Tennessee Valley Authority, Sequoyah Nuclear Plant, P.O. Box 2000, Soddy Daisy, Tennessee 37384

October 3, 2016

10 CFR 50.73

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Sequoyah Nuclear Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-77 and DPR-79
NRC Docket Nos. 50-327 and 50-328

Subject: **Licensee Event Report 50-327 and 50-328/2016-004-01, Emergency Diesel Generator Fire Dampers and Crankcase Pressure Switches Not Analyzed for Withstanding the Effects of a Tornado**

Reference: Letter from TVA to NRC, "Licensee Event Report 50-327 and 50-328/2016-004-00, Emergency Diesel Generator Fire Dampers and Crankcase Pressure Switches Not Analyzed for Withstanding the Effects of a Tornado," dated July 15, 2016

The enclosed Licensee Event Report has been revised with supplemental information concerning the Emergency Diesel Generator fire dampers and crankcase pressure switches not being analyzed for withstanding the effects of a tornado. This revised report reflects the results of the apparent cause analysis along with further corrective actions. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B), as an event or condition that resulted in the nuclear power plant being in an unanalyzed condition that significantly degraded plant safety. Changes to the reference report are indicated by revision bars on the right side margin of the page.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Michael McBrearty, Site Licensing Manager, at (423) 843-7170.

Respectfully,

Preston P. Pratt
Plant Manager
Sequoyah Nuclear Plant

Enclosure: Licensee Event Report 50-327 and 50-328/2016-004-01
cc: NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Sequoyah Nuclear Plant

NRC FORM 366 (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE

Emergency Diesel Generator Fire Dampers and Crankcase Pressure Switches Not Analyzed for Withstanding the Effects of a Tornado

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	16	2016	2016	004	01	10	03	2016	Sequoyah Nuclear Plant Unit 2	05000328
									FACILITY NAME: NA	DOCKET NUMBER:

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☒ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
100	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Rebecca L. Travis	423-843-8335

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On May 16, 2016, at 2105 Eastern Daylight Time (EDT), Sequoyah Nuclear Plant (SQN) identified a nonconforming condition involving the Emergency Diesel Generator (EDG) fire dampers installed for Units 1 and 2. Specifically, it has been identified that if a tornado causes a differential pressure across the east and west sides of the EDG Building, the associated ventilation fire dampers have not been analyzed to withstand the corresponding high air flow rate that could result from this condition and could possibly fail in a way that impedes airflow for EDG cooling. On June 8, 2016, at 1526 EDT, SQN determined that a tornado could potentially cause actuation of the EDG crankcase pressure trip due to a low barometric condition that could result in an EDG lockout condition. The EDG lockout condition prevents subsequent EDG starts (normal or emergency) until operators manually reset the lockout condition locally at the EDG. Corrective actions include establishing compensatory measures to block the fire dampers in the open position in the event that a Tornado Watch/Warning is issued for the Hamilton County, Tennessee area. In addition, a compensatory measure has been established, that upon notification of a Tornado Warning, the EDGs will be emergency started and operated during the time the Tornado Warning is in effect to bypass the crankcase pressure trip function and allow the EDGs to perform their required safety function. The apparent cause of these events is misjudgment regarding the intent of the Regulatory Issue Summary 2006-23. The corrective actions developed in response to the RIS were too narrowly focused on ductwork and ventilating dampers withstanding the effects of a tornado.

NRC FORM 366A (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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		YEAR	SEQUENTIAL NUMBER	REV NO.
Sequoyah Nuclear Plant Unit 1	05000327	2016	- 004 -	01

NARRATIVE

I. PLANT OPERATING CONDITIONS BEFORE THE EVENT

At the time of the events, Sequoyah Nuclear Plant (SQN) Unit 1 and Unit 2 were in Mode 1 at 100 percent rated thermal power.

II. DESCRIPTION OF EVENTS

A. Event:

On May 16, 2016, at 2105 Eastern Daylight Time (EDT), Sequoyah Nuclear Plant (SQN) identified a nonconforming condition involving the Emergency Diesel Generator (EDG) [EIIS Code EK and DG] fire dampers [EIIS Code DMP] installed for Units 1 and 2. Specifically, it has been identified that if a tornado causes a differential pressure across the east and west sides of the EDG Building, this could create a high airflow rate through the EDG Building ventilation path. The fire dampers for each EDG bay have not been analyzed to withstand high air flows resulting from a tornado and could possibly fail in a way that impedes airflow for EDG cooling. This is an unanalyzed condition that potentially significantly degrades plant safety and could prevent all EDGs from supplying electrical power as designed during a tornado or other similar weather events.

On June 8, 2016, at 1526 EDT, another issue was identified involving the potential impact of a tornado on the EDGs. The EDGs are designed with a crankcase pressure trip [EIIS Code PS], which is bypassed during an emergency start. A tornado could potentially cause actuation of the crankcase pressure trip due to a low barometric condition. If an emergency start signal has not previously occurred, then during a tornado, actuation of the crankcase pressure trip would energize the shutdown relay causing an EDG lockout condition. The EDG lockout condition prevents subsequent EDG starts (normal or emergency) until operators manually reset the lockout condition locally at the EDG. This condition places both units in an unanalyzed condition that potentially significantly degrades plant safety and could potentially affect all four EDGs simultaneously.

B. Status of structures, components, or systems that were inoperable at the start of the event and contributed to the event:

No inoperable structures, components, or systems contributed to this event.

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C. Dates and approximate times of occurrences:

Date/Time (EDT)	Description
May 16, 2016 at 2105 EDT	SQN determined that a tornado could potentially cause failure of the EDG building fire dampers.
May 16, 2016 at 2217 EDT	An 8-hour non-emergency notification was made to the NRC to report the event as an unanalyzed condition that significantly degrades plant safety per 10 CFR 50.72(b)(3)(ii)(B).
June 8, 2016 at 1526 EDT	SQN determined that a tornado could potentially cause actuation of the EDG crankcase pressure trip.
June 8, 2016 at 1710 EDT	An 8-hour non-emergency notification was made to the NRC to report the event as an unanalyzed condition that significantly degrades plant safety per 10 CFR 50.72(b)(3)(ii)(B).

D. Manufacturer and model number of each component that failed during the event:

There were no component failures.

E. Other systems or secondary functions affected:

There were no other systems or secondary functions affected by this event.

F. Method of discovery of each component or system failure or procedural error:

The unanalyzed conditions were discovered as a result of questions asked during the NRC Component Design Bases Inspection.

G. The failure mode, mechanism, and effect of each failed component, if known:

There were no component failures.

H. Operator actions:

Upon determination of each unanalyzed condition, operators promptly made NRC notifications.

I. Automatically and manually initiated safety system responses:

There were no automatic or manual system responses associated with this event.

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II. CAUSE OF THE EVENT

A. The cause of each component or system failure or personnel error, if known:

The apparent cause of these events is misjudgment regarding the intent of Regulatory Issue Summary (RIS) 2006-23, "Post-Tornado Operability of Ventilating and Air-Conditioning Systems Housed in Emergency Diesel Generator Rooms." The corrective actions developed in response to RIS 2006-23 were too narrowly focused on ductwork and ventilating dampers withstanding the effects of a tornado, and did not conservatively expand the analysis limits to include all safety related components within the ventilating system.

B. The cause(s) and circumstances for each human performance related root cause:

The human performance issue that contributed to the cause was a wrong assumption or preconceived idea. The decision to analyze the ductwork and dampers, as opposed to all components of the ventilation system, appears to have been a non-conservative decision; however, the decision also appears to have been more of a misunderstanding of the intent of the RIS. Since the licensee response that prompted RIS 2006-23 only analyzed vulnerable duct segments, it led to a predisposition of the initiator of the CR to suggest that only the ductwork and dampers needed to be analyzed. These precursors led to a faulty scope. The decision does not appear to be deliberately non-conservative. The personnel involved with the response to the CR were adequately trained in both general engineering principles and work group specific training.

IV. ANALYSIS OF THE EVENT

All 4 EDGs are required to be operable by both units' Technical Specifications to provide electrical power to safe shutdown/safety related equipment following accident conditions coincident with a loss of offsite power. The Current Licensing Basis (CLB) requires that tornado effects be considered in the design of safety related structures, systems, and components. It could not be demonstrated at the time of the events that the fire dampers and crankcase pressure switches would withstand the design basis tornado.

The EDGs are operable, but degraded and have successfully passed their required surveillances within the appropriate frequency. The occurrence of such an event involving failure of the fire dampers or the crankcase pressure switches is highly unlikely and there was no imminent concern regarding severe weather involving tornadoes.

In order to prevent any operability issues with the EDG due to tornado damage to the EDG building or components, compensatory measures have been developed to address the associated nonconformance. These compensatory measures will be accomplished by physically blocking open the fire dampers, and removing an access port downstream of one of each pair of the EDG exhaust fan dampers. It will be implemented promptly upon site notification of a Tornado Watch or Warning. A compensatory measure has also been established, that upon notification of a Tornado Warning, the EDGs will be emergency started and operated during the time the Tornado Warning is in effect to

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bypass the crankcase pressure trip function and allow the EDGs to be able to perform their required safety function.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The EDGs are located inside the power plant structure and are capable of performing their safety function. The occurrence of such an event involving failure of the fire dampers or the crankcase pressure switches is highly unlikely and there was no imminent concern regarding severe weather involving tornadoes at the time of the events.

A risk assessment has been completed and has determined that the change in core damage frequency is less than 1E-6 for failures of both the EDG fire dampers and crankcase pressure switches, which is of very low safety significance.

A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event:

There were no component failures.

B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident:

These events did not occur when the reactor was shutdown.

C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from discovery of the failure until the train was returned to service:

With the compensatory measures in place, the EDGs will remain capable of fulfilling their design basis function following a tornado.

VI. CORRECTIVE ACTIONS

This event was entered into the Tennessee Valley Authority Corrective Action Program under Condition Reports (CR) 1170545, 1178891, and 1181710.

A. Immediate Corrective Actions:

8-hour non-emergency notifications were made to the NRC to report the events as unanalyzed conditions that significantly degrade plant safety per 10 CFR 50.72(b)(3)(ii)(B).

B. Corrective actions to reduce probability of similar events occurring in the future:

Corrective actions include establishing compensatory measures to block the fire dampers in the open position in the event that a Tornado Watch/Warning is issued for the Hamilton

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County, Tennessee area. In addition, a compensatory measure has been established, that upon notification of a Tornado Warning, the EDGs will be emergency started and operated during the time the Tornado Warning is in effect to bypass the crankcase pressure trip function and allow the EDGs to perform their required safety function.

Further corrective actions include establishing the bounding criteria for evaluation of other components that are subject to the effects of a tornado that could impact the safe operation of safety related equipment in Category I structures, fully evaluating the components of the EDG building ventilation system, and fully evaluating the components in the EDG building that are subject to the effects of a tornado that could impact the operation of the EDGs.

VII. ADDITIONAL INFORMATION

A. Previous similar events at the same plant:

There have been no similar events at SQN in the past three years that resulted in an unanalyzed condition on the EDGs due to a tornado.

B. Additional Information:

None.

C. Safety System Functional Failure Consideration:

These events did not result in a safety system functional failure in accordance with 10 CFR 50.73(a)(2)(v).

D. Scrams with Complications Consideration:

There were no scrams associated with these events.

VIII. COMMITMENTS

None.