FENOC

FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Mark B. Bezilla
Vice President - Nuclear

419-321-7676
Fax: 419-321-7582

Docket Number 50-346 10 CFR 50.90

License Number NPF-3

Serial Number 3078

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United States Nuclear Regulatory Commission
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Washington, DC 20555-0001

Subject: Davis-Besse Nuclear Power Station
License Amendment Application to Change Design Requirements for Tornado Missile Protection (License Amendment Request No. 04-0024)

Ladies and Gentlemen:

Pursuant to 10 CFR 50.90, the following amendment is requested for the Davis-Besse Nuclear Power Station, Unit 1 (DBNPS). The proposed amendment would change the facility as described in the DBNPS Updated Safety Analysis Report (USAR) to modify the design requirements for protection from tornado missiles. Specifically, the proposed amendment would allow certain structures, systems, and components that are not currently provided with physical protection from tornado-induced missiles to remain unprotected when the probability of a tornado-induced missile impact is demonstrated to be acceptably low using the Electrical Power Research Institute "Tornado Missile Risk Evaluation Methodology" (TORMIS). The proposed amendment does not involve a change to any Operating License Condition or Technical Specification. The proposed changes have been evaluated under 10 CFR 50.59, and it has been concluded that a License Amendment is required. Enclosure 1 to this letter contains the technical analysis of the proposed changes and the proposed no significant hazards consideration.

During the recently completed thirteenth refueling outage at the DBNPS, it was discovered that certain structures, systems, and components were not provided with tornado missile protection as required by USAR design criteria. These nonconformances were entered into the DBNPS Corrective Action Program. The proposed amendment would support resolution of these nonconformances by allowing the use of a probabilistic argument to accept the absence of physical protection for these structures, systems, and components. Approval of the proposed amendment is requested by April 30, 2005, to support final corrective action for this non-conforming condition. Once approved, the amendment shall be implemented within 120 days.

A001
A053

The proposed changes have been reviewed by the DBNPS onsite review committee and offsite review committee.

Should you have any questions or require additional information, please contact Mr. Henry L. Hegrat, Supervisor - Licensing, at (330) 315-6944.

The statements contained in this submittal, including its associated enclosures and attachments, are true and correct to the best of my knowledge and belief. I am authorized by the FirstEnergy Nuclear Operating Company to make this request. I declare under penalty of perjury that the foregoing is true and correct.

Executed on: JAN 11, 2005

By:
Mark B. Bezilla, Vice President - Nuclear

MAR

Enclosures

cc: J. L. Caldwell, Regional Administrator, NRC Region III
J. B. Hopkins, NRC/NRR Senior Project Manager
N. Dragani, Executive Director, Ohio Emergency Management Agency, State of Ohio (NRC Liaison)
C. S. Thomas, NRC Region III, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

Docket Number 50-346
License Number NPF-3
Serial Number 3078
Enclosure 1

DAVIS-BESSE NUCLEAR POWER STATION
EVALUATION
FOR
LICENSE AMENDMENT REQUEST NUMBER 04-0024

(32 pages follow)

DAVIS-BESSE NUCLEAR POWER STATION
EVALUATION
FOR
LICENSE AMENDMENT REQUEST NUMBER 04-0024

Subject: License Amendment Application to Change Design Requirements for Tornado Missile Protection

1.0 DESCRIPTION

This is a request to amend the Davis-Besse Nuclear Power Station (DBNPS), Unit Number 1 Facility Operating License Number NPF-3.

During the recently completed thirteenth refueling outage at the DBNPS, it was discovered that certain structures, systems, and components were not provided with tornado missile protection as required by Updated Safety Analysis Report (USAR) design criteria. These nonconformances were entered into the DBNPS Corrective Action Program. The proposed amendment would support resolution of these nonconformances by allowing a change to the facility as described in the USAR to modify the design requirements for protection from tornado missiles. Specifically, the proposed amendment would allow certain structures, systems, and components that are not currently provided with physical protection from tornado-induced missiles to remain unprotected when the probability of a tornado-induced missile impact is demonstrated to be acceptably low using the Electrical Power Research Institute "Tornado Missile Risk Evaluation Methodology" (TORMIS). The proposed amendment does not involve a change to any condition of the Operating License or to any Technical Specification. The proposed changes have been evaluated under 10 CFR 50.59, and it has been concluded that a License Amendment is required.

Changes to the DBNPS USAR to reflect the use of TORMIS were previously made without NRC approval under 10 CFR 50.59. Subsequent to approval of the 10 CFR 50.59 evaluation and implementation of the associated USAR change, it was identified that the evaluation was deficient and that NRC approval of the proposed change should have been obtained prior to making the change (refer to NRC Inspection Report 05000346/2004010). The changes to the USAR which were made under the deficient evaluation were included in Revision 24 of the USAR which was provided to the NRC by letter dated June 23, 2004.

Use of the TORMIS methodology was previously approved by the NRC for the Perry (reference 8), Haddam Neck (reference 9), Waterford (reference 12), and Farley (reference 13) stations.

2.0 PROPOSED CHANGE

The proposed amendment would change the facility as described in the USAR to modify the design requirements for protection from tornado missiles. The proposed changes are shown on the marked-up USAR pages in Attachment 1. The proposed changes affect USAR Sections 3.3.2.1, "Tornado Criteria - General;" 3.3.3, "Essential Systems and Components for Safe Shutdown in the Event of a Tornado;" 3.5.1, "Missile Criteria;" 3.8.1.1.1, "Auxiliary Building;" and 3.12, "References." The marked-up pages in Attachment 1 show changes to the pages from Revision 23 of the USAR and not the most recent Revision 24 pages, which included the changes made under the deficient 10 CFR 50.59 evaluation.

The proposed changes would add a description of the application of the TORMIS Methodology to the USAR. Specifically, the following discussion would be added following the list of methods for missile protection in Section 3.5.1:

The reinforced concrete structures identified in Section 3.3.2.1 have been designed to preclude damage to plant equipment from tornado generated missiles. These structures have various openings that have not been protected by missile barriers. Openings associated with the systems identified in Table 3.3-1 have been analyzed using the "TORMIS" methodology developed by the Electric Power Research Institute (reference 94). A listing of unprotected targets in essential safe shutdown systems is provided in Table 3.5-3.

TORMIS determines the probability of tornado missiles striking the openings in the structure. The probability is calculated by simulating a large number of tornado strike events at the site for each tornado wind speed intensity scale. After the probability is calculated, the exposed area of specific components is factored in to compute the probability of striking a particular item.

The acceptance criteria for the TORMIS analysis has been established as 1×10^{-6} per year cumulative probability of a tornado missile striking an unprotected essential SSC required for safe shutdown in the event of a tornado, which is the same value found to be acceptable by the NRC based on the expected rates of occurrence of potential exposures in excess of 10 CFR 100 guidelines. This criteria in combination with conservative qualitative assumptions show that the realistic probability of a potential exposures in excess of the 10 CFR Part 100 guidelines is lower than 1×10^{-6} per year. These conservative qualitative assumptions for the DBNPS TORMIS analysis are the same as previously found to be acceptable by the NRC (reference 95). The qualitative assumptions are described below:

- It is assumed that an essential system or component (USAR Table 3.3-1) being struck by a tornado missile will result in damage sufficient to preclude it from performing its intended safety function.

- It is assumed that the damage to the essential system or component (USAR Table 3.3-1) results in damage to fuel sufficient to result in conservatively calculated radiological release values in excess of 10 CFR 100 guidelines.

- There are no missiles that can directly impact irradiated fuel, even the spent fuel stored in the Spent Fuel Pool area of the Auxiliary Building. Any missiles postulated to enter this area either miss the pool entirely, are stopped by internal walls, or strike the far side of the pool or piping above the level of the fuel.

In the event that DBNPS evaluations using TORMIS methodology provide results indicating that the probability of a damaging tornado induced missile strike due to plant configuration equals or exceeds DBNPS's 1×10^{-6} per year acceptance criteria, then unique protective barriers will be utilized to reduce the total probability to below the acceptance criteria. TORMIS shall not be used to justify the permanent removal of any protective barriers.

The TORMIS methodology has been approved by the NRC (reference 93). The DBNPS analysis is in accordance with the TORMIS program, except for the following NRC required plant specific items stated in the TORMIS related SER:

1. As described in USAR Sections 2.3.1.2.6 and 3.3.1, the probability of a tornado strike at a point within the one-degree square in which the site is located is 6.3×10^{-4} per year based on local analysis. This value is used in the DBNPS analysis. This value is more conservative than the tornado probability value within the TORMIS program.

2. The Fujita wind speed intensity scales were used in lieu of the standard TORMIS wind speeds.

3. The tornado wind field parameters are selected such that the V0 (speed at ground level) / V33 (speed at 33 feet elevation) ratio is 0.82. This value is consistent with previously accepted NRC values for this parameter (references 95 and 96).

4. The number of missiles used in the DBNPS TORMIS analysis is a conservative value for site specific sources, such as laydown, parking, and warehouse areas. These are postulated based on a site walkdown to develop the specific value for the DBNPS.

New USAR Table 3.5-3 would also be added to identify the unprotected targets in essential safe shutdown systems. Additional changes would be made to make appropriate cross-references to this section and to add appropriate documents to the list of references.

The proposed amendment would change the facility as described in the DBNPS Updated Safety Analysis Report (USAR) to modify the design requirements for protection from tornado missiles. Specifically, the proposed amendment would allow certain structures, systems, and components that are not currently provided with physical protection from tornado-induced missiles to remain unprotected when the probability of a tornado-induced missile impact is demonstrated to be acceptably low using the Electrical Power Research Institute "Tornado Missile Risk Evaluation Methodology" (TORMIS). The proposed amendment does not involve a change to any condition of the Operating License or to any Technical Specification. The proposed changes have been evaluated under 10 CFR 50.59, and it has been concluded that a License Amendment is required.

3.0 BACKGROUND

During the recently completed thirteenth refueling outage at the DBNPS, it was discovered that certain structures, systems, and components were not provided with tornado missile protection as required by Updated Safety Analysis Report (USAR) design criteria. These nonconformances were entered into the DBNPS Corrective Action Program. The proposed amendment would support resolution of these nonconformances by allowing a change to the facility as described in the USAR to modify the design requirements for protection from tornado missiles.

Protection against tornadoes is described in USAR Section 3.3.2, "Tornado Criteria." Essential systems and components that are required for safe shutdown in the event of a tornado are identified in USAR Section 3.3.3, "Essential Systems and Components for Safe Shutdown in the Event of a Tornado." Missile protection is described in USAR Section 3.5, "Missile Protection Criteria."

The TORMIS methodology is described in EPRI Topical Report NP-2005, "Tornado Missile Risk Evaluation Methodology," Volumes I and II, dated August 1981. The NRC's evaluation of this methodology is documented by NRC memorandum dated October 26, 1983, "Safety Evaluation Report - Electric Power Research Institute (EPRI) Topical Reports Concerning Tornado Missile Probabilistic Risk Assessment (PRA) Methodology."

4.0 TECHNICAL ANALYSIS

The proposed change affects the design requirements for tornado missile protection. The proposed change will revise the protection scheme of some systems, structures, and components (SSCs) from tornado induced missile effects. The currently approved approach is to provide positive physical tornado missile protection for all essential SSCs required for safe shutdown in the event of a tornado. The proposed change will be to accept the lack of physical protection for some of these SSCs from the effects of tornado induced missiles, when they can be shown to be of an acceptably low probability using the TORMIS methodology.

Utilization of the proposed methodology, which employs the probabilistic approach permitted in appropriate regulatory guidance and the proposed acceptance criteria detailed further below, is a sound and reasonable method of addressing tornado missile protection at the DBNPS for the limited portions of essential SSCs required for safe shutdown in the event of a tornado that are not protected by tornado missile barriers. As noted above, the USAR would be revised, making this an established part of the DBNPS licensing basis for conformance to design criteria for protection against tornado missiles. Existing plant conditions, as well as future changes to the facility, could be evaluated using the probabilistic approach.

Consistent with the guidance of NRC Standard Review Plan (SRP) Section 3.5.1.4 "Missiles Generated By Natural Phenomena," and SRP Section 2.2.3, "Evaluation Of Potential Accidents," the total probability will be maintained below an allowable level (i.e., an acceptance criteria threshold, which reflects an extremely low probability of occurrence). SRP Section 3.5.1.4, Revision 2, notes in Section II, "Acceptance Criteria," that the "methodology of identification of appropriate design basis missiles generated by natural phenomena shall be consistent with the acceptance criteria defined for the evaluation of potential accidents from external sources in SRP Section 2.2.3." SRP Section 2.2.3, Revision 2, in Section II, "Acceptance Criteria," notes that the acceptance criteria are based on meeting "the relevant requirements of 10 CFR Part 100, . . . which indicates that reactors should reflect through their design, construction and operation an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products." It also notes that "the expected rate of occurrence of potential exposures in excess of the 10 CFR Part 100 guidelines of approximately 10^{-6} per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower."

The proposed DBNPS-specific acceptance criteria, which will be reflected in the USAR, is considered to contain inherent qualitative conservatism. This conservatism stems from the DBNPS assumption that in all cases, a tornado missile strike on the limited portion of a system or component that is exposed will result in damage, and that the damage results in a radioactive release, rather than performing specific evaluations as to whether the strike can actually cause damage and releases.

The DBNPS approach requires that if the probability calculation result for the total plant identifies that the total probability of tornado missiles striking a portion of an essential SSC required for safe shutdown in the event of a tornado is greater than or equal to 10^{-6} per year, then unique missile barriers must be installed to lower the total probability below the acceptance criteria of 10^{-6} per year. Further discussion of these topics and the conservatism which makes the 10^{-6} per year criteria "acceptable" as described in SRP Section 2.2.3, are contained in the words that are being added into the DBNPS USAR. The USAR words addressing the probability analysis technique, the acceptance criteria, and the requirement to reduce or maintain the total probability of tornado generated missile strikes to below the DBNPS-specific acceptance criteria, will become part of the DBNPS licensing basis for conformance to tornado missile protection criteria.

In the NRC Safety Evaluation Report dated October 26, 1983, the NRC noted that licensees using the EPRI approach must consider five specific points regarding input parameters. The following provides the DBNPS response to these points.

1. Data on tornado characteristics should be employed for both broad regions and small areas around the site. The most conservative values should be used in the risk analysis or justification provided for those values selected.

Response: The DBNPS is located in NRC Tornado Region I. Therefore, the characteristics from Tornado Region I are applicable from a broad region perspective. Based on tornado occurrence information presented in EPRI NP-2005, the broad region probability of a tornado strike at a site of intensities F0 through F6 is 4.25×10^{-4} per year (F0 through F6 refer to Fujita tornado intensities). Based on tornado occurrence information presented in USAR Sections 2.3.1.2.6 and 3.3.1, the probability of a tornado striking a point within the one-degree square in which the site is located is 6.3×10^{-4} per year. Accordingly, in the TORMIS analysis, tornado occurrence rates of Region I are increased to yield a site probability of tornado strike equal to the local value of 6.3×10^{-4} per year. Therefore, the study uses conservative characteristics of local and broad region information. As part of the DBNPS analysis, the annual probability of a tornado will be determined for the wind speeds in item 2 below, using regional data available in TORMIS for NRC Tornado Region I. The more conservative of these two values will be utilized in the DBNPS analysis.

2. The EPRI study proposes a modified tornado classification, F'-scale, for which the velocity ranges are lower by as much as 25% than the velocity ranges originally proposed in the Fujita

F-scale. Insufficient documentation was provided in the studies in support of the reduced F'-scale. The F-scale tornado classification should therefore be used in order to obtain conservative results.

Response: The Fujita scale (F-scale) wind speeds are used in lieu of the TORMIS wind speeds (F'-scale) used in EPRI NP-2005 (reference 4).

3. Reductions in tornado wind speed near the ground due to surface friction effects are not sufficiently documented in the EPRI study. Such reductions were not consistently accounted for when estimating tornado wind speeds at 33 feet above grade on the basis of observed damage at lower elevations. Therefore, users should calculate the effect of assuming velocity profiles with ratios V_0 (speed at ground level) / V_{33} (speed at 33 feet elevation) higher than that in the EPRI study. Discussion of sensitivity of the results to changes in the modeling of the tornado wind speed profile near the ground should be provided.

Response: Tornado wind field parameters are selected such that the V_0 / V_{33} ratio is 0.82, which is the ratio of near ground wind velocity to the velocity at 33 feet above ground from Figure 11-12 of EPRI NP-2005. This value ensures that an appropriate near ground tornado wind speed was applied in the DBNPS TORMIS analysis. The 0.82 value is not a site dependant value and this approach is consistent with the previously NRC accepted parameter for plants located within the same NRC Tornado Region I, i.e., the Perry Plant (reference 8) and the Haddam Neck Plant (reference 9).

4. The assumptions concerning the locations and numbers of potential missiles presented at a specific site are not well established in the EPRI studies. However, TORMIS allows site-specific information on tornado missile availability to be incorporated in the risk calculation. Therefore, users should provide sufficient information to justify the assumed missile density based on site specific missile sources and dominant tornado paths of travel.

Response: The plant area and non-safety related buildings within a 6000' x 6000' area were evaluated, and missile population and distribution were determined from this information. The evaluated area exceeds one square mile as recommended by EPRI. This evaluation yielded a plant missile population in excess of 108,000 missiles, which included about 8,200 missiles from buildings within the power block with steel framing and siding. This number of missiles far exceeds the number of missiles used in EPRI NP-2005.

Additional attention was given to potential increase in missiles from possible addition of new structures and sources planned for plant modifications during a time of major plant outage by performing a sensitivity study where the total missile population was increased by more than 25,000.

Based on this sensitivity study included in the DBNPS TORMIS calculation, it is documented that the probability values are not significantly adversely impacted by an increase in missile population. Therefore, no periodic assessment of potential tornado missiles is necessary.

5. Once the EPRI methodology has been chosen, justification should be provided for any deviations from the calculational approach.

Response: The DBNPS analyses do not have any deviations from EPRI NP-2005, except as noted in items 1 through 4 above.

The NRC concluded in its Safety Evaluation Report that the EPRI approach is an acceptable probabilistic approach for demonstrating compliance with the requirements of the General Design Criteria regarding protection of specific safety related plant features from the effects of tornado and high wind generated missiles, subject to the additional concerns related to input parameters discussed above. The NRC also noted that use of the EPRI or any tornado missile probabilistic study should be limited to the evaluation of specific plant features where additional costly tornado missile protective barriers or alternative systems are under consideration. FENOC believes the cost to add new permanent barriers would be significant, and is not considered to be cost-justified based on the extremely low probability of tornado missile strike and damage to an essential SSC required for safe shutdown in the event of a tornado, and even lower probability of any resultant radiological release of sufficient quantity to compromise the health and safety of the public.

Based on the acceptability of the TORMIS methodology and the low probability of a tornado missile striking essential safe shutdown equipment, the proposed amendment would have no significant adverse effect on nuclear safety.

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

The proposed amendment would change the facility as described in the Davis-Besse Nuclear Power Station (DBNPS) Updated Safety Analysis Report (USAR) to modify the design requirements for protection from tornado missiles. Specifically, the proposed amendment would allow certain structures, systems, and components that are not currently provided with physical protection from tornado-induced missiles to remain unprotected when the probability of a tornado-induced missile impact is demonstrated to be acceptably low using the Electrical Power Research Institute "Tornado Missile Risk Evaluation Methodology" (TORMIS). The proposed amendment does not involve a change to any condition of the Operating License or to any Technical Specification.

An evaluation has been performed to determine whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed amendment would reflect use of the Electric Power Research Institute (EPRI) Topical Report "Tornado Missile Risk Evaluation Methodology" (EPRI NP-2005), Volumes I and II. As noted in the NRC Safety Evaluation on this report dated October 26, 1983, "The current licensing criteria governing tornado missile protection are contained in Standard Review Plan (SRP) Sections 3.5.1.4 and 3.5.2. These criteria generally specify that safety-related systems be provided positive tornado missile protection (barriers) from the maximum credible tornado threat. However, SRP Section 3.5.1.4 includes acceptance criteria permitting relaxation of the above deterministic guidance, if it can be demonstrated that the probability of damage to unprotected essential safety-related features is sufficiently small."

"Certain Operating License (OL) applicants and operating reactor licensees have chosen to demonstrate compliance with tornado missile protection criteria for certain portions of the plant . . . by providing a probabilistic analysis which is intended to show a sufficiently low risk associated with tornado missiles. Some . . . have utilized the tornado missile probabilistic risk assessment (PRA) methodology developed by" EPRI in the Topical Report listed above. The NRC noted that this report "can be utilized when assessing the need for positive tornado missile protection for specific safety-related plant features." This methodology has subsequently been utilized in nuclear power plant licensing actions.

As permitted in NRC Standard Review Plan (NUREG-0800) sections, the total probability will be maintained below an allowable level, i.e., an acceptance criteria threshold, which reflects an extremely low probability of occurrence. The DBNPS approach assumes that if the probability calculation result for the total plant identifies that the cumulative probability of tornado missiles striking an unprotected portion of a safety system or component required for safe shutdown in the event of a tornado exceeds 10^{-6} per year, then unique missile barriers would need to be installed to lower the total probability below the acceptance criteria of 10^{-6} per year.

With respect to the probability of occurrence of an accident previously evaluated in the USAR, the possibility of a tornado reaching the DBNPS site and causing damage to plant structures, systems, and components is an event considered in the USAR. The changes being proposed herein do not affect the probability that the natural phenomena (a tornado) will reach the plant, but they do, from a licensing basis perspective, affect the probability that missiles generated by the winds of the tornado might strike certain plant systems or components. As recently determined, there are a limited number of safety-related components that could theoretically be struck by a tornado generated missile. The total (cumulative) probability of a tornado missile striking an unprotected component will be maintained below an extremely low acceptance criteria to ensure overall plant safety. Due to the extremely low probability of a tornado missile impacting an essential component, the small increase in the probability of accident initiation is not considered significant.

With respect to the consequences of an accident previously evaluated, there is an extremely low probability of a malfunction of an unprotected essential component due to tornado missile impact. Due to (1) the extremely low probability of a tornado missile striking essential equipment as calculated by TORMIS, and (2) the low probability that any tornado missile strikes would cause sufficient damage to prevent essential equipment from performing its accident-mitigating function, a loss of accident mitigation capability is not considered credible. Therefore, the radiological consequences of accidents are not significantly affected.

The proposed change is not considered to constitute a significant increase in the probability of occurrence or the consequences of an accident, due to the extremely low total probability of a tornado missile strike and thus an extremely low probability of a radiological release. Therefore, the proposed change does not involve a significant increase in the probability or consequences of previously evaluated accidents.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The possibility of a tornado reaching the DBNPS site is a design basis event considered in the USAR. This change involves recognition of the acceptability of performing tornado missile probability calculations in accordance with established regulatory guidance. The change therefore deals with an established design basis event (the tornado). Therefore, the proposed change would not contribute to the possibility of a new or different kind of accident from those previously analyzed.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   This request does not involve a significant reduction in a margin of safety. The existing licensing basis for the DBNPS with respect to the design basis event of a tornado reaching the plant is to provide positive missile barriers for all systems and components required for safe shutdown in the event of a tornado. With the change, it will be recognized that there is an extremely low probability, below an established acceptance limit, that a limited subset of these systems and components could be struck. The change to missile protection based on extremely low probability (less than 1×10^{-6} per year cumulative strike probability) of occurrence of tornado generated missile strikes on portions of these systems and components is not considered to constitute a significant decrease in the margin of safety due to that extremely low probability. Therefore, the changes associated with this license amendment request do not involve a significant reduction in the margin of safety.

Based on the above, it is concluded that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is acceptable.

5.2 Applicable Regulatory Requirements/Criteria

The DBNPS design criteria for tornado missile protection are specified in USAR Section 3D.1.2, "Criterion 2 - Design Bases for Protection against Natural Phenomena," and USAR Section 3D.1.4, "Criterion 4 - Environmental And Missile Design Bases." USAR Section 3D.1.2 states, in part:

> Structures, systems, and components important to safety are designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components reflect: (1) appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

USAR Section 3D.1.4 states, in part:

> Structures, systems and components important to safety are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components are 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.

NRC criteria for assessing tornado missile protection are contained in NRC Standard Review Plan (SRP) Section 3.5.1.4, "Missiles Generated by Natural Phenomena." Consistent with the existing DBNPS design requirements, these criteria generally specify that important systems be provided positive tornado missile protection (i.e., barriers) from the maximum credible tornado. However, SRP Section 3.5.1.4 includes acceptance criteria permitting relaxation of the deterministic guidance if it can be demonstrated that the probability of damage to unprotected important structures, systems, and components (SSCs) is acceptably low. The criteria proposed for use by FENOC to demonstrate an acceptably low probability of tornado missile damage to essential SSCs required for safe shutdown in the event of a tornado is consistent with guidance in SRP Section 2.2.3, "Evaluation of Potential Accidents." SRP 2.2.3 states, "The expected rate of occurrence of potential exposures in excess of the 10 CFR Part 100 guidelines of approximately 10^{-6} per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower." The limit of 10^{-6} per year and the qualitative arguments are contained in the proposed USAR text.

The proposed amendment would utilize the probabilistic approach for addressing tornado missiles specified in SRP 3.5.1.4. The approach being proposed has previously been found to be acceptable by the NRC for the Perry Nuclear Power Plant (reference 8). The changes being made by the proposed amendment do not affect the DBNPS's compliance with any requirement of Title 10 of the Code of Federal Regulations or the DBNPS Technical Specifications. The proposed changes have been evaluated to assure continued compliance with the DBNPS principal design criteria. Therefore, the proposed amendment is acceptable.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

1. DBNPS Operating License NPF-3, Appendix A Technical Specifications through Amendment 262.
2. DBNPS Updated Safety Analysis Report through Revision 24.
3. Memorandum from L. Rubenstein to F Miraglia, "Safety Evaluation Report - Electric Power Research Institute (EPRI) Topical Reports Concerning Tornado Missile Probabilistic Risk Assessment (PRA) Methodology," dated October 26, 1983.
4. EPRI Topical Report NP-2005, "Tornado Missile Risk Evaluation Methodology," Volumes I and II, dated August 1981.
5. NUREG-0800, *U.S. Nuclear Regulatory Commission Standard Review Plan.*
6. Regulatory Guide 1.76, "Design Basis Tornado for Nuclear Power Plants," dated April 1974.
7. Regulatory Guide 1.117, Revision 1, "Tornado Design Classification," dated April 1978.
8. Letter to L. Myers from D. Pickett, "Amendment No. 90 to Facility Operating License No. NPF 58 - Perry Nuclear Power Plant, Unit 1 (TAC No. M99447)," dated November 4, 1997.
9. Letter to J. Opeka from A. Wang, "Haddam Neck Plant - Systematic Evaluation Program Topics III-2 and III-4.A, Wind and Tornado Loadings and Tornado Missiles (TAC No. 51935)," dated October 21, 1992.
10. Letter to M. Bezilla from J. Grobe, "NRC Evaluations of Changes, Experiments, or Tests and Permanent Plant Modifications Inspection Report 05000346/2004010," dated August 3, 2004.
11. Letter to USNRC from M. Bezilla, "Revision 24 to the Davis-Besse Nuclear Power Station (DBNPS) Unit 1 Updated Safety Analysis Report (USAR)," dated June 23, 2004.
12. Letter to C. Dugger from N. Kalyanam, "Waterford Steam Electric Station, Unit 3 - Issuance of Amendment No. 168 Re: Amendment for a Previously Unreviewed Safety Question Regarding Design Basis Concerning Tornado Missile (TAC No. MA7359)," dated September 7, 2000.
13. Letter to D. Morey from F. Rinaldi, "Joseph M. Farley Nuclear Plant, Units 1 and 2 Re: Issuance of Amendments (TAC Nos. MA9495 and MA 9496)," dated September 26, 2001.
14. DBNPS Condition Report 02-04147, "LIR-EDG-Missle Protection On Stacks About 6 Feet Short Of Completely Effective"
15. DBNPS Condition Report 02-04700, "Tornado Missile Protection."

8.0 ATTACHMENTS

1. Proposed Mark-Up of Updated Safety Analysis Report Pages

LAR 04-0024
Attachment 1

PROPOSED MARK-UP
OF
UPDATED SAFETY ANALYSIS REPORT PAGES

(18 pages follow)

LIST OF TABLES

3.3.2 Tornado Criteria

3.3.2.1 General

There are few reliable measurements of the pressure drop associated with a tornado funnel. The greatest reliably measured pressure drops have been on the order of 1.5 psi or less.

The design pressure drop is assumed to be 3 psi in 3 seconds. This is 100% greater than the greatest pressure drop ever reliably measured, which is conservative.

Because of the complexity of the airflow in a tornado, it has not been possible to calculate the velocity or trajectory of missiles that would truly represent tornado conditions. It is assumed that objects of low cross-sectional density, such as boards, metal siding, and similar items, are picked up and carried at the maximum wind velocity of 300mph.

The behavior of heavier, oddly shaped objects, such as an automobile, is less predictable. The design values of 50mph for a 4000 lb automobile lifted 25ft in the air is considered to be representative of what could happen in a 300mph wind as the automobile is lifted, tumbled along the ground, and ejected from the tornado funnel by centrifugal force. These missile velocities are consistent with reported behavior of such items in previous tornadoes.(23)

The following Category I structures are analyzed for tornado loading (not coincident with the LOCA or earthquake):

except for certain openings considered acceptable based on probabilistic analysis (refer to Section 3.5.1)

1. Shield Building
2. Auxiliary Building
3. Intake structure
4. Valve rooms number 1 and 2
5. Service Water tunnel
6. The three electrical manholes

The above structures are analyzed for tornado loading using the following criteria:

except that criteria 4 through 7 were not applied for those openings considered acceptable based on probabilistic analysis

1. Differential pressure between the inside and outside is assumed to be 3 psi positive pressure for the shield building and 1.5 psi positive pressure for the Auxiliary Building with the provision of venting the structure in order to control the differential pressure to within the 1.5 psi limit.

2. Differential pressure between the inside and outside is assumed to be +1.5 psi for the intake structure and +3.0 psi for the remaining structures mentioned above. Basically, the intake structure is an open structure with one closed room (23 feet x 54 feet x 134 feet high) which contains seismic Class I equipment. This room has sufficient openings (78 square feet) for ventilation to justify a reduction in the design pressure.

3. Lateral force on the Shield Building is assumed to be the force caused by a tornado funnel having a peripheral tangential velocity of 300mph and a forward progression of 60mph. The applicable portions of wind design methods described in ASCE Paper 3269 are used, particularly for shape factors. The provisions for gust factors and variation of wind velocity with height do not apply.

4. A tornado driven missile equivalent to a 12ft long piece of wood 8in. in diameter traveling end on at a speed of 250mph is assumed.

5. A tornado driven missile equivalent to a 4000lb automobile traveling through the air at 50mph and at not more than 25ft above the ground is assumed.

6. A tornado driven missile equivalent to a 10 foot long piece of pipe 3.5 inches O.D. traveling end on at a speed of 100 mph is assumed. Pipe type is 3in. I.D. Schedule 40.

7. A list of credible external missiles is provided in Table 3.5-2.

Section 3.5.1 provides further discussion of tornado missile probability.

A discussion of the probability of tornado occurrence is presented in Sections 2.3 and 3.3.1.

Except for local crushing at the missile impact area, the effect of a tornado is accounted for in the design of the Shield Building by the ultimate strength design method in accordance with the loading combination in Appendix 3A.

Seismic Class II structures are separated from Seismic Class I structures, and any damage to Seismic Class II buildings, due to the tornado does not damage Class I systems.

3.3.2.1.1 Tornado Model

The tornado model was patterned after the Dallas tornado of April 2, 1957, as studied by Hoecker (ref. 41). The model is basically that given in WCAP-7897 (ref. 42) but with a more rigorous extrapolation to the parameters desired for a design tornado than given by Bates and Swanson (ref. 43).

Hoecker summarized his findings by the use of a "pressure-time profile" for an average translational velocity of 27 mph and as a function of percentage of total pressure drop.

the different compartments are integrated in a smaller number of nodes for the purpose of this analysis.

Initial pressure inside and outside of the auxiliary building is assumed at 14.7 psi. A small time interval (0.005 seconds) is considered for the computation. Since the pressure drop is relatively small, a constant temperature is assumed during the process. The equation of isentropic air flow through the venting area is

$$Q = 2454\ CIA\rho \left[\left(\frac{P1}{P2}\right)^{1.43} - \left(\frac{P1}{P2}\right)^{1.741} \right]^{1/2}$$

where:

- C = 0.8, constant, assumed for the coefficient of discharge
- I = time interval (0.005 sec)
- A = venting area in square feet
- ρ = density of air, varied with time interval and computed as mass divided by volume
- P1 & P2 = pressures at nodes

A proportionality constant $Z = 2.874 \times 10^4$ is established by applying the following equation at any time

$$P = \left(\frac{M}{V}\right) Z$$

In this manner, pressures are established at each interval of time, and the differential pressures are obtained. The computer program "DEPRELLIN" (a Bechtel program) was used to obtain the differential pressure between the compartments.

From the computer output, it was found that the maximum differential pressure was 0.5 psi.

3.3.3 Essential Systems and Components for Safe Shutdown in the Event of a Tornado

Table 3.3-1 lists all of the essential systems and components that are required for a safe shutdown in the event of a tornado. The equipment listed includes required control, sensing, power and cooling lines. The equipment 14
is located within the protective boundary provided by the barriers listed in Subsection 3.3.2.1. 20

Table 3.5-2 "Credible External Missiles" lists the kinetic energy due to external missiles.

or has been shown to be acceptable by probabilistic analysis as discussed in Section 3.5.1.

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No Changes

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Table 3.3-2 provides a listing of the depth of missile penetration and minimum available concrete thickness. The penetrations are less than half of the thickness of the barriers.

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TABLE 3.3-1

Essential Systems Required for a Safe Shutdown in the Event of a Tornado

No.	System Description
1.	Auxiliary feedwater system
2.	Service water system
3.	Component cooling system
4.	Decay heat removal system
5.	Makeup pumps
6.	ECCS room air cooling fans
7.	Containment air coolers
8.	Steam generators
9.	Pressurizer
10.	Deleted
11.	Auxiliary feed pump room vent fans
12.	Boric acid addition system
13.	Emergency diesel generators, air receivers, and day tanks
14.	Diesel generator rooms vent fans
15.	Service Water System and MCC's E12C, F12C, and EF12C (intake structure)
16.	Emergency diesel generator buses C1, D1, and diesel vent fans
17.	E1 and F1 substations, MCC's E12A, E14, E15, EF15, F12A, F14 and F15
18.	Batteries, chargers, rectifiers, and assoc. panels
19.	MCC E11A
20.	MCC E11B, E11C
21.	MCC E11D, E12D, F11C, and F11D
22.	MCC E12B, F12B
23.	MCC F11A and F11B

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3.5 MISSILE PROTECTION CRITERIA

This section defines and postulates the existence of selected missiles and the source of energy which creates them. The event which generates these postulated missiles is considered to be singular, affecting only the postulated missile itself. Although the missile generation event may occur simultaneously with a postulated accident such as a LOCA or be coincident with a seismic event, however, for purposes of identification of missiles and their analysis, the assumption is made that the event is a separate occurrence. While it is conceivable that missiles could be generated during the LOCA as a result of blowdown forces, they are not identifiable and therefore their postulation is not considered. Dynamic effects associated with a LOCA are discussed in Section 3.6.

3.5.1 Missile Criteria

The design bases for missile protection is found in NRC General Design Criterion 4. In order to comply with the intent of this criterion the following criteria are given as design bases:

(1)a. Protection is provided for potential missiles that could result in a LOCA.

b. Protection is provided for potential missiles that could result in the loss of ability to control the consequences of a LOCA including both the necessity for core cooling and for retention of containment integrity.

c. Protection is provided for potential missiles that could jeopordize functions necessary to bring the reactor to a safe shutdown condition during normal or abnormal conditions.

The relationship that missiles have to single failure criteria is:

(2)a. That if a missile is generated and causes failure of an adjacent system then that is considered to be a single failure for which that adjacent system must be designed. No other failures of the adjacent system is assumed for design purposes.

b. That a missile which may be generated from the reactor coolant system, coincident with a LOCA, is considered a part of the LOCA for single failure assumption purposes, but may be considered as a separate subject for missile analysis purposes.

Protection against a potential missile may be provided by but not necessarily limited to any one or combination of the following protection methods:

(3)a. Compartmentalization - enclosure of missile source or equipment requiring protection in compartments whose walls preclude penetration by the missile.

b. Barriers - erection of missile barriers either at the source or at the equipment to be protected.

c. Separation - sufficient separation of redundant systems or of components in a safety network so that a potential missile cannot damage both redundant strings of the system and preclude safe shutdown of the reactor plant.

d. Distance - location of equipment beyond the range of a potential missile.

e. Restraints - securing potential missiles by means of restraints.

f. Strategic Orientation - facing equipment and components of equipment in a direction that points the potential missile away from equipment to be protected.

g. Equipment Design - design structure or equipment to withstand impact of potential missile without loss of function.

Insert A

The following Seismic Class I structures are designed to withstand external and internal missiles:

a. Containment structures

b. Auxiliary Building

c. Intake structure

d. Valve rooms number 1 and 2

The above discussion provides methods by which protection may be given for postulated missiles, however, a very basic premise for protection is to design components and equipment so that they have a low potential for generation of missiles. In general, that design which results in reduction of missile generation potential is also the same as that design which promotes the long life and usability of a component, and that is to design well within permissible limits of accepted codes and standards. The following general methods are used in the design, manufacture, and inspection of equipment:

(4)a. All pressurized equipment and sections of piping that from time to time may become isolated under pressure are provided with pressure relief code valves. These valves are preset to assure that any pressure build up in equipment or piping sections does not exceed the design limits of the materials involved.

b. All components and equipment of various systems have been designed and built to the standards established by the ASME Code or other equivalent industrial standards. A stringent quality control program is also applied during manufacture, testing and installation.

Insert A

The reinforced concrete structures identified in Section 3.3.2.1 have been designed to preclude damage to plant equipment from tornado generated missiles. These structures have various openings that have not been protected by missile barriers. Openings associated with the systems identified in Table 3.3-1 have been analyzed using the "TORMIS" methodology developed by the Electric Power Research Institute (reference 94). A listing of unprotected targets in essential safe shutdown systems is provided in Table 3.5-3.

TORMIS determines the probability of tornado missiles striking the openings in the structure. The probability is calculated by simulating a large number of tornado strike events at the site for each tornado wind speed intensity scale. After the probability is calculated, the exposed area of specific components is factored in to compute the probability of striking a particular item.

The acceptance criteria for the TORMIS analysis has been established as 1×10^{-6} per year cumulative probability of a tornado missile striking an unprotected essential SSC required for safe shutdown in the event of a tornado, which is the same value found to be acceptable by the NRC based on the expected rates of occurrence of potential exposures in excess of 10 CFR 100 guidelines. This criteria in combination with conservative qualitative assumptions show that the realistic probability of a potential exposures in excess of the 10 CFR Part 100 guidelines is lower than 1×10^{-6} per year. These conservative qualitative assumptions for the DBNPS TORMIS analysis are the same as previously found to be acceptable by the NRC (reference 95). The qualitative assumptions are described below:

- It is assumed that an essential system or component (USAR Table 3.3-1) being struck by a tornado missile will result in damage sufficient to preclude it from performing its intended safety function.

- It is assumed that the damage to the essential system or component (USAR Table 3.3-1) results in damage to fuel sufficient to result in conservatively calculated radiological release values in excess of 10 CFR 100 guidelines.

- There are no missiles that can directly impact irradiated fuel, even the spent fuel stored in the Spent Fuel Pool area of the Auxiliary Building. Any missiles postulated to enter this area either miss the pool entirely, are stopped by internal walls, or strike the far side of the pool or piping above the level of the fuel.

In the event that DBNPS evaluations using TORMIS methodology provide results indicating that the probability of a damaging tornado induced missile strike due to plant configuration equals or exceeds DBNPS's 1×10^{-6} per year acceptance criteria, then unique protective barriers will be utilized to reduce the total

Insert A (Continued)

probability to below the acceptance criteria. TORMIS shall not be used to justify the permanent removal of any protective barriers.

The TORMIS methodology has been approved by the NRC (reference 93). The DBNPS analysis is in accordance with the TORMIS program, except for the following NRC required plant specific items stated in the TORMIS related SER:

1. As described in USAR Sections 2.3.1.2.6 and 3.3.1, the probability of a tornado strike at a point within the one-degree square in which the site is located is 6.3×10^{-4} per year based on local analysis. This value is used in the DBNPS analysis. This value is more conservative than the tornado probability value within the TORMIS program.

2. The Fujita wind speed intensity scales were used in lieu of the standard TORMIS wind speeds.

3. The tornado wind field parameters are selected such that the V0 (speed at ground level) / V33 (speed at 33 feet elevation) ratio is 0.82. This value is consistent with previously accepted NRC values for this parameter (references 95 and 96).

4. The number of missiles used in the DBNPS TORMIS analysis is a conservative value for site specific sources, such as laydown, parking, and warehouse areas. These are postulated based on a site walkdown to develop the specific value for the DBNPS.

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c. Volumetric and ultrasonic testing of materials used in components and equipment coupled with periodic inservice inspections add further to the assurance that any material flaws that could permit the generation of missiles are detected.

The selection of postulated missiles to be analysed to disclose those that should be protected against is based on the examination of components and equipment for energy sources that could be converted to kinetic energy of the potential missile. The following energies are considered:

(5)a. Stored strain energy - this type of energy is associated with nuts, bolts, studs, etc.

b. Contained fluid energy - associated with equipment and components that contain fluids under pressure.

c. Rotational energy - associated with equipment such as the reactor coolant pump motor flywheel. (Consideration for the reactor coolant pump motor flywheel is given in Subsection 5.2.3).

It should be noted that missiles generated due to these energy sources are those that can be identified as component parts of systems and therefore are those for which measures can be taken for protection at the source as well as at the point where damage might occur. Randomly generated missiles cannot be identified or analyzed for protection on normal bases, therefore, protection must be given at the point where damage might occur.

Various postulated missiles located throughout the station may be disqualified from further consideration for missile protection if any of the following design conditions can be identified and associated with the potential missiles involved.

(6)a. If sufficient distance exists between the postulated missile and the equipment and components that if damaged would not result in conditions (1) a, b, or c. Sufficient distance is defined as a distance that if traveled by the missile renders it incapable of causing (1) a, b, or c.

b. If barriers inherent to the station design can be identified and associated with potential missiles such that due to the barrier the postulated missile is rendered incapable of causing (1) a, b, or c. A valid barrier in this case is defined as a structure that is capable of absorbing the effect of the missile impact and not resulting in any of conditions (1) a, b, or c.

c. If enclosure of a postulated missile source can be identified and associated with the missile such that the walls of the enclosure can absorb the effects and preclude the penetration of the missile without causing any of conditions (1) a, b, or c.

d. If restraints inherent to station design can be identified and associated with a postulated missile so that due to the restraint the missile is incapable of being generated.

e. If postulated missile sources associated with components and equipment have been oriented as a result of inherent station design such that the path of the missile is away from equipment to be protected. The path of the missile must be directed into an area such that conditions (1) a, b, or c do not occur if the potential missile is generated.

f. If equipment or components are specifically designed against generation of missiles or are specifically designed to be capable of withstanding missile impact without resulting in the occurrence of conditions (1) a, b, or c.

3.5.2 Missile Identification and Characterization

Systems, components, and equipment of systems have been examined in order to identify and postulate specific missiles and to identify the associated sources of energy that would lead to the generation of these postulated missiles. In addition each postulated missile has been classified.

In general, missiles are characterized by:

Mass
Velocity
Size
Density
Orientation or location
Impact area

Also missiles may be identified (or categorized) according to the potential energy source which serves as the generation mechanism such as:

1. Stored strain energy
2. Contained fluid energy
    a. Jet propelled type missile
    b. Piston type missile
3. Rotational Energy

All Seismic Class I structures are designed to withstand an end-on impact of the missiles as outlined in Tables 3.5-1 and 3.5-2. Analytical techniques described in Subsections 3.5.7 and 3.5.8 are used to analyze Seismic Class I structures, and the Seismic Class I structures are found to be adequate. The missiles which are considered in Subsection 3.3.2.1 were used to check the walls and slabs of Seismic Class I structures. All Class I structures are

USAR Table 3.5-3

TORMIS Analysis - Essential Safe Shutdown System Tornado Missile Targets

LOCATION	TARGETS
Auxiliary Bldg. Roll-Up and Man Doors- West & South Walls Elev. 585'	Spent Fuel Pool
Auxiliary Bldg. Misc. Man Doors East Wall Elevation 585, 603, 623, & 643	Component Cooling Water, Trains 1 & 2 & Swing Components Control Room Auxiliary Feedwater, Trains 1 & 2
Auxiliary Bldg. Misc. Penetrations - East Wall Area	Component Cooling Water Trains 1 & 2 & Swing Components 4160 Volt Switchgear Buses C1and D1 480 Volt Essential Unit Substations E1and F1 480 Volt Motor Control Centers E12A, E14, E15, EF15, F12A, F14, and F15 250 Volt DC Motor Control Centers 1 and 2 Batteries 1N, 1P, 2N, and 2P Battery Chargers DBC1N, DBC1P, DBC1PN, DBC2N, DBC2P, and DBC2PN DC Distribution Panels D1N, D1P, D2N, and D2P Regulated Rectifiers YRF1, YRF2, YRF3, YRF4 Inverters YV1, YV2, YV3, and YV4 Constant Voltage Transformers XY1, XY2, XY3, and XY4 AC Distribution Panels Y1, Y1A, Y2, Y2A, Y3, and Y4 Auxiliary Feedwater, Trains 1 & 2
Auxiliary Bldg. Emergency Diesel Gen. Exhaust Stacks	Emergency Diesel Generators, Trains 1 & 2
Auxiliary Bldg. Emergency Diesel Gen. Roof Elev. 610'	Emergency Diesel Generator Train 1
Auxiliary Bldg. Misc. Cable Tray Penetrations-North Wall	4160 Volt Switchgear Buses C1and D1
Auxiliary Bldg. Roof Misc. Penetrations	Main Steam Piping (up to and including the Atmospheric Vent Valves)
Auxiliary Bldg. Misc. Roof Drains	Spent Fuel Pool
Service Water Valve Rooms #1 & 2 and Misc. Rooms in Auxiliary Building	Service Water Trains 1 & 2 & Swing Components

ADD NEW PAGE

Notes:
1) This list is based on protection of the essential systems listed in USAR Table 3.3-1, control room, and the spent fuel pool areas.

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3.8 DESIGN OF SEISMIC CLASS I AND CLASS II STRUCTURES

The definitions of Class I and Class II are given in Subsection 3.2.1.1.

Piping System supports and anchors within these structures utilize loading combinations given in 20
Table 3.9-3 for piping. Standard hangers and snubbers are designed per MSS-SP-69 for supporting
piping and valves and allowable stresses as given in Table 2 of MSS-SP-58 are utilized. 9
Nonstandard supports and anchors for piping and valves are designed per the following allowable stresses:

a. Normal Load Case
Allowable = f_t per AISC

b. Upset Load Case
Allowable = 1.25 f_t

c. Faulted Load Case
Allowable = the lesser of
i. 1.5 f_t
ii. 0.9 S_y where S_y = yield strength of material at 21
temperature, except that shear, f_v, shall 9
not exceed 0.5 S_y

3.8.1 Seismic Class I Structures Other Than Containment

The Class I structures other than containment are:

1. Auxiliary Building
2. Intake Structure
3. Service Water Pipe Tunnel & Valve Rooms
4. Miscellaneous Structures:
    a. Three Electrical Manholes
    b. Borated Water Storage Tank

3.8.1.1 Physical Separation

3.8.1.1.1 Auxiliary Building

The Auxiliary Building is located adjacent to both the Shield Building and Turbine Building. It is a five-story building with two levels below grade. The radwaste systems are housed in the basement. The remainder of the building is used for fuel storage and handling, auxiliary nuclear equipment and associated facilities, the control room, switchgear, and other operational facilities. The building is a reinforced concrete structure.

The Auxiliary Building has been designed with sufficient venting area in order to keep the differential pressure drop within the 1.5 psi design limit. The external walls and the roof slabs are designed to withstand the forces due to a tornado.

This 1.9 x 10^6 cubic foot building has natural venting area on roof slabs, in the external walls, internal walls, and internal slabs. Each floor has an adequate opening or a number of openings to allow the air flow during tornado depressurization. The pressure drop is assumed to be 3.0 psi in 3.0 seconds, which is quite conservative.

a. Fuel Storage and Handling Area:

The fuel storage area is located immediately adjacent to the Shield Building. This building accommodates the spent fuel storage pool and its spent fuel storage racks; cask pit, transfer pit, storage | 23
facilities for new fuel assemblies and control rods; a spent fuel cask washdown facility; and a fuel handling crane.

The main 140-ton cask crane is capable of lifting the spent fuel shipping cask out of the cask pit | 23
and placing this cask on a

Certain openings in the Auxiliary Building are not analyzed to withstand tornado missile loading but are considered acceptable based on probabilistic analysis (refer to Section 3.5.1)

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semi-trailer or spent fuel shipping car for shipment to an off-site reprocessing facility. The weight
of a fully loaded dry fuel storage canister (DSC) transfer cask is within the capacity of the 140 ton 20
cask crane. The transfer cask will be used to transport the DSC to the onsite dry fuel storage facility.

The spent fuel storage pool is constructed of reinforced concrete and is lined with 1/4-inch stainless steel plate to facilitate cleaning.

22

The design of the spent fuel cask crane prevents it from traveling over the spent fuel pool and cask 22
pit unless a key operated by-pass switch is actuated.

The design and the safety evaluation of the spent fuel storage facility are described in Subsections 9.1.2.2 and 9.1.2.3, respectively.

New fuel assemblies are received in shipping containers and stored in the new fuel storage area, which is a separate and protected area for the dry storage of new fuel assemblies. The new fuel storage area sizing is discussed in Section 9.1.1.

The design and evaluation of the Dry Fuel Storage Facility (DFSF) components is described in the 21
Davis-Besse Site Certified Safety Analysis Report (CSAR). The DFSF is located within the 20
Protected Area of the plant. The DFSF foundation is a non-safety related structure, in accordance with the requirements of 10CFR72, Subpart L. The foundation has been designed for the applicable static loading combinations of ACI 318.

b. Radiologically Restricted Area: 18

The radiologically restricted areas of the building on all five levels are grouped together next to the 18
Shield Building to facilitate traffic control. Perimeter doors around the radiologically restricted
areas, while providing radiologically emergency exit ways, are not opened from radiation 4
uncontrolled areas without the use of a key. Emergency shower rooms, and stairs within the
radiologically restricted areas are provided to reduce traffic in and out of these areas and further 18
facilitate control. Basement stairs exit into the Elevation 603 ft radiologically restricted area.

c. Control Room:

The control room and its supporting facilities, including a computer room, conference room, and test rooms as well as a kitchen and an office are grouped together in a shielded complex located so as to permit expansion, should a second unit be added to the station. This expansion feature is further implemented by knock-out panels in the south exterior wall of the building and in other locations where connections with future structures is envisioned to be required.

The control room ceiling is an illuminative type.

d. Outside of Radiologically Restricted Areas and Equipment Rooms: 18

Outside of the radiologically restricted areas, but accessible to them, corridors with the appropriate 18
fire resistance rating are provided for normal and emergency passageway as discussed in the FHAR. 5
Three stairways, with one extending to the roof serve

the corridors. All of these stairways are encased by enclosures with at least two-hour fire resistance rating. |5

Two elevators furnish vertical transportation between the five levels of the building. One of the elevators is for limited access only.

3.8.1.1.2 Intake Structure

The following major facilities, related to station safety and the Circulating Water System, are located in the Intake Structure:

a. Service Water pumps (Class I)

b. Cooling tower water makeup pumps (Class II)

c. Diesel driven fire water pump (Class II)

d. Water treatment makeup pumps (Class II)

e. Traveling screens (Class II)

The reinforced concrete substructure of the Intake Structure and enclosures for the Service Water pumps are designed to withstand a Class I seismic event as well as tornado and turbine missiles. There are three floors, two of which accommodate all the pumps, traveling screens and other equipment. The third floor is used as a secondary laydown area. The Class II structural steel superstructure is provided for Class II equipment on the second floor. A 40-ton gantry crane has been provided for equipment services and maintenance.

3.8.1.1.3 Service Water Pipe Tunnel and Valve Rooms

The Service Water Pipe Tunnel is located between the Auxiliary Building and Intake Structure. This reinforced concrete tunnel is buried underground and shields the Service Water pipes and other minor pipes. Valve Room No. 1 is located adjacent to the Auxiliary Building in the Turbine Building. Valve Room No. 2 is located adjacent to the Intake Structure. Both Valve Rooms are single reinforced concrete rooms, housing the required valves and connections for the Service Water pipes. The concrete roofs of these valve rooms are designed for tornado and turbine missiles. These structures are designed for Class I seismic loads.

3.8.1.1.4 High Density Fuel Storage Racks

The Davis-Besse Nuclear Power Station Unit 1 high density fuel storage racks have been designed to meet the requirements for Seismic Class I structures. Detailed structural and seismic analyses of the high density storage racks have been performed to verify the adequacy of the design to withstand the loadings encountered during installation, normal operation, the severe and extreme environmental conditions of the operating basis and safe shutdown earthquakes, and the abnormal loading condition of an accidental fuel assembly drop event.

(88) Holtec Report HI-992250, Seismic/Structural Analysis of Davis-Besse Nuclear Station Unit 1 Spent Fuel Pool Racks. 23

(89) Holtec Report HI-981963, Rack Fatigue Analysis for Davis-Besse Nuclear Plant.

(90) Holtec Report HI-992346, Analysis of Mechanical Accidents for Davis-Besse Spent Fuel Pool.

(91) LAR No. 98-0013, License Amendment Application to Increase Spent Fuel Storage Capability, Serial No. 2640, dated December 2, 2000.

(92) Wyle Nuclear Environmental Qualification Report No. 44681-2, dated 10-27-81.

(93) Letter, Rubenstein (NRC) to Miraglia (NRC) entitled "Safety Evaluation Report - Electric Power Research Institute (EPRI) Topical Reports Concerning Tornado Missile Probabilistic Risk Assessment (PRA) Methodology", dated October 26, 1983.

(94) Twisdale, L.A. and Dunn, W.L., EPRI NP-2005, Tornado Missile Simulation and Design Methodology, Volumes I and II, Final Report dated August 1981.

(95) Letter, Pickett (NRC) to Myers (Centerior) entitled "Amendment No. 90 to Facility Operating License No. NPF-58 - Perry Nuclear Power Plant, Unit 1," Dated November 4, 1997.

(96) Letter, Wang (NRC) to Opeka (Northeast Nuclear Energy Company) "Haddam Neck Plant: Systematic Evaluation Program Topics III-2 and III-4a, Wind and Tornado Loadings and Missiles," Dated October 21, 1992.

Docket Number 50-346
License Number NPF-3
Serial Number 3078
Enclosure 2

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station (DBNPS) in this document. Any other actions discussed in the submittal represent intended or planned actions by the DBNPS. They are described only for information and are not regulatory commitments. Please notify the Supervisor - Licensing (330-315-6944) of any questions regarding this document or any associated regulatory commitments.

COMMITMENTS	DUE DATE
None	N/A