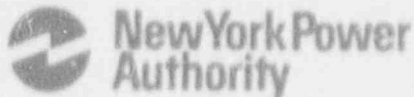


James A. FitzPatrick  
Nuclear Power Plant  
P.O. Box 41  
Lycoming, New York 13093  
315 342-3840



Harry P. Salmon, Jr.  
Resident Manager

December 10, 1992  
JAFF-92-0843

United States Nuclear Regulatory Commission  
Document Control Desk  
Mail Station P1-137  
Washington, D.C. 20555


SUBJECT: DOCKET NO. 50-333  
LICENSEE EVENT REPORT: 92-007-01 - Failure of Analog  
Transmitter Trip System (ATTS)  
Trip Relays Due to Thermal  
Aging.

Dear Sir:

This report is submitted in accordance with 10 CFR  
50.73(a)(2)(v).

Questions concerning this report may be addressed to  
Mr. Paul McGuire at (315) 349-6362.

Very truly yours,

  
HARRY P. SALMON, JR.

HPS:PJM:tld  
Enclosure

cc: USNRC, Region 1  
USNRC Resident Manager  
INPO Records Center

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## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN REC. RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  
James A. FitzPatrick Nuclear Power PlantDOCKET NUMBER (2) 3 3 3  
0 5 0 0 0 1 1 1 OF 5TITLE (4)  
Failure of Analog Transmitter Trip System (ATTS) Trip Relays Due To Thermal Aging

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 NUMBERS
0	1	2	9	2	9	2	0	0	7	0 1 1 2 1 0 9 2
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)										
OPERATING MODE (9) N			20.405(a) 20.405(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)	
POWER LEVEL (10) 0 0 0			20.405(a)(1)(i)		50.36(a)(1)		50.73(a)(2)(v)		73.71(c)	
			20.405(a)(1)(ii)		50.36(a)(2)		50.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text, NRC Form 306A)	
			20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(vii)(A)			
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(vii)(B)			
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(ix)			

LICENSEE CONTACT FOR THIS LER (12)

NAME  
Mr. Paul McGuire, Senior Licensing EngineerTELEPHONE NUMBER  
3 1 5 3 4 9 - 6 3 6 2

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15)

MONTH DAY YEAR

YES (If yes, complete EXPECTED SUBMISSION DATE)

X NO

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

EIS Codes are in []

On 1/23/92 while the plant was in cold shutdown, technicians were performing a routine surveillance of the Analog Transmitter Trip System (ATTS). An excessive time delay was observed from the time the "push-to-test" button was pressed and the time when the low voltage annunciator responded (approximately thirty seconds). The relay in the annunciator circuit was replaced. A subsequent formal mechanistic root cause analysis concluded that the time delay was due to excessive contact resistance attributed to cumulative thermal offgassing from the normally energized relay coil. The offgassing fouls the contacts with a polymeric coating.

In addition to the failure mechanism, the service life of the ATTS relay was called into question. The normally energized relay had been in service for approximately 4 years longer than the vendor recommended service life of 3 years.

This type of relay is used in the normally energized mode in the Reactor Protection System, Emergency Core Cooling System, Primary Containment Isolation System relay logic, and in the Emergency Diesel Generator Fuel Oil Transfer Pump auto-start logic. All the relays in these systems have been replaced.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

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James A. FitzPatrick  
Nuclear Power Plant

YEAR

SEQUENTIAL  
NUMBERREVISION  
NUMBER

0 5 0 0 0 3 3 9 2 - 0 0 7 - 0 1 0 2 OF 0 5

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

Description:

On January 23, 1992, the plant was in cold shutdown and preparations for fuel off-load were in process. Instrumentation and control technicians were performing a routine surveillance (calibration) on the Analog Transmitter Trip System (ATTS) when they noticed an excessive time delay (approximately thirty seconds) from the time the "push-to-test" button was pressed and the time when the annunciator responded. It was originally thought that the delay was due to a sticking relay in the "card out of file" annunciator circuit. Subsequent tests and analyses including a root cause analysis indicates that the delay was due to high contact resistance in the low current annunciator circuit. The function of this circuit is to alert the operator when an ATTS master or slave trip unit (analog comparator) is not fully inserted into the circuit board connector.

The function of the ATTS system is to compare process analog variables (pressure temperature, level) and provide a bistable output when the variable deviates from a predetermined setpoint. The system implementation utilizes the analog comparator (master or slave unit) to drive RPS and Engineered Safety Feature actuation system logic circuits which result in Reactor Trip, Emergency Core Cooling initiation and Primary Containment Isolation functions.

The failed relay was replaced with a spare unit from stock (an installed spare) and was retained for technical evaluation. The failed relay was visually inspected at JAF. It was noted that the coil wrap was discolored, the coil leads were also discolored and appeared to be burned where they touched the metal frame of the relay. There was evidence of off-gassing (condensing of varnish-like material) on the plastic relay case. The cylindrical part of the coil form (bobbin) was discolored (red vs original black color), severely embrittled, cracked and broken. It was thought that the bobbin or debris from it was the cause of the relay malfunction that was originally observed. Subsequent testing proved this assumption wrong.

The failed "card out of File" relay was used in the normally energized mode which resulted in internal heat generation (6 watts) and subsequent thermal degradation of the relay components. The ATTS relays used in RPS are also normally energized (de-energized to trip).

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P&30), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  James A. FitzPatrick Nuclear Power Plant	DOCKET NUMBER (2)  0 5 0 0 0 3 3 3	LER NUMBER (8)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		9 2	0 0 7	0 1	0 3	OF	0 5

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

Industry operating experience and plant records were reviewed for reference to this failure mode. This review indicated that there is inconsistent documentation relative to the recommended service life for these relays when applied in the normally energized mode. GE environmental tests indicate that normally energized relays have a service life of 3 years while the manufacturer (Amerace) recommends 4.5 - 5 years. The manufacturer also recommends a 10 year limit on the shelf life from the time of manufacture. This shelf life criteria would also apply to relays that are normally de-energized. The subject relays had been in service since the ATTS system was installed via plant modification in 1985. The date of manufacture was 1979 per the respective date codes. Both normally energized and normally de-energized relays in the ATTS system at JAF had exceeded their service lives at the time of the Interim LER (2/25/92). All ATTS relays, including Reactor Protection System, Emergency Core Cooling Systems, Primary Containment Isolation System, and Emergency Diesel Generator Fuel Oil Transfer Pump auto start logic have since been replaced as of 7/2/92.

Because the original failure mode of the relays was believed to be a delay in the drop out time, plant surveillance procedures (response time tests) were reviewed to determine if incipient failure in critical channels (RPS, ECCS, PCIS, EDG) would have been detected. The review concluded that the surveillance tests in effect at the time of the failure would not be able to detect incipient failure. Since 1985 response time testing had been conducted beginning with the dropout of the relays. Accordingly, the measured response time did not include the response time of the sensor or the time required for the sensor output signal to be processed by other ATTS components. Plant technical specifications were also reviewed to determine if the surveillance tests were consistent with existing Technical Specifications for JAF. The review indicated the testing prescribed was in accordance with technical specifications as written at the time of the relay failure.

A review of the Nuclear Safety Evaluation and other licensing bases for the ATTS Modification confirmed the existence of a requirement to perform response time testing of the subject relays and the associated process channels. It became apparent that the technical specifications as written were not adequate or complete relative to RPS response time testing requirements. To correct this condition, comprehensive surveillance test procedures have been prepared and a Technical Specification Amendment has been submitted to and approved by the NRC providing for response time testing requirements appropriate for the entire instrument channel including ATTS system components and sensor.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

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James A. FitzPatrick  
Nuclear Power Plant

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YEAR SEQUENTIAL REVISION  
NUMBER NUMBER NUMBER

9 2 - 0 0 7 - 0 1 0 4 OF 0 5

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

Cause:

The cause of the failure (30 second delay) of the ATTS "card-out-of-file" relay is excessive contact resistance. This failure mode manifests itself when the normally open contacts (close to alarm) are called upon to operate in a low voltage, low amperage circuit similar to the annunciator configuration at JAF. The excessive contact resistance is a result of cumulative build-up of relay coil and bobbin offgas contamination and oxidation.

The Mechanistic Root Cause Analyses concludes:

1. Contact resistance increases with the age of the relay.
2. The sample of relays taken from service exhibited the highest contact resistance, and relays taken from storage had a higher resistance than those that were new.
3. The physical degradation of the coil material in the used relays is evidence of long term outgassing and thermal aging. This the primary wearout mechanism in the relays. The outgassing has caused high contact resistance above that caused by oxidation.

Analyses:

This event is reportable under the provisions of 10CFR50.73(a)(2)(v). This event is reportable because (a postulated) simultaneous failure of the subject relays to "drop out" when de-energized could inhibit a reactor scram. This event is also reportable because the JAF modification process failed to identify critical parameters and translate those requirements into the necessary response time surveillance tests and technical specification changes. This event is also reportable because the industry and vendor operating experience review program and the modification process failed to establish relay replacement intervals within the preventative maintenance program that were in accordance with vendor service life recommendations.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-430), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

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

Corrective Actions:

NYPA has taken the following actions since the event occurred:

1. 27 people have undergone training in Root Cause Analyses.
2. The Results Improvement Program and the Business Plan have been developed, and will address the programmatic issues identified by the root cause analysis
3. NYPA has conducted an initial investigation of CAT I equipment used in mild environments to ascertain the proper service life and incorporate the results of this effort into the Preventive Maintenance program.
4. Response time testing has been completely revamped for ATTS and revised technical specifications submitted to the NRC and subsequently approved. Systems other than ATTS have been evaluated regarding response time and programs upgraded accordingly.
5. All ATTS relays, as well as, all other equipment whose service life has expired have been replaced or will be before plant startup.

Additional Information:

## Failed Components:

Component:

Manufacturer:

Manufacturer NPRDS Code:

Similar Events:

Reactor Protection Sys ATTS Relays

FGPBC750

Amerace

A348

Perry - 10/10/90 Agastat-thermal aging  
of bobbinTurkey Point - 4/14/90 Agastat-thermal  
aging of bobbinGrand Gulf - 10/83 Amerace GP series  
relays - Thermal aging

## IE Information Notices:

No. 84-20 Service Life of Relays in  
Safety-Related SystemsNo. 92-04 Potter and Brumfield Model MDR  
Rotary FailuresNo. 92-27 Thermally Induced Accelerated  
Aging and Failure of ITE/Gould A.C. Relays  
used in Safety Related Applications