Nebraska Public Power District
Nebraska's Energy Leader

NLS2000070
August 28, 2000

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

Gentlemen:

Subject: Licensee Event Report No. 2000-008-01
Cooper Nuclear Station, NRC Docket 50-298, DPR-46

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

Sincerely,

J. A. McDonald
Plant Manager

/dnm
Enclosure

cc: Regional Administrator
USNRC - Region IV

Senior Project Manager
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector
USNRC

NPG Distribution

INPO Records Center

W. Leech
MidAmerican Energy

Cooper Nuclear Station
P.O. Box 98 / Brownville, NE 68321-0098
***Telephone:** (402) 825-3811 / **Fax:** (402) 825-5211*
http://www.nppd.com

IE22

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

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Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If 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)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)

Non-conservative Drywell Temperature Profile Places Plant in a Condition Outside of Design Basis

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 NAME	DOCKET NUMBER
04	01	2000	2000	-- 008 --	01	08	28	2000		05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	5
POWER LEVEL (10)	000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
S. R. Mahler, Assistant Manager Nuclear Licensing and Safety	(402) 825-3811

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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

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

On April 1, 2000, during a review of Equipment Qualification Data Packages (EQDPs), it was discovered that Buchanan Model 0241 terminal blocks installed in the drywell had been qualified to a temperature profile which did not bound the worst case postulated environmental conditions. Subsequent inspections of Environmentally Qualified (EQ) components in the drywell revealed noncompliance with the EQDPs. Based on the results of these inspections, a review of the Cooper Nuclear Station (CNS) EQ Program was conducted. This review identified specific splice and terminal block nonconformances which were determined to place the plant in a condition outside the design basis. In addition, the review identified weaknesses in the implementation of the EQ Program at CNS.

The individual root causes of these nonconformances were determined to be (1) a technical error made in August 1985, (2) a deficiency in the overall process of translating EQ information to the field, and (3) EQ programmatic weaknesses in that existing EQ Program standards and expectations were not effectively communicated, implemented, and enforced.

Immediate corrective actions were taken to ensure field installation reflects EQ Program requirements and to correct technical deficiencies associated with the EQ Program. Additional corrective actions are being taken to resolve the weaknesses that resulted in the EQ Program deficiencies noted during the EQ Program review.

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

PLANT STATUS

Cooper Nuclear Station (CNS) was in Mode 5 for Refueling Outage 19 at the time the initial condition was discovered on April 1, 2000.

BACKGROUND

Written confirmation of the environmental qualification (EQ) of CNS safety-related electrical equipment was compiled in response to Nuclear Regulatory Commission (NRC) Bulletin 79-01B, and to confirm compliance with 10 CFR 50.49 as published in 1983.

EVENT DESCRIPTION

While in Refueling Outage 19, review of calculations to support future operation identified an increase in the analyzed peak drywell temperature identified in the Updated Safety Analysis Report (USAR). CNS review of the impact of the increased temperature identified a concern that the temperature profile being used for EQ of equipment in the drywell may not bound the postulated break scenarios.

On April 1, 2000, during the review of Equipment Qualification Data Packages (EQDPs), it was discovered that Buchanan Model 0241 terminal blocks installed in the drywell had been qualified to a peak temperature which was not bounded by postulated worst-case environmental conditions. Although the terminal blocks are qualified to a peak temperature above the current design basis accident (DBA) conditions described in the USAR accident analysis, certain high energy line breaks (HELBs) inside the drywell could result in temperatures which exceed the qualification temperature. Further, sufficient information was not readily available to document qualification to the worst case environmental conditions. Rather than attempt to qualify the terminal blocks to the increased temperature profile, a decision was made to replace these components with qualified connectors to facilitate plant start up.

In addition, some cable splices were identified as not conforming to their qualified configuration. This concern resulted in increased scrutiny of EQ equipment inside of the drywell and a decision to inspect the splices to identify degradation or improper installation. This inspection identified (beginning approximately April 15, 2000) several instances of improper installation of EQ splices. Subsequent discussions raised concerns regarding the adequacy of the splices to perform their function, resulting in additional inspection of EQ splices. The nonconforming splice conditions observed included loose overtape on the splice, unraveled tape, foreign material in the tape, insufficient tape overlap and splice bolts protruding into the tape.

In response to the EQ profile and splice concerns, CNS also conducted an investigation of the EQ Program and its implementation. The concerns were evaluated as either a profile issue, field nonconformance issue, or programmatic issue. Suspect equipment was evaluated and replaced, repaired, or accepted prior to restart from the outage on May 29, 2000.

BASIS OF REPORT

The nonconforming profile condition identified on April 1, 2000, and the subsequently identified field nonconformances are reportable under the requirements of 10CFR50.73(a)(2)(ii)(B) in that CNS was in a condition outside the design basis of the plant.

CAUSE

Profile Issue

A technical error was identified as the root cause of the profile nonconformance. In the establishment of the EQ Program, a step function curve for drywell temperature was developed by CNS based on a General Electric Specification. This curve became the design input basis for documentation of the drywell accident environment used for qualification of equipment which included time and temperature intervals. The curve temperatures and intervals were based on generic BWR input to bound small, intermediate, and large break analyses.

In August 1985, the drywell profile was removed from calculation file 46 and in its place the design input profile (from USAR Figure XIV-6-8 using a lower peak drywell temperature for a large break loss of coolant accident (LOCA)) was inserted. This decision was based on an incorrect understanding of the DBA LOCA event as an overall bounding event for EQ of drywell equipment. Subsequently, the EQDP for the Buchanan Model 0241 terminal blocks was developed based on the incorrect drywell temperature profile.

Field Non-conformance Issue

The root cause of the field nonconformances was that the overall process of translating EQ information from the EQDP test configuration documents to the actual splices in the field was less than adequate. The field nonconformances identified were primarily cases where the field splices did not match the EQDP test configuration. The apparent cause was a failure to properly translate EQDP test data into actual field splices. The specific processes that have impacted this condition involve procedure writing, quality control, training, evaluation and execution of 10CFR50.49 requirements, and the establishment of EQ Programs and protocols within CNS.

The possibility that the splice materials, in particular Okonite tape, might have been defective and suffered deterioration was also considered. However, the reviewed industry data did not indicate that material degradation has been a significant contributor to non-conformance concerns.

Program Issue

The investigations also determined that programmatic weaknesses in the EQ Program have contributed to these conditions. The programmatic weaknesses included insufficient EQ Program implementation resulting from EQ Program standards and expectations not being effectively communicated, implemented, and enforced. Additionally, EQ Program monitoring did not adequately verify translation of EQ Program requirements to the field. These programmatic weaknesses in the EQ Program led to the noncompliant field conditions.

SAFETY SIGNIFICANCE

This condition has been evaluated and the resulting increase in risk remained below the established risk significance threshold value.

A Probabilistic Safety Analysis (PSA) evaluation of change in core damage frequency (CDF) caused by the nonconforming splices and terminal blocks was performed in several steps. First, the event tree sequences from the CNS PSA model which are expected to result in adverse EQ environments were identified. This minimized the number of sequences to be evaluated since many initiating events do not themselves cause the high temperature environments under consideration.

Since this evaluation involved sequences with multiple, independent (in the base model) system failures, it is possible that the truncation limits used in the quantification of the base PSA eliminated applicable cutsets from consideration. This was evaluated by requantifying the applicable event sequences with the failure probability for the terms that were used to represent nonconforming splices or terminal blocks set to 1.0. In addition, operator actions taking place in the reactor building during the applicable sequences were assumed to fail by setting their failure probability to 1.0. Using this method, it was ensured that the events being evaluated were not removed from consideration simply because of their own reliability. It is this new set of cutsets that was manipulated to evaluate the increase in CDF and large early release frequency (LERF).

New, location-specific, HELB frequencies were developed. To provide a consistent comparison for the risk significance of the scenarios described below, the current baseline CNS PSA model results were recalculated given these updated frequencies. The base CDF and CDF with consideration of nonconforming splices and terminal blocks were calculated for the HELB zone, as well as a summary of the cumulative risk significance of the reported condition.

The overall CDF increase attributed to failure of equipment located in or having splices in potential HELB areas was calculated to be less than the risk significance threshold value of 1E-6 per reactor year per Regulatory Guide 1.174. The resulting LERF increase is also below the LERF significance threshold of 1E-7 per reactor year.

Since the last operating cycle began (July 1998), twenty Licensee Event Reports (LERs) have been generated to document instances of license nonconformance. The evaluation also addressed the effects of non-qualified EQ splices on these events. Examination of these events found only negligible or no risk significance. Therefore, it was concluded that the evaluation of increase in CDF and LERF would not significantly change if these events were considered.

In addition, analysis was performed on potential vulnerabilities due to postulated erroneous indications and inadvertent actuation of equipment due to the splices and terminal blocks in question. It was determined that there are no break sizes that can cause the operator, because of misleading indications, to delay ADS actuation until after the ADS valves have failed from environmental effects. Depending on break size, the reactor vessel will depressurize through the break, the conditions will not exist which can fail the splices, or the operator will initiate ADS due to wetwell or pressure suppression pressure limits being reached before ADS failure can occur. Certain splice or terminal block failure modes associated with control or instrumentation circuits could cause inadvertent actuation of equipment. These inadvertent actuations could have had an adverse effect on the mitigation of the accident. If an inadvertent actuation could occur, it was assumed to occur in its most limiting manner. The risk due to inadvertent actuation was qualitatively evaluated and it was determined that inadvertent actuation of equipment would not have occurred or would have had consequences which could be mitigated.

No safety system functional failures were identified from review of these nonconformances.

CORRECTIVE ACTIONS

The corrective actions are provided in relation to the cause(s) of the nonconformances. Some of the actions provided under the programmatic issues also address portions of the profile and field nonconformance issues.

Profile Issue

The root cause of this event was a technical error, made in August 1985, in utilizing the DBA LOCA for the most severe environment in the drywell. Heightened awareness resulting from this event, additional documentation in the EQDP, and process changes since 1985 for validation, independent review, and Supervisory approval, provide additional barriers to prevent recurrence of this technical error. The immediate corrective actions also included developing and applying a conservative drywell temperature profile, replacing the affected terminal blocks, reviewing the remaining EQ equipment in the drywell to ensure the equipment is also qualified to a conservative profile, and reviewing other Engineering Programs and calculations to ensure the design basis accident peak temperature was appropriately applied. These immediate corrective actions were completed prior to restart of the unit.

The long-term corrective actions include performing a documented review of the existing EQ Program environmental design bases against the docketed EQ licensing basis. This action will be completed by December 14, 2000.

The long-term corrective actions also include revision of a calculation that was determined to have used a non-conservative drywell temperature. This calculation evaluated the potential for reactor equipment cooling system boiling during post accident conditions in response to concerns identified in Generic Letter 96-06. The initial impact evaluation indicates that operation of CNS can proceed with reasonable assurance of safety. This action will be completed by October 31, 2001.

Field Non-conformance Issue

In response to the EQ splice concerns, CNS initiated an effort to replace deficient EQ splices with EQ qualified connectors that meet current EQDP test configuration requirements. As splice configuration issues affecting the EQ Program were identified, the issues were investigated and suspect equipment was evaluated and replaced, repaired, or accepted prior to restart of the unit.

An investigation was conducted to determine if problems might exist in EQ information transmission processes. Several EQDPs were found to have EQ-related implementation discrepancies involving procedure writing, quality control, training, evaluation and execution of 10CFR50.49 requirements, and the establishment of EQ Programs and protocols within CNS. These discrepancies were evaluated for impact and were corrected, or determined to not have a significant impact on safety, prior to restart of the unit.

Program Issue

EQ programmatic issue corrective actions have been initiated. The short-term actions included verifying or initiating controls that will ensure EQ Program interfaces are maintained (as additional barriers to prevent recurrence in the near term). This action was completed prior to restart of the unit.

The long-term corrective actions include implementing management and administrative requirements and guidance for responsibilities, interfaces, implementation, strategy, and performance measures for the EQ Program. These are addressed in CNS Engineering Division Procedures for management and administration of Engineering Division Programs and for structure and content of Engineering Program Documents. This action will be completed by November 18, 2000.

The long-term corrective actions also include revising the EQDP initiation and revision process to incorporate additional administrative controls to address interface deficiencies. Similar administrative controls are currently included in procedures for the design calculation process. This action will be completed by November 18, 2000.

The investigation included screening other CNS programs and further evaluation of a sampling of selected programs. The evaluation did not identify concerns with the field configuration, but determined there are similar weaknesses in the administration of the programs. The long-term corrective actions for this condition include defining and developing the appropriate standards and expectations for site programs, as determined necessary for the program, and then assessing the site programs against the revised standards and expectations. This action will be completed by February 14, 2001.

PREVIOUS EVENTS

LER 97-017, "Inadequate Original Design Places Plant Outside Design Basis." This report documents a condition where original plant design failed to provide diverse power sources, and automatic closure logic to primary containment isolation valves associated with the residual heat removal steam condensing mode.

LER 97-013, "Plant Outside of Design Basis Due to Inadequate Scram Discharge Volume Modification." This report documents the failure to install redundant automatic valves in response to IEB 80-17, "Failure of Control Rods to Insert During a Scram at a BWR."

LER 97-001, "Six Containment Penetrations Susceptible to Thermally Induced Overpressurization." This report documents the discovery of the potential to overpressurize primary containment penetrations during engineering evaluations in response to Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity during Design Basis Accident Conditions."

Correspondence Number: NLS2000070

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 to the NRC for the NRC's information 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
The District will perform a documented review of the existing EQ Program environmental design bases against the docketed EQ licensing basis.	December 14, 2000
The District will revise a calculation that was determined to have used a nonconservative drywell temperature. This calculation evaluated the potential for reactor equipment cooling system boiling during post accident conditions in response to concerns identified in Generic Letter 96-06.	October 31, 2001
The District will implement management and administrative requirements and guidance for responsibilities, interfaces, implementation, strategy, and performance measures for the EQ Program. These are addressed in CNS Engineering Division Procedures for management and administration of Engineering Division Programs and for structure and content of an Engineering Program Document.	November 18, 2000
The District will revise the EQDP initiation and revision process to incorporate additional administrative controls to address interface deficiencies.	November 18, 2000
The District will define and develop the appropriate standards and expectations for site programs, as determined necessary for the program, and then assess the site programs against the new standards and expectations.	February 14, 2001