NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
OYSTER CREEK, UNIT 1	0 5 0 0 0 2 1 9	1 OF 0 3

TITLE (4)

HFA Relay Window Fogging with Undetermined Substance

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)
0 6	0 7 ~~25~~	8 4	8 4	- 0 1 5	- 0 1	0 3	0 6	8 6		0 5 0 0 0
										0 5 0 0 0

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

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Arthur Dickinson, Supv., Electrical Engineering	AREA CODE 6 0 9 — 9 7 1 - 4 6 2 6

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

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

GPUN considers this issue to be of potentially generic importance. Since no failures or events requiring specific reporting have occurred, this report should be considered voluntary.

On January 25, 1984, window fogging of a number of HFA relays were found. Fifty-eight (58) relays (out of 68) with date code HW installed in the Reactor Protection System when energized began to fog up with an unknown oily vapor within the enclosed portion of the relay. The other ten (10) were not energized. General Electric was notified of this condition and asked to provide Oyster Creek with a solution.

New relays were supplied to Oyster Creek. Two new relays with date code EX were installed and energized on June 9, 1984 and fogging was noticed June 25, 1984. GE has been notified that further testing is required to determine the cause and solution to the problem.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

DATE OF OCCURRENCE

The event occurred on January 25, 1984. Two new relays which were provided for a second replacement were energized and began fogging on June 25, 1984.

IDENTIFICATION OF OCCURRENCE

This report is being submitted for informational purposes only.

CONDITIONS PRIOR TO OCCURRENCE

1. When the original 68 relays (date code HW) were installed, the reactor was defueled and the mode switch was in REFUEL.

2. When the two new relays date code EX were installed, the reactor was fueled and the mode switch was in REFUEL.

DESCRIPTION OF OCCURRENCE

The original HFA relay change out was accomplished under recommendations from GE to change only Lexan coil HFA relays since they were proven to have coil failures and a plant decision to replace relays (nylon GE HFA 51 series) which were failing as a result of reaching end of life. At present, the newly installed AC Century Series HFA relays have an unknown oily substance which is coating the internal parts and fogging the glass cover of the relays. The substance is undergoing evaluation at GE labs. It was GE's contention that all the relays installed should be changed with GE replacements. New GE relays date code EX were shipped to the plant. Two relays date code HW were replaced with two relays date code EX on June 9, 1984. The two new relays date code HW with the oily substance were delivered to GE Labs in Malvern, PA along with the three relays date code HW from the Oyster Creek storeroom which had never been installed.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

GPU Reading Labs were contacted to conduct independent testing of the one AC and one DC HFA Century series relays to simulate conditions at Oyster Creek. No significant fogging was produced at Reading Labs.

The GE preliminary report of February 20, 1984 and interim report of May 11, 1984 concluded the substance to be from the adhesive used to seal the glass to the cover plate. Oyster Creek proceeded to schedule replacement of the balance of the affected relays within the Reactor Protection System. After preliminary shop testing was completed on June 25, 1984, it was found that the two new relays date code EX installed on June 9, 1984 were fogging. These relays had a glass cover which contained no adhesive.

Again, GE was contacted to advise them of our findings. After discussions with GE, it was noted that their Malvern facility was developing the same condition as Oyster Creek had seen without the adhesive on the glass cover.

GPUN's Labs were contacted to provide personnel to examine the existing field conditions to determine what further testing would be required.

APPARENT CAUSE OF OCCURRENCE

The apparent cause of the occurrence was a mist created when the coil was energized for the first time. It is apparent that the resin used during the manufacturing process to encapsulate the coil released organic vapors when energized which were deposited on the relay internals. Their organic vapors were due to incomplete coil curing. The conclusion drawn was that neither the incompletely cured coil nor the mist would affect the relay's performance.

As a result of the General Electric study, Power Systems Management Business Department has changed the coil manufacturing process (effective December 1985) to provide a more complete cure of the coil resin. Tests shall be performed on new manufactured relays to verify that the extended cure time of the coil has effectively corrected misting problem.

CORRECTIVE ACTION

The corrective action recommended by General Electric to relay users who have experienced misting, is to clean and burnish the contacts and to clean the window and other accessible areas witnin the relay.

The cleaning method is detailed in General Electric's Report (Appendix 1) to GPU dated January 7, 1986 (attached).

(0689A)

GENERAL ELECTRIC COMPANY

POWER SYSTEMS MANAGEMENT BUSINESS DEPARTMENT
205 GREAT VALLEY PARKWAY
MALVERN, PENNSYLVANIA 19355

TYPE HFA151 RELAY WINDOW MISTING INVESTIGATION

January 7, 1986

Abstract: Window "misting" has been seen on the subject relays during operation. Tests on this material show it to be a condensate evolving from the relay coil organic materials.

It is concluded that the window "mist" will not degrade the performance of the relay.

Introduction

In October 1983, a customer reported the appearance of a mist on the inside of the glass cover plate of a number of HFA151 type relays after 24 to 48 hours of service.

As a part of our study to determine if there could be any in-service problems with relays exhibiting misting, 21 relays were put on test in our laboratory in July 1984. The relays were energized with 120 volts and contact resistance was measured periodically for relays continuously energized and normally de-energized. All of the relays exhibited misting, but no deterioration was observed after 12 months.

In addition, relays were provided to the General Electric Materials and Process Laboratory in Schenectady for added study. This laboratory conducted an in-depth study of the materials and processes involved in the manufacture of this relay family.

Conclusions

1. Chemical and infra-red spectroscopy tests on the mist material identify the material as condensed organic vapors resulting from added cure of the resin used to encapsulate the coil.

2. Tests on the time-temperature relationship of a manufactured coil undergoing bake for resin curing show that added cure time in manufacture will increase the cure state to minimize in-service misting. (Cure time has been extended per the study recommendations.)

3. No contact problems were found in tests simulating in-service conditions of relays which exhibited misting. Windows and accessible internal surfaces of in-service relays can be cleaned* (in the deenergized state) to prevent possible migration of mist material to relay contacts.

* See Appendix I

Tests and Analyses

(General Electric Materials and Processes Laboratory)

1. Electrical Testing

Prior to performing any inspection or analysis to the internal components of the test relay, DC resistance bridge measurements were made of the contacts. A Rubicon bridge was used for these measurements. Those results are:

Table I

Contact Resistance

Milliohms

	Contact Number					
	1	2	3	4	5	6
Power off			26	41	33	
Power on 117V AC	170	24				320
Power off			18	29	24	

The results reported above are the maximum readings obtained during a 2 minute test per contact. Generally, the readings represent the first reading obtained approximately 10 seconds after applying the DC sense current to the contact pair. For all six contact pairs, the readings fluctuated downward from these readings.

In the case of the number one contact, the reading fell from the reported 170 milliohms to approximately 120 milliohms around which it stabilized after 30 to 40 seconds. Contacts 2 through 5 all dropped an average of 16% from the reported readings. Contact number 6 was the most erratic in that the minimum reading obtained on this contact was 130 milliohms versus the reported 320 milliohms during the two minute contact energized test period.

2. IR Spectrophotometric Analysis

The initial IR scan of the window "mist" was performed on a scraping smeared onto a KBR plate. Various solvent extraction methods were employed to maximize sample recovery without altering the sample composition. This was done to obtain a larger sample to improve the IR spectra resolution.

Additional contaminated windows were requested for two reasons. First, to see if the mist was consistent from window to window and secondly, to obtain a source of a larger sample of the "mist" for purposes of possible fractionating of the sample.

The glass was scribed and cut free from the window frame. Acetone extracts of these windows were taken. The IR scans of this extract was found to be the same as the first window.

Analysis of the IR spectra obtained indicates the "mist" contains some uncured resin, some curing agent and some other organic compounds resulting from the added curing.

A review of the materials used in the relay coil was made and the vendor of the major organic compound was contacted. It was concluded that the fully reacted resin would not be a source of mist.

3. Thermal Analyses

A coil assembly was instrumented to observe the temperature of various locations in the coil as a function of time after the assemblies were placed in an oven at the prescribed temperature. These tests showed that cure temperature in the coil was reached after about 2 hours. This information led to the recommendation that the manufacturing process for the HFA151 coil assembly be changed to provide an additional three hours of cure.

APPENDIX I

Cleaning Method for Mist on Window and Accessible Surfaces

HFA relay users who have experienced misting should clean and burnish the relay contacts, and clean the window and other accessible areas within the relay. Acetone or MEK are effective solvents; however, proper handling precautions must be followed when using these solvents: Do not use on energized relays but do allow sufficient ventilation to remove solvent vapors prior to reactivation of the relay. Cleaning and burnishing can be done during the next normally scheduled inspection or maintenance cycle for the HFA relays now in service.

GPU Nuclear

GPU Nuclear Corporation
Post Office Box 388
Route 9 South
Forked River, New Jersey 08731-0388
609 971-4000
Writer's Direct Dial Number:

March 6, 1986

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
Licensee Event Report. 50-219/84-015 Rev. 1

This letter forwards one (1) copy of Licensee Event Report (LER) No. 84-015, Revision 1. Vertical lines in the right side margin indicate those sections of the LER that have been revised.

If you have any further questions, please contact Mr. John Rogers of my staff at (609)971-4893.

Very truly yours,

Peter B. Fiedler
Vice President and Director
Oyster Creek

PBF:JR:dam (#0689A)
Encs.

cc: Dr. Thomas E. Murley, Administrator
Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

NRC Resident Inspector
Oyster Creek Nuclear Generating Station
Forked River, NJ 08731

Mr. Jack N. Donohew, Jr.
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue, Phillips Bldg.
Bethesda, MD 20014
Mail Stop No. 314

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