

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
OFFICE OF NUCLEAR REACTOR REGULATION  
OFFICE OF NEW REACTORS  
WASHINGTON, DC 20555-0001

June 10, 2015

**NRC REGULATORY ISSUE SUMMARY 2015-06  
TORNADO MISSILE PROTECTION**

**ADDRESSEES**

All holders of an operating license or construction permit for a nuclear power reactor under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," including those who have permanently ceased operations and have spent fuel in spent fuel pools.

All holders of and applicants for a power reactor early site permit, combined license, standard design approval, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Reactors." All applicants for a standard design certification, including such applicants after initial issuance of a design certification rule.

All holders of and applicants for a license under 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Fuel, High Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste."

**INTENT**

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary (RIS) to (1) remind licensees of the need to conform with a plant's current, site-specific licensing basis for tornado-generated missile protection, (2) provide examples of failure to conform with a plant's tornado-generated missile licensing basis, and (3) remind licensees of the staff's position that a licensee's systematic evaluation program (SEP) and individual plant examination of external events (IPEEE) results do not constitute regulatory requirements and are not part of the plant-specific licensing basis unless the NRC or licensee took action to specifically amend the operating license. This RIS does not require any actions or written response on the part of the addressees.

**BACKGROUND INFORMATION**

Systems, structures, and components (SSCs) of nuclear power plants are designed to withstand natural phenomena such as earthquakes, tornadoes, hurricanes, and floods without the loss of capability to safely maintain the plant. In general, 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

**ML15020A419**

conditions with the effects of the natural phenomena, and (3) the importance of the safety functions to be performed. The specific criteria for each nuclear power plant are contained in the individual plant's specific licensing basis.

In designing SSCs for the consequences of design-basis tornados, tornado-generated missiles must be considered. There are several design methods typically used for protecting SSCs from tornado-generated missiles. These include placing the SSC within a structure designed to withstand tornado missiles, designing the SSC to withstand the tornado missile, or installing a barrier around the SSC designed to withstand tornado missiles. In addition to physical design methods, the NRC allows the use of probability analysis to demonstrate the probability of a tornado-generated missile striking a component required to safely maintain the plant is sufficiently low such that no additional measures are required.

In the late 1970s and early 1980s several licensees identified components that did not conform to their plant specific licensing basis for tornado-generated missile protection. Examples of nonconforming items included components not located inside structures designed to protect against tornados and tornado-generated missiles, components not provided with tornado missile barriers, and components not designed to withstand tornados and tornado missiles. Topical reports were submitted by the Electric Power Research Institute (EPRI) for NRC review of the probability-based TORMIS methodology. The TORMIS methodology determines the probability of components being struck and disabled by a tornado-generated missile, and was accepted for use by the NRC.<sup>1</sup> In cases where some components were not in conformance with a plant's licensing basis, licensees used the TORMIS methodology as a means for demonstrating that the probability of these components being struck by a tornado-generated missile was low enough to justify that protection from tornado-generated missiles was not required. Several licensees have incorporated the TORMIS methodology, or other probabilistic methodologies, into their plant specific licensing basis.

## SUMMARY OF ISSUE

There have been several instances of plants that have been identified as not being in conformance with their tornado-generated missile licensing basis. The nonconformances have been identified by licensees as reflected in license amendment requests submitted to the NRC and also by the NRC during plant inspections. Examples are provided below.

## LICENSE AMENDMENT REQUESTS

1. A licensee submitted a license amendment request (LAR) to change the licensing basis for tornado-generated missiles to account for several components not in conformance with the plant's licensing basis for tornado-generated missile protection. The licensee identified that both A and B emergency diesel generator exhaust header/ductwork could be exposed to tornado missiles generated by a design-basis tornado. The licensee also identified that the emergency diesel generator fuel oil vents were vulnerable to tornado-generated missiles. The LAR proposed to use the TORMIS methodology to assess the need for additional protection from tornado-generated missiles.

---

<sup>1</sup> NRC Memorandum, L.S. Rubenstein to F.J. Miraglia, "Safety Evaluation Report – Electric Power Research Institute (EPRI) Topical Reports Concerning Tornado Missile Probabilistic Risk Assessment (PRA) Methodology," October 26, 1983, Agencywide Documents Access and Management System (ADAMS) Accession No. ML080870291

2. A licensee submitted an LAR to incorporate the application of the TORMIS methodology to determine if physical protection from tornado-generated missiles is necessary for portions of certain safety related or non-safety related systems that are inadequately protected. The licensee evaluated site-wide tornado missile strike probability for a number of components including pipe risers, level switches, anti-trash racks, fan motors, inspection hatches, fans, and electrical room louvers.
3. A licensee submitted an LAR to use the TORMIS methodology to assess the need for additional protection from tornado-generated missiles. If approved, the amendment would allow certain SSCs that were not provided with physical protection from tornado-generated missiles to remain unprotected when the results of a TORMIS analysis satisfy the acceptance criteria. The components analyzed included: Auxiliary Feedwater Trains 1 and 2, Component Cooling Water Trains 1 and 2 and Swing Components, 480-Volt Essential Unit Substations E1 and F1, Batteries, Battery Chargers, DC Distribution Panels, and AC Distribution Panels.

## NRC INSPECTIONS

### North Anna Power Station (Units 1 and 2)

NRC inspectors issued a non-cited violation<sup>2</sup> upon identification that the turbine driven auxiliary feedwater (AFW) steam exhaust piping external to the AFW pump house was not protected from tornado-generated missiles. The licensee established compensatory measures that remained in effect until a permanent resolution was implemented. The licensee also entered the violation into the corrective action program.

### Surry Power Station

NRC inspectors issued a non-cited violation<sup>3</sup> upon identification that the diesel driven emergency service water pumps were not in conformance with the licensee's Updated Final Safety Analysis Report (UFSAR). The licensee had implemented a design change that was not adequate to protect the diesel engine exhausts from being blocked by tornado-generated missile damage or protected from water intrusion. The licensee took corrective action to remove the modification from one of the pumps, placed compensatory measures on all three pumps pending removal/alteration of the modifications, and the violation was entered into the corrective action program.

### Point Beach Nuclear Plant

NRC<sup>4</sup> inspectors identified that the UFSAR did not recognize the probabilistic approach used to justify the acceptability of the emergency diesel generator (EDG) exhaust stacks. The licensee investigated and agreed there was no record of analysis for the exhaust stacks. The licensee's evaluation concluded that tornado induced missiles could damage the exhaust stacks to a

---

<sup>2</sup> NRC letter to David Christian, Virginia Electric Power Company, "North Anna Power Station – NRC Integrated Inspection Report Nos. 05000338/2006004 and 05000339/2006004," October 30, 2006, ADAMS Accession No. ML063030486

<sup>3</sup> NRC letter to David A. Heacock, Virginia Electric Power Company, "Surry Power Station – NRC Resident Inspection Report 05000280/2009004 and 05000281/2009004," October 29, 2009, ADAMS Accession No. ML093020726

<sup>4</sup> NRC letter to Dennis L. Koehl, Point Beach Nuclear Plant Nuclear Management Co., "NRC Component Design Bases Inspection (CDBI) Inspection Report 05000266/2006006, 05000301/2006006," November 16, 2006, ADAMS Accession No. ML063200093

sufficient extent that the exhaust flow would be restricted and the EDGs would not be capable of performing their design safety function. The licensee implemented corrective actions that restored standby emergency power to resolve the issue.

#### Enrico Fermi Nuclear Generating Station

NRC inspectors issued a non-cited violation<sup>5</sup> upon identification that the licensee did not obtain NRC approval prior to including a tornado-generated missile hazard analysis in the UFSAR. The licensee had performed an analysis using the TORMIS methodology; however, the licensee had inappropriately used the probability analysis for licensing basis determinations. The licensee submitted an LAR<sup>6</sup> to allow the use of TORMIS analysis to update the UFSAR as a means of complying with the tornado missile protection requirements. The NRC approved the proposed change to the licensing bases and issued an amendment to the facility operating license.<sup>7</sup>

#### SYSTEMATIC EVALUATION PROGRAM AND INDIVIDUAL PLANT EXAMINATION OF EXTERNAL EVENTS APPLICABILITY

Some licensees have attempted to use the SEP and/or the IPEEE to justify conformance with their tornado missile protection licensing bases. The objectives of the SEP and IPEEE are summarized below:

- The objectives of the SEP, as outlined in SECY-92-223<sup>8</sup>, are that the NRC would:
  1. Assess the safety adequacy of the design and operation of currently licensed nuclear power plants.
  2. Establish documentation which shows how each operating plant reviewed compares with current criteria on significant safety issues and provide a rationale for acceptable departures from these criteria.
  3. Provide the capability to make integrated and balanced decisions about any required backfitting.
  4. Structure the program to identify early and resolve any significant deficiencies.
  5. Use available resources efficiently and minimize requirements for additional resources by the NRC or the industry.

---

<sup>5</sup> NRC letter to Mr. Jack Davis, Detroit Edison Company, "Fermi Power Plant, Unit 2 Integrated Inspection Report 05000341/2008-004," November 12, 2008, ADAMS Accession No. ML083171034

<sup>6</sup> Letter to NRC from J. Todd Conner, DTE Energy, Co., "Proposed License Amendment to Revise the Fermi 2 Licensing Bases for Protection from Tornado-Generated Missiles," January 11, 2013, ADAMS Accession No. ML13011A377

<sup>7</sup> NRC letter to Joseph H. Piona, DTE Electric Co., "Fermi 2 – Issuance of Amendment Re. Revise the Fermi 2 Licensing Basis Concerning Protection from Tornado-Generated Missiles", March 10, 2014, ADAMS Accession No. ML14016A487

<sup>8</sup> SECY-92-223, "Resolution of Deviations Identified During the Systematic Evaluation Program," June 19, 1992, ADAMS Accession No. ML12256B290

- The objectives of the IPEEE for each licensee as listed in section 1.2 of NUREG-1407<sup>9</sup>, “Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities,” are:
  1. To develop an appreciation of severe accident behavior.
  2. To understand the most likely severe accident sequences that could occur at the licensee’s plant under full power operating conditions.
  3. To gain a qualitative understanding of the overall likelihood of core damage and fission product releases.
  4. If necessary, to reduce the overall likelihood of core damage and radioactive material releases by modifying, where appropriate, hardware and procedures that would help prevent or mitigate severe accidents.

The objectives of the IPEEE and SEP programs do not address conformance with a plant’s licensing basis. Some licensees used the results of the SEP and/or IPEEE as the basis for demonstrating conformance with the plant-specific licensing bases, and submitted these results for NRC review and approval as part of an LAR. After the NRC review and approval of the LAR, the results became part of the plant-specific licensing bases. Other licensees may have used the SEP and/or IPEEE as a basis for license changes pursuant to 10 CFR 50.59, and such changes are also part of the plant-specific licensing bases. The remaining licensees may not have expressly incorporated the findings of the SEP and IPEEE into their plant specific licensing bases. Absent additional action by either the NRC or the licensee, the SEP and IPEEE are not part of these plants’ licensing basis for meeting tornado missile protection requirements.

### PROBABILISTIC ANALYSIS

Since 1983, the NRC has accepted LARs using Probabilistic Risk Assessment (PRA) methodologies to assess compliance with tornado missile requirements, including the NRC accepted EPRI TORMIS computer code. Licensees may decide to use other PRA computer models, and those new methodologies should be submitted for approval.

### OTHER DOCUMENTS

The staff has issued the following generic communications related to protection of components from tornado missiles:

- NRC Information Notice 96-06, “Design and Testing Deficiencies of Tornado Dampers at Nuclear Power Plants,” Agencywide Documents Access and Management System (ADAMS) Accession No. ML031060290.
- NRC RIS 2006-23, “Post-Tornado Operability of Ventilating and Air-Conditioning Systems Housed In Emergency Diesel Generator Rooms,” ADAMS Accession No. ML061720371.

---

<sup>9</sup> NUREG-1407, “Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities,” June 1991, ADAMS Accession No. ML063550238

- NRC RIS 2008-14, "Use of TORMIS Computer Code for Assessment of Tornado Missile Protection," ADAMS Accession No. ML080230578.
- NRC RIS 2013-05, "NRC Position on the Relationship between General Design Criteria and Technical Specification Operability," ADAMS Accession No. ML13056A077.

### **ENFORCEMENT DISCRETION**

The NRC may grant enforcement discretion in accordance with EGM 15-002, "Enforcement Discretion for Tornado Missile Protection Noncompliance" (ADAMS Accession No. ML15111A269) to licensees who are in non-compliance with their plant-specific licensing bases.

### **BACKFITTING AND ISSUE FINALITY DISCUSSION**

This RIS is a review of the NRC staff's positions on the applicable NRC regulatory requirements and guidance with respect to tornado-generated missile protection. It also presents the staff's position that a licensee's SEP and IPEEE do not constitute regulatory requirements and are not expressly part of the plant-specific licensing basis unless the NRC or licensee took action to specifically amend the operating license or other parts of the plant's licensing basis for meeting tornado missile protection requirements.

These positions do not represent new or changed staff positions. In addition, this RIS does not require any action or written response on the part of any licensee or design certification applicant. Accordingly, issuance of this RIS in final form would not represent backfitting as defined in 10 CFR § 50.109(a)(1) or 10 CFR 72.62(a), or be inconsistent with any applicable issue finality provision in 10 CFR Part 52. Therefore, the NRC did not prepare a backfit analysis for this RIS or further address the issue finality criteria in Part 52.

### **FEDERAL REGISTER NOTIFICATION**

Although this RIS is informational and does not represent a departure from the current regulatory requirements, a notice of opportunity for public comment on this RIS was published in the *Federal Register* (79 FR 18933) on April 4, 2014, for 60 days. On May 8, 2014, a notice was published (79 FR 26464) extending the comment period for an additional 15 days. Ten organizations and individuals provided comments, which were considered before issuance of this RIS. NRC staff reviewed all comments, and the comments and responses are available in ADAMS at Accession No. ML14356A295.

This RIS does not represent a departure from current regulatory requirements.

### **CONGRESSIONAL REVIEW ACT**

This RIS is not a rule as defined in the Congressional Review Act (5 U.S.C. §§ 801-808).

### **PAPERWORK REDUCTION ACT STATEMENT**

This RIS does not contain new or amended information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget (OMB), approval numbers 3150-0011 and 3150-0151.

## Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

### CONTACT

Please direct any questions about this matter to the technical contact listed.

**/RA/**

Michael C. Cheok, Director  
Director of Construction Inspection  
and Operational Programs  
Office of New Reactors

**/RA/**

Lawrence E. Kokajko, Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

**/RA/**

Larry W. Camper, Director  
Division of Decommissioning, Uranium  
Recovery, and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards

Technical Contact: G. A. Casto, NRR  
301-415-0565  
e-mail: [greg.casto@nrc.gov](mailto:greg.casto@nrc.gov)

Note: NRC generic communications may be found on the NRC public Web site,  
<http://www/nrc.gov>, under NRC Library/Document Collections.

## Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

### CONTACT

Please direct any questions about this matter to the technical contact listed.

Michael C. Cheok, Director  
Director of Construction Inspection  
and Operational Programs  
Office of New Reactors

Lawrence E. Kokajko, Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Larry W. Camper, Director  
Division of Decommissioning, Uranium  
Recovery, and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards

Technical Contact: G. A. Casto, NRR  
301-415-0565  
e-mail: [greg.casto@nrc.gov](mailto:greg.casto@nrc.gov)

Note: NRC generic communications may be found on the NRC public Web site,  
<http://www.nrc.gov>, under NRC Library/Document Collections.

ADAMS Accession No.: ML15020A419

\* via e-mail

TAC No. MF0541

OFFICE	Tech Editor*	NRR/DSS/SBPB*	NRR/DSS/D*	RI/DRS/D*	RII/DRS/D*
NAME	CHsu	GCasto	TMcGinty	RLorson	AGody
DATE	01/27/2015	02/13/2015	02/25/ 2015	02/26/2015	02/25/205
OFFICE	RIII/DRS/D*	RIV/DRS/D*	NRR/DORL/D*	NRR/DRA/D*	OE*
NAME	KOBrien	AVegel (JClark for)	MEvans	JGitter	NHilton
DATE	02/26/2015	03/02/2015	02/26/2015	02/25/2015	03/02/2015
OFFICE	NRR/PMDA*	OIS *	OGC	NRR/DPR/PGCB	NRR/DPR/PGCB/LA
NAME	LHill	KBenney	GMizuno	TKeene	ELee
DATE	03/02/2015	03/02/2015	03/18/2015	04/08/2015	04/13/2015
OFFICE	NRR/DPR/PGCB	NMSS/DUWP/D	NRO/DCIP/D	NRR/DPR/DD	NRR/DPR/D
NAME	SStuchell	LCamper	MCheok	AMohseni	LKokajko
DATE	04/15/2015	04/23/2015	04/29/2015	06/09/2015	06/10 /2015

OFFICIAL RECORD COPY