



Byron Generating Station

4450 North German Church Rd  
Byron, IL 61010-9794

[www.exeloncorp.com](http://www.exeloncorp.com)

July 21, 2016

LTR: BYRON 2016-0071  
File: 1.10.0101 (1D.101)  
2.07.0100 (5A.108)

United States Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Byron Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-37 and NPF-66  
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Licensee Event Report (LER) No. 454-2016-002-00, Inadequate Protection from Tornado Missiles Identified Due to Non-Conforming Design Conditions

Enclosed is Byron Station Licensee Event Report (LER) No. 454-2016-002-00 regarding non-conforming conditions in the plant design such that specific TS equipment on both units was considered to not be adequately protected from tornado missiles. This condition is being submitted in accordance with 10 CFR 50.73, "Licensee Event Report System."

There are no regulatory commitments in this report.

Should you have any questions concerning this submittal, please contact Mr. Douglas Spitzer, Regulatory Assurance Manager, at (815) 406-2800.

Respectfully,

A handwritten signature in black ink, appearing to read "Mark E. Kanavos", with a horizontal line extending to the right.

Mark E. Kanavos  
Site Vice President  
Byron Generating Station

MEK/GC/sg

Enclosure: LER 454-2016-002-00

cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Byron Generating Station



**LICENSEE EVENT REPORT (LER)**  
(See Page 2 for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>1. FACILITY NAME</b> Byron Station – Unit 1	<b>2. DOCKET NUMBER</b> 05000454	<b>3. PAGE</b> 1 OF 4
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**4. TITLE**  
Inadequate Protection from Tornado Missiles Identified Due to Non-Conforming Design Conditions

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	25	16	2016	002	00	07	21	16	Byron Station – Unit 2	05000455
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

**9. OPERATING MODE**      **11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)**

1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
100%	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A	

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT Douglas Spitzer - Manager, Byron Regulatory Assurance	TELEPHONE NUMBER (Include Area Code) (815) 406-2800
---------------------------------------------------------------------------	--------------------------------------------------------

**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b> MONTH:    DAY:    YEAR:
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**ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)**  
On May 25, 2016, during evaluation of protection for Technical Specification (TS) equipment from the damaging effects of tornados, Byron identified non-conforming conditions in the plant design such that specific TS equipment on both units was considered to not be adequately protected from tornado missiles.

On May 25, 2016 at 1350 Operations declared the affected equipment inoperable, implemented EGM 15-002, "Enforcement Discretion for Tornado-Generated Missile Protection Noncompliance" and the required compensatory measures, and then declared the affected equipment operable but non-conforming.

The cause of this issue was a lack of clarity and changing requirements during the original licensing of the plants that led to inadequate understanding of the original NRC regulatory guidance.

The corrective actions planned are to obtain a license amendment for the use of the TORMIS computer code for assessment of tornado missile protection, to complete the EGM 60-day comprehensive compensatory measures to demonstrate a discernable change from its pre-discovery actions, and to modify the Refueling Water Storage Tank hatches and the Miscellaneous Electrical Equipment Room ventilation openings to eliminate the tornado missile vulnerability, or revise the design/licensing bases.

NRC FORM 366A  
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018



## LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Byron Station – Unit 1	05000454	2016	- 002	- 00

### NARRATIVE

#### A. Plant Operating Conditions Before the Event:

Event Date: May 25, 2016

Unit: 1      Mode: 1      Reactor Power: 100 percent  
 Unit: 2      Mode: 1      Reactor Power: 100 percent

Unit 1 Reactor Coolant System (RCS) [AB]: Normal operating temperature and pressure  
 Unit 2 Reactor Coolant System (RCS) [AB]: Normal operating temperature and pressure

No structures, systems or components were inoperable at the start of this event that contributed to the event.

#### Background NRC Documents

Enforcement Guidance Memorandum (EGM) 15-002, "Enforcement Discretion for Tornado-Generated Missile Protection Noncompliance," provides guidance to exercise enforcement discretion when an operating power reactor licensee does not comply with a plant's current site-specific licensing basis for tornado-generated missile protection. Specifically, discretion would apply to the applicable technical specification (TS) limiting condition(s) for operation (LCO) which would require a reactor shutdown or mode change; if a licensee could not meet TS LCO required action(s) within the TS completion time.

Interim Staff Guidance DSS-ISG-2016-01, "Clarification of Licensee Actions in Receipt of Enforcement Discretion Per Enforcement Guidance Memorandum EGM 15-002," provides interim staff guidance (ISG) to provide clarifying guidance to facilitate staff understanding of expectations for consistent oversight associated with implementing enforcement discretion for tornado missile protection noncompliance(s) per EGM 15-002.

Appendix A to DSS-ISG-2016-01 provides guidance for acceptable initial and comprehensive compensatory measures for licensee use in implementing the enforcement discretion outlined in EGM 15-002. The licensee should declare (log) the utilization of EGM 15-002, inform the resident inspector, and enter the issue into the corrective action program. For initial compensatory measures, it is expected that the measures listed are already in place at sites that may be affected by severe weather, such as tornadoes and/or hurricane force winds. The measures provided should be verified as current and readily deployable within a very short timeframe (the shortest timeframe could, in some scenarios, be dictated by a technical specification (TS) 3.0.3 completion time of one hour).

#### B. Description of Event:

On May 25, 2016, during evaluation of protection for TS equipment from the damaging effects of tornados, Byron identified non-conforming conditions in the plant design such that specific TS equipment on both units was considered to not be adequately protected from tornado missiles. These included ventilation openings in the wall that separates the non-safety related turbine building and the safety related auxiliary building.

Additionally, the refueling water storage tank (RWST) roof access opening Bilco hatch is fabricated from sheet metal that is not designed to prevent all postulated tornado missiles from entering the tank. The following piping, located inside the RWST, could be impacted by tornado missiles entering the RWST roof access: the six inch RWST recirculation pipe; the three inch overflow pipe; and the twenty-four inch suction pipe.

On May 25, 2016 at 1350, Operations declared the affected equipment inoperable, implemented EGM 15-002 and the required compensatory measures, and then declared the affected equipment operable but non-conforming, as allowed

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Byron Station – Unit 1	05000454	2016	- 002	- 00

### NARRATIVE

by the EGM and DSS. The TS LCOs and Technical Requirements Manual (TRM) limiting conditions for operation (TLCOs) that were entered and exited were for the following equipment: The two Unit 0 A and B trains of control room ventilation [VI], the Unit 1 (Division 11) and Unit 2 (Division 21) Train A battery chargers and DC buses [EJ], the Unit 1 and Unit 2 112/114/212/214 ESF Inverters [EF], the Main Control Room radiation monitors (0PR31J, 0PR32J, 0PR33J, 0PR34J) [IL], the Unit 1 and Unit 2 RWSTs, the Unit 1 and Unit 2 emergency core cooling system both trains, the Unit 1 and Unit 2 containment spray [BE] for both trains, and the Byron Essential Service Water Cooling Towers (Ultimate Heat Sink). NRC Event Notification (ENS) 51958 was made on May 25, 2016 at 1650 EDT.

This condition is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(B) for any event or condition that results in the nuclear power plant being in an unanalyzed condition that significantly degrades plant safety, and in accordance with 10 CFR 50.73(a)(2)(v)(D) for any event or condition that at the time of discovery could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident. As the issues have been in place per original plant design, this condition existed for a longer period of time than is allowed by TS; therefore, this event is also being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) for any operation or condition which was prohibited by TS. Additionally, this event is being reported in accordance with 10 CFR 50.73a)(2)(ix)(A) for any event or condition that as a result of a single cause could have prevented the fulfillment of a safety function for two or more trains or channels in different systems that are needed to mitigate the consequences of an accident.

### C. Cause of Event:

The cause of this issue was a lack of clarity and changing requirements during the original licensing of the plants that led to inadequate understanding of the original NRC regulatory guidance.

### D. Safety Consequences:

This condition had no actual safety consequences impacting plant or public safety since Byron Station did not experience a tornado missile event.

During a postulated design basis tornado, this could have resulted in the loss of one or more of the equipment listed above under Description of Event, and result in the loss of safety function of one or more systems.

EGM 15-002, in providing the basis for granting the enforcement discretion states that, in general, tornado missile scenarios that may lead to core damage are very low probability events because safety-related systems, structures and components (SSCs) are typically designed to withstand the effects of tornados. For a tornado missile induced scenario to occur, a tornado would have to hit the site and result in the generation of missiles that would hit and fail vulnerable, unprotected safety related equipment and/or unprotected safety related subcomponents in a manner that is non-repairable and non-recoverable. In addition, because plants are designed with redundancy and diversity, the tornado missiles would have to affect multiple trains of safety systems and/or means of achieving safe shutdown.

EMG 15-002 states that the NRC completed a generic risk analysis of potential tornado missile protection non-compliances to examine the risk significance of these scenarios. The generic nature of this analysis did not afford the staff the capability to assess plant-specific tornado missile protections which likely exist at many reactors that would result in lower risk determinations, and it did not consider the plant-specific nature of the non-compliances or the redundancies of SSCs. The generic analysis assumed that core damage would occur if a tornado hit a plant located in the most active tornado region in the country and that it caused a tornado-generated missile to fail all emergency core cooling equipment at the plant with no ability to recover.

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Byron Station – Unit 1	05000454	2016	- 002	- 00

### NARRATIVE

Further, the study did not account for a number of conservatisms. For example, whereas the study assumed the failure of redundant systems due to tornado generated missiles, actual spatial configurations of redundant systems at a plant could lower the probability of complete system failures as a result of tornado generated missiles. Additionally, some tornado generated missiles may not cause system failures at all or may cause failures that are repairable or recoverable within a reasonable time frame.

In summary, EGM 15-002 stated that the generic bounding risk analysis performed by the NRC concluded that this issue is of low risk significance. Therefore, enforcement discretion until June 10, 2018, will not impose significant additional risk to public health and safety.

### E. Corrective Actions:

#### Immediate Actions Completed

1. Abnormal Operating Procedure addressing tornados and high winds was revised to add additional guidance for performing actions in the event of a tornado watch or warning.
2. A description of the nonconforming SSCs and associated compensatory measures has been added to the Operations turnovers, and a briefing discussing these actions was performed during each shift turnover briefing.
3. An Operations Ops Standing Order and an associated read and sign was created to document all Operations personnel understanding of the additional requirements.
4. Log entries were made documenting the inoperability and subsequent transition to operable but nonconforming. The initial briefing actions were also completed and logged.

#### Corrective Actions Planned

1. Complete the EGM 60-day comprehensive compensatory measures to demonstrate a discernable change from its pre-discovery actions.
2. Modify the RWST hatches to eliminate the tornado missile vulnerability, or revise the design/licensing bases.
3. Modify the Miscellaneous Electrical Equipment Room ventilation openings to eliminate tornado missile vulnerability, or revise the design/licensing bases.
4. Obtain a license amendment for the use of the TORMIS computer code for assessment of tornado missile protection

### F. Previous Occurrences:

There have been no previous Licensee Event Reports at Byron on this issue.

### G. Component Failure Data:

Manufacturer

N/A

Nomenclature

N/A

Model

N/A

Mfg. Part Number

N/A