



**SYSTEM ENERGY  
RESOURCES, INC.**

A Middle South Utilities Company

WILLIAM T. COTTE  
Vice President  
Nuclear Operations

December 6, 1989

U.S. Nuclear Regulatory Commission  
Mail Station P1-137  
Washington, D.C. 20555

Attention: Document Control Desk

Gentlemen:

SUBJECT: Grand Gulf Nuclear Station  
Unit 1  
Docket No. 50-416  
License No. NPF-29  
Lightning Induced Spikes Causes  
APRM Scram  
LER 89-016-00  
AECM-89/0221

Attached is Licensee Event Report (LER) 89-016-00 which is a final report.

Yours truly,

WTC:cg  
Attachment

cc: Mr. D. C. Hintz (w/a)  
Mr. T. H. Cloninger (w/a)  
Mr. R. B. McGehee (w/a)  
Mr. N. S. Reynolds (w/a)  
Mr. H. L. Thomas (w/o)  
Mr. H. O. Christensen (w/a)

Mr. Stewart D. Ebnetter (w/a)  
Regional Administrator  
U.S. Nuclear Regulatory Commission  
Region II  
101 Marietta St., N.W., Suite 2900  
Atlanta, Georgia 30323

Mr. L. L. Kintner, Project Manager (w/a)  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Mail Stop 14B20  
Washington, D.C. 20555

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Grand Gulf Nuclear Station - Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 4 1 6	PAGE (3) 1 OF 0 3
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TITLE (4)  
Lightning Induced Spikes Cause APRM Scram

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NUMBER(S)
11	07	89	89	016	00	12	06	89			0 5 0 0 0

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)									
POWER LEVEL (10) 1 0 0	20.402(b)	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	73.71(b)					
	20.405(a)(1)(i)	50.36(c)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	73.71(c)					
	20.405(a)(1)(ii)	50.36(c)(2)	<input type="checkbox"/>	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)					
	20.405(a)(1)(iii)	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)						
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)						
20.405(a)(1)(v)	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(x)							

LICENSEE CONTACT FOR THIS LER (12)

NAME Riley Ruffin/Licensing Specialist	TELEPHONE NUMBER 61011 41317 - P 11617
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

On November 7, 1989, a severe thunder storm was in progress in the site vicinity. During the storm, lightning struck the site causing a spike on plant instrumentation. The reactor automatically scrammed due to the spike simulating a high flux signal on the Average Power Range Monitors (APRMs). The spike caused two High Pressure Core Spray (HPCS) low water level channels to trip. HPCS did not initiate due to the short duration of the spike. Also, Reactor Core Isolation Cooling (RCIC) received an initiation signal, but did not inject due to the trip throttle valve being in the closed position in preparation for an I&C surveillance. Reactor water level decreased to -18 inches and was subsequently raised to 51 inches by the feedwater System.

A functional check of APRM indications and HPCS trip units was performed prior to plant startup. No adverse effects were observed. A design change package was issued to install a lightning dissipation system on vulnerable structures. Implementation of the system is due to be completed by startup from the fourth refueling outage (RFO4).

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES 5/31/88

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Grand Gulf Nuclear Station - Unit 1	05000411689	0	16	0	02	OF 03

TEXT (if more space is required, use additional NRC Form 305A's) (17)

## A. Reportable Occurrence

On November 7, 1989, the reactor automatically scrambled due to a lightning induced spike on the Average Power Range Monitors (APRMs). This Reactor Protection System (RPS) actuation is reported pursuant to 10CFR50.73(a)(2)(iv).

## B. Initial Condition

The plant was operating at approximately 100 percent power at the time of occurrence.

## C. Description of Occurrence

On November 7, 1989, a severe thunder storm was in progress in the site vicinity. At 1743, during the storm, the reactor automatically scrambled due to a high neutron flux signal on the APRMs (EIIS code: IG). Numerous alarms were received, one being APRM UPSC TRIP/INOP. Evaluation of the event revealed that the APRM high neutron flux trip signal lasted less than 50 mSec. Also during the storm, two High Pressure Core Spray (HPCS) System (EIIS code: BG) low water level channels tripped, but the trip signal duration was not long enough for the logic to seal-in and cause a HPCS initiation. Reactor Core Isolation Cooling (RCIC) System (EIIS code: BN) received an automatic initiation signal due to a simulated low water level signal. RCIC steam supply valve opened, but steam was not admitted to the turbine due to the trip throttle valve being in the closed position for preparation of an I&C surveillance.

Following the scram, the reactor water level decreased to -18 inches. Level was raised to approximately 51 inches by the Feedwater System. Level control was placed on Startup Level Control and the 'A' Reactor Feed Pump Turbine was manually tripped. At 1750 the reactor water level decreased to approximately 32 inches and stabilized.

## D. Apparent Cause

Review of the computer traces indicated two lightning strikes approximately 0.5 seconds apart. The RPS actuation and subsequent reactor scram were caused by an initiation signal from 3 of 8 APRM channels. Although all 8 APRM channels spiked due to the lightning strikes, only 3 channels (D, G, and H) had spikes of the magnitude and duration necessary to cause a high neutron flux trip.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT IF more space is required, use additional NRC Form 305A's (17)

The Post Trip Analysis concluded that the cause of the instrumentation signal spikes was induced voltage and/or ground potential spikes caused by lightning activity at the site. On the first strike, Div. I (Channel G) tripped giving a half-scam. Div. II (Channels D, H) did not trip due to the short duration of the spike, but Div. II did trip on the second strike completing the scram initiation logic.

Two previous similar events were reported in LER 88-012 and LER 89-010. Commitments were made in the latter to install lightning dissipation arrays for vulnerable structures. Design of the new lightning protection system was in progress at the time of this occurrence, but the changes had not been implemented.

#### E. Supplemental Corrective Actions

A functional check of APRM indications was performed on November 8, 1989 to confirm proper response. No adverse effects were observed.

The HPCS functional check of vessel level trip units was performed on channels G and L. Proper actuation of the initiation logic was verified.

The roofs of the Turbine, Auxiliary, and Enclosure buildings were inspected before restart. There was no evidence of damage to them due to lightning.

A design change has been issued to install a lightning dissipation system. The system will provide lightning dissipation arrays to reduce the potential of lightning striking the plant site and other vulnerable plant structures. Installation of the system in areas which are accessible during normal plant operation is due for completion December 31, 1989. Implementation of the entire system is due to be completed by startup from the fourth refueling outage (RFO4).

#### F. Safety Assessment

The Post Trip Analysis confirmed that all safety systems functioned properly and that plant response to these automatic actions was as expected. RPS response times were satisfactory when compared to expected or required times. HPCS did not initiate from a trip of the low water level channels due to the short duration between the time the trip signal was received and when it reset. Reactor water level remained at least .48 inches above the top of active fuel during the event. All Emergency Core Cooling Systems were operable but were not required to be automatically or manually initiated.