Nebraska Public Power District
Nebraska's Energy Leader

NLS2001097
November 6, 2001

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

Gentlemen:

Subject: Licensee Event Report No. 2001-004
Cooper Nuclear Station, NRC Docket 50-298, DPR-46

The subject Licensee Event Report is forwarded as an enclosure to this letter.

Sincerely,

J. A. Hutton
Plant Manager

/dwv
Enclosure

cc: Regional Administrator
USNRC - Region IV

Senior Project Manager
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector
USNRC

NPG Distribution

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NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 information collection does not display a currently valid OMB control number, the NRC

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Cooper Nuclear Station	05000298	1 OF 4

4. TITLE

Loss Of Both Offsite Power Sources Due To Lightning

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
09	07	2001	2001	– 004 –	0	11	06	2001	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE	1
10. POWER LEVEL	100

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

	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
	20.2203(a)(1)		50.36(c)(1)(i)(A)		50.73(a)(2)(iv)(A)		73.71(a)(4)
	20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
	20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		
	20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)	x	50.73(a)(2)(v)(D)		
	20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
	20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
David Kunsemiller, Risk and Regulatory Affairs Manager	402-825-5236

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
E	FK	BKR	G080	Y	E	FK	67RLY	W120	Y

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

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

On September 7, 2001, the plant was operating at 100% power during an early evening lightning storm. A combination of a lightning strike occurring on a 161 kilovolt (kV) transmission line, with equipment malfunctions, resulted in the loss of the preferred offsite alternating current (AC) source at 1750 Central Standard Time (CST). Subsequent voltage perturbations, due to the storm, on the 69 kV sub-transmission system which supplies the emergency offsite AC source, resulted in the loss of the second offsite AC source at 1754 CST due to low voltage. A complete loss of the second offsite AC source occurred at 2230 CST.

The cause of the loss of both offsite power sources during the lightning strikes was that standards, policies and administrative controls to ensure maintenance and testing of switchyard equipment were not adequate to detect degradation of certain key equipment important to offsite power prior to failure. Thus, the offsite power switching circuitry was vulnerable to perturbations and failure.

Immediate corrective actions included inspection, testing, restoring equipment to service, replacing and repairing equipment and revising equipment testing. Long term corrective actions include determining acceptance criteria, identifying major switchyard equipment important to offsite power and reviewing procedures for test adequacy, acceptance criteria and test frequency.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cooper Nuclear Station	05000298	2001	-- 004 --	0	2 OF 4

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

PLANT STATUS:

Cooper Nuclear Station (CNS) was in mode 1, Power Operation, at approximately 100 percent steady state power when the event occurred.

BACKGROUND:

The offsite power sources at CNS are a Startup Station Service Transformer (SSST) (EIIS:EA/XFMR) which connects to the CNS 161 kilovolt (kV) switchyard (EIIS:FK) and the 345/161 kV, 300 megavolt-amp (MVA) "T2" auto-transformer (EIIS:FK/XFMR) connected to the 345 kV switchyard (EIIS:FK), and a separate Emergency Station Service Transformer (ESST) (EIIS:EA/XFMR) energized by a 69 kV line. The 161 kV switchyard is connected to one 161 kV line which terminates in a switchyard near Auburn, Nebraska, and the 345/161 kV, 300 MVA "T2" auto-transformer which connects to the CNS 345 kV switchyard. The 345 kV switchyard has five (5) lines which terminate in switchyards near Booneville, Iowa; Hallam, Nebraska; St. Joseph, Missouri; Fairport, Missouri, and Nebraska City, Nebraska. The emergency station service transformer is fed by a 69 kV line which is part of a subtransmission grid of another utility (Omaha Public Power District). If the Normal Station Service Transformer (EIIS:EL/XFMR) (powered by the main generator) is lost, the SSST, which is normally energized, will automatically energize 4160 volt buses 1A and 1B (EIIS:EA/BU) as well as their connected loads, including the critical buses. If the SSST fails to energize the critical buses (EIIS:EA/BU), the ESST, which is normally energized, will automatically energize both critical buses. If the ESST were also to fail, the diesel generators (EIIS:EK/DG) would automatically energize their respective buses to power essential loads.

EVENT DESCRIPTION:

On September 7, 2001, CNS declared both sources of offsite power inoperable. At 1750 Central Standard Time (CST) the preferred source of offsite power, the SSST, was declared inoperable as a result of a breaker (EIIS:FK/BKR) malfunction and a malfunctioning relay (EIIS:FK/67RLY) in response to lightning striking a transmission line approximately seven miles from CNS. The malfunctioning breaker opened slowly allowing the fault current to conduct through the breaker longer than designed. As a result, a directional fault relay was damaged, or had a pre-existing defect, and actuated on a sensed fault current in a direction that should not have caused an actuation. This caused an isolation of the "T2" auto-transformer, by opening breakers disconnecting the preferred source of offsite power, and locking them out.

At 1754 CST CNS subsequently declared the emergency source, the ESST, of offsite power inoperable due to 69 kV sub-transmission system voltage perturbations. After declaring the emergency source inoperable, the transmission line supplying the emergency source tripped due to a lightning strike and was reclosed approximately forty-five seconds later. The grid voltage improved at 1932 CST and CNS declared the emergency source operable. The emergency source was again declared inoperable at 2230 CST due to insufficient voltage. CNS placed a capacitor bank in service at a CNS substation to boost voltage and declared the emergency source operable at 2231 CST.

Inspection and testing of switchyard equipment supplying the preferred source continued through the night. The initial visual inspection and testing did not identify any damaged equipment. Protective relays were reset and the switchyard breakers were reclosed at 0550 CST on September 8, 2001. The preferred source was declared operable at 1045 CST on September 8, 2001. On September 11, 2001, a detailed review of the fault data concluded that the fault was not interrupted within the expected time that the breakers should have opened. On September 13, 2001, an internal inspection found damage in the breaker. On September 15, 2001, additional testing on the directional relay discovered the relay would actuate on a sensed fault in the wrong direction.

BASIS OF REPORT:

The loss of both offsite power sources is reportable as an "event or condition that could have prevented fulfillment of a safety function" under 10CFR50.73(a)(2)(v)(D).

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cooper Nuclear Station	05000298	2001	-- 004	-- 0	3 OF 4

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

CAUSE:

The root cause of this event was that CNS did not have standards, policies or administrative controls to ensure maintenance and testing of switchyard equipment is adequate to detect degradation of equipment important to offsite power prior to failure. Thus, the offsite power switching circuitry was vulnerable to perturbations and failure.

The breaker that malfunctioned had been tested five months prior to this event by Nebraska Public Power District Transmission and Distribution (NPPD T&D) technicians. The results of that test indicated that the breaker was slower than two other identical breakers of the same model and vintage tested the same day. The other two had similar opening and closing performances. The technicians performing the test were unsure of the test results and had no defined performance criteria to determine if the test results were acceptable. The test was performed with a new style of equipment that allowed the breaker to remain energized instead of requiring the breaker to be de-energized. There had been no performance criteria established for acceptable breaker opening or closing for this new test equipment. The test equipment recorded a "baseline" opening and closing performance for each breaker.

The previous test equipment and procedure had established performance criteria for opening and closing. The technicians noted that one breaker was slower than the others with the new equipment. The test results were not required to be transmitted to NPPD T & D engineers for evaluation or to the CNS switchyard engineer for trending.

Immediate corrective actions included responding to the unplanned power change and restoration of offsite power sources. CNS switchyard equipment was inspected for damage and tested. The directional fault relay that malfunctioned was functionally tested in accordance with guidance provided in the vendor manual after the event. This testing did not include polarized fault simulation. The directional relay passed the limited functional testing that was initially performed. The emergency offsite AC source was declared operable at 1932 CST. The preferred offsite AC was declared operable at 1045 CST on September 8, 2001.

On September 11, 2001, a review of the recorded fault data concluded that fault was not interrupted within the expected time that the breakers should have opened. Communications between NPPD T & D engineers, T & D test technicians and the CNS switchyard engineer concerning an apparent breaker slow opening time discovered the unevaluated test data indicating slow performance of one of the breakers. On September 13, an internal inspection found damage in the breaker. On September 15, additional testing on the directional fault relay discovered that the relay would actuate on a sensed fault in the wrong direction. A new relay was tested and installed. The breaker was repaired, has been tested and is returned to service.

SAFETY SIGNIFICANCE:

During this event the station remained on AC power supplied by the CNS generator through the Normal Transformer. Both diesel generators were operable and could have started and supplied essential loads if required.

The Core Damage Probability (CDP) of the conditions associated with unavailability of the Startup and Emergency Transformers was approximately 3×10^{-7} greater than the baseline CDP for the same period. The threshold for risk significance is 10^{-6} greater than baseline CDP. Therefore, the condition is considered to have low risk significance.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cooper Nuclear Station	05000298	2001	-- 004 --	0	4 OF 4

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

CORRECTIVE ACTIONS:

A. Immediate Corrective Actions - to correct the condition (Note: All have been completed)

1. Restore ESST to service. (Correct Condition - Loss of emergency source of offsite power)

2. Restore T2 Auto-transformer and SSST to service. (Correct Condition - Loss of preferred source of offsite power) Subsequently, restart Reactor Recirculation Motor Generator Set A and raise power to 100%. (Correct Condition - Resume normal power operation)

Immediate Corrective Actions - to prevent recurrence and bound the condition (Note: All have been completed)

3. Retest protective relays for auto-transformer. (Corrective Action to prevent recurrence - Loss of preferred source of offsite power)

4. Evaluate 69 kV subtransmission system response. (Corrective Action to bound the extent of condition - Loss of emergency source of offsite power)

5. Change test process for the directional fault relay testing. (Corrective Action to bound the extent of condition and prevent recurrence - Loss of preferred source of offsite power)

6. Inspect and repair breaker 1602. (Corrective Action to prevent recurrence - Loss of preferred source of offsite power)

B. Long Term Corrective Actions

1. Determine acceptance criteria for breaker testing using Kelman test equipment. (To be completed by 03/01/2002)

2. Identify the standards, policies, and administrative controls (SPAC) for maintenance and testing of the 161 kV breakers. Review the SPAC for maintenance and testing of the 161kV breakers. Prepare appropriate procedure change requests. Implement SPAC changes to eliminate inadequacies in the detection of breaker degradation prior to failure that could lead to loss of offsite power. (To be completed by 03/01/2002)

3. Inventory the CNS switchyards to identify major equipment important to offsite power in order to review switchyard standards, policies and administrative controls. (To be completed by 04/01/2002)

4. Identify the standards, policies, and administrative controls for maintenance and testing of the major equipment to offsite power. Review the SPAC for maintenance and testing of the switchyard equipment. Prepare appropriate procedure change requests. Implement SPAC changes to eliminate inadequacies in the detection of breaker degradation prior to failure that could lead to the loss of offsite power. (To be completed by 06/30/2002)

PREVIOUS EVENTS

There has not been a previous reportable event of a simultaneous loss of both sources of offsite power.

Correspondence Number: NLS2001097

The following table identifies those actions committed to by the District in this document. Any other actions discussed in the submittal represent intended or planned actions by the District. They are described for information only and are not regulatory commitments. Please notify the NL&S Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITTED DATE OR OUTAGE
Determine acceptance criteria for breaker testing using Kelman test equipment.	03/01/2002
Identify the standards, policies, and administrative controls (SPAC) for maintenance and testing of the 161 kV breakers. Review the SPAC for maintenance and testing of the 161 kV breakers. Prepare appropriate procedure change requests. Implement SPAC changes to eliminate inadequacies in the detection of breaker degradation prior to failure that could lead to a loss of offsite power.	03/01/2002
Inventory the CNS switchyards to identify major equipment important to offsite power in order to review switchyard standards, policies, and administrative controls.	04/01/2002
Identify the standards, policies, and administrative controls (SPAC) for maintenance and testing of the major equipment to offsite power. Review the SPAC for maintenance and testing of the switchyard equipment. Prepare appropriate procedure change requests. Implement SPAC changes to eliminate inadequacies in the detection of breaker degradation prior to failure that could lead to the loss of offsite power.	06/30/2002