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Question: 1337

With respect to Question 1166, evaluation of tornado missile impacts on EDG intake and exhaust, provide the pertinent current licensing basis information.

Response:

EDG Tornado Missile Protection

As noted in the response to CDBI question 1166, the configuration of the intakes and exhausts for the emergency diesel generators is original design. UFSAR Section 3.5 notes that components are protected from the effects of postulated missiles either by barriers, or in the case of redundant systems or components, by physical separation: “As appropriate, safety-related equipment is protected from missiles through basic station arrangement such that, if equipment failure should occur, redundant equipment will remain available to perform the safety function.” Separation and redundancy provides adequate protection and is consistent with the plant licensing basis. The Atomic Energy Commission (AEC) reviewed plant protection related to a postulated tornado strike in a 1966 Safety Evaluation (Reference 1) noting:

“…independence of vital systems has been provided in the design to insure that a safe shutdown of the plant can be accomplished even if a tornado-generated missile were to penetrate the secondary containment. We believe that these design considerations provided reasonable insurance [sic] that a tornado striking the proposed plant would not result in a nuclear hazard.”

In 1971 the NRC approved the General Design Criteria (GDCs) which included requirements for externally generated missiles (Reference 2); however, Quad Cities was not formally licensed to these requirements. As noted in UFSAR Section 3, at the time of initial plant licensing draft GDCs were in place for industry comment, but were not formally used for plant licensing.

The NRC published Regulatory Guide 1.76 in April 1974 (Design Basis Tornado for Nuclear Power Plants). The Regulatory Guide provided guidance for establishing design basis tornado characteristics (i.e., wind velocities, pressure drop, etc.). Regulatory Guide 1.76 did not provide explicit guidance for missile protection (as noted in the Regulatory Guide, missile protection was deferred to subsequent guides). This subsequent guidance was published as Revision 1 to Regulatory Guide 1.76 in March 2007. While Revision 1 provides guidance for establishing a design basis tornado missile spectrum, Section D of Draft Guide 1143 (January 2006) noted:

"Except in those cases in which an applicant or licensee proposes or has previously established an acceptable alternative method for complying with specified portions of the NRC’s regulations, the methods to be described in the active guide will reflect public comments and will be used in evaluating (1) submittals in connection with applications for construction permits, standard plant design certifications, operating licenses, early site permits, and combined licenses; and (2) submittals from operating reactor licensees who voluntarily propose to initiate system modifications if there is a clear nexus between the proposed modifications and the subject for which guidance is provided herein."

The NRC previously accepted an alternative design basis regarding tornado missile protection for Quad Cities, that being components are protected from the effects of postulated missiles either by barriers, or in the case of redundant systems or components, by physical separation current plant design features for protection against tornado missiles (Reference 1).

In addition, plant risk related to tornado missiles was evaluated under the SEP process (for designs similar to Quad Cities) and deemed acceptable. Similar risk reviews for external events were completed and reviewed by the Staff under the IPEEE program for Quad Cities Station (Reference 4).

References:

1. NRC Safety Evaluation (for construction), “Safety Evaluation by the Division of Reactor Licensing U.S. Atomic Energy Commission in the Matter of Commonwealth Edison Company Quad Cities Station Units 1 and 2 Cordova, Illinois,” dated December 30, 1966
2. GDC 4: Systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.
3. SRP Section 3.5.1.4, “Missiles Generated by Tornados and Extreme Winds”
4. NRC Safety Evaluation, "Quad Cities Nuclear Power Plant – Review of Individual Plant Examination of External (IPEEE) Submittal," dated April 26, 2001.