevent or mitigate severe accidents.

On September 15, 1999, the agency issued "NRC Staff Evaluation Report on IPEEE Submittal for PBNP Units 1 and 2." This report stated, "The licensee's USI A-45 evaluation is consistent with the guidance provided in Section 6.3.3.1 of NUREG-1407 and, therefore, the NRC staff considers this issue resolved." Section, "GSI-156, Systematic Evaluation Program (SEP)," states, "The licensee's IPEEE submittal contains information directly addressing external-events-related SEP issues, which included "Tornado Missiles." It was concluded that "on the

basis that no vulnerability associated with this issue was identified in the IPEEE submittal, the NRC staff considers this issue resolved for Point Beach.” Also, the “Unique Plant Features, Potential Vulnerabilities, and Improvements” section states “The diesel generator stacks were modified to accommodate higher winds.” Section III, “Conclusion,” states “Point Beach, Units 1 and 2, IPEEE has met the intent of Supplement 4 to GL 88-20 and the resolution of specific generic safety issues discussed in this SER (which included USI A-45 and GSI-156 and both addressed tornado effects).

The inspectors noted the IPEEE was used to systematically search for and identify vulnerabilities associated with external events. Plant changes were to be made, if determined to be appropriate, in accordance with 10 CFR 50.59 and 10 CFR 50.90. Therefore, the IPEEE is not by itself a licensing basis document. The conclusions drawn in the September 1999 staff evaluation report were pertinent only to the resolution of USI A-45. The staff reviewed the Point Beach UFSAR and did not identify any examples where the IPEEE had been incorporated in the licensing basis nor had been determined to adequately justify regulatory compliance. Therefore, the staff concluded the licensee’s reference to the IPEEE for justification of the plant’s design was invalid.

With respect to the use of probability to justify plant design, the NRC staff clarified its position on the use of probability for tornado missile evaluations in a memorandum dated November 7, 1983 (Reference 8). The memorandum states: “Based on the guidance in SRP Sections 3.5.1.4 and 2.2.3, we plan to permit applicants and licensees to use risk-assessments for tornado and other high wind missiles and to judge their acceptability against a numerical criterion, which is as follows...” While this statement clearly states that the NRC will accept probability analysis for tornado missile protection evaluations, it also is clear that the NRC intends to review and approve the analysis by stating that the staff will “...judge their acceptability...” Therefore, any use of probability analysis for tornado missile evaluations must be approved by the NRC and included in a plant’s licensing basis.

With respect to the current licensing bases, the resident inspectors stated that previous noncited violations were documented for incomplete or inaccurate statements in the UFSAR. As a result of this inspection, the licensee revised UFSAR Section 1.3.1 to include a reference to a Bechtel Topical Report B-TOP-3 for the design criteria against tornado missiles. However, the topical report only addresses the design criteria when something is determined to require protection. The report does not provide criteria or guidance for determining what needs to be protected; thus, it does not address the issue of non-compliance with the licensing basis for what needs to be protected.

CONCLUSION

Based on the above, the staff concludes the licensing basis for Point Beach requires the emergency diesel generator exhaust stacks to be protected from tornado missiles.

The licensee's proposed use of the IPEEE, other non-licensing basis documentation, and judgments of low probability to demonstrate compliance with the licensing basis are not acceptable without submitting this material for NRC staff review and inclusion in the UFSAR. The Bechtel topical report reference in the UFSAR does not address the issue on what components are required to be protected from tornado missiles.

REFERENCES

1. "NRC Inspection Question 2006 Component Design Basis Inspection," Question 174, September 28, 2006 (ADAMS Accession No. ML103510420)
2. "NRC Inspection Question 2006 Component Design Basis Inspection," Question 174, October 13, 2010 (ADAMS Accession No. ML103510423)
3. "NRC Inspection Question 2006 Component Design Basis Inspection," Question 131, September 22, 2006 (ADAMS Accession No. ML103510375)
4. "NRC Inspection Question 2006 Component Design Basis Inspection," Question 131, October 13, 2010 (ADAMS Accession No. ML103510380)
5. "NRC Inspection Question 2006 Component Design Basis Inspection," Question 136, September 22, 2006 (ADAMS Accession No. ML103510384)
6. "NRC Inspection Question 2006 Component Design Basis Inspection," Question 136, October 13, 2010 (ADAMS Accession No. ML103510389)
7. "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities – 10 CFR 50.54(f) (Generic Letter No. 88-20, Supplement 4)"
8. Memorandum to Victor Stello, Deputy Executive Director for Regional Operations and Generic Requirements, from Harold R. Denton, Director, Office of Nuclear Reactor Regulation, "POSITION ON USE OF PROBABILISTIC RISK ASSESSMENT IN TORNADO MISSILE PROTECTION LICENSING ACTIONS," dated November 7, 1983 (ADAMS Accession No. ML080870287)
9. NRC Regulatory Issue Summary 2008-14, "Use of TORMIS Computer Code for Assessment of Tornado Missile Protection," June 16, 2008 (ADAMS Accession No. ML080230578)
10. NRC GL 95-04: Final Disposition of the Systematic Evaluation Program Lessons-Learned Issues, dated April 28, 2005 (ADAMS Accession No. ML031070101)
11. PBNP IPEEE summary report; dated June 30, 1995 (ADAMS Accession No. ML080100398)
12. Request for additional information by NRC on PBNP's IPEEE submittal; dated April 15, 1996
13. PBNP's Response to NRC RAI on HFOs; dated August 15, 1996 (ADAMS Accession No. ML080100395)
14. Staff Evaluation Report on PBNP's IPEEE submittal; dated September 15, 1999 (ADAMS Accession No. ML 112030452)
15. NRC SE on PBNP's response to GL 81-14; dated September 16, 1986 (ADAMS Accession No. ML 112030423)
16. Letter dated October 31, 1986, from PBNP to NRC in response to the NRC concerns listed in the SE on PBNP's GL 81-14 submittal (ADAMS Accession No. ML 112030401)
17. NRC letter dated January 21, 1987, to PBNP acknowledging and accepting PBNP's response to the NRC concerns listed in the SE on PBNP's GL 81-14 submittal (ADAMS Accession No. ML 112030407)

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Memo to Mr. Robert A. Nelson from Mr. Steven A. Reynolds, dated August 8, 2011.

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NUCLEAR PLANT TORNADO MISSILE PROTECTION LICENSING BASIS
(TIA 2011-011)

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