Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
James A. Fitzpatrick NPP
P.O. Box 110
Lycoming, NY 13093
Tel 315-349-6024 Fax 315-349-6480

Michael J. Colomb
Site Vice President - JAF

June 18, 2012
JAFP-12-0066

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: LER: 2012-001, Unit Cooler Fan Motor Contactor Low Voltage Test Failure Results in Loss of Safety Function and Condition Prohibited by the Technical Specifications
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

Dear Sir or Madam:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the Plant's Technical Specifications" and 10 CFR 50.73(a)(2)(v)(D), "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident."

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Joseph Pechacek, Licensing Manager, at (315) 349-6766.

Sincerely,

Michael J. Colomb
Site Vice President

MC/JP/jo

Enclosure(s): JAF LER 2012-001, Unit Cooler Contactor Low Voltage Test Failure Results in Loss of Safety Function and Condition Prohibited by the Technical Specifications

cc: USNRC, Region 1
USNRC, Project Directorate
USNRC Resident Inspector
INPO Records Center

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@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 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
James A. FitzPatrick Nuclear Power Plant	05000333	1 OF 7

4. TITLE

Unit Cooler Fan Motor Contactor Low Voltage Test Failure Results in Loss of Safety Function and Condition Prohibited by the Technical Specifications

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	05000
01	26	2012	2012	– 001 –	00	06	18	2012	FACILITY NAME N/A	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)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Mr. Joseph Pechacek, Licensing Manager	(315) 349-6766

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
B	ED	CL	G080	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ Yes (If yes, complete 15. *EXPECTED SUBMISSION DATE*) ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On 1/26/12, a first time low voltage pickup test was performed for 71MCC-163-OE5 (East Crescent Unit Cooler 66UC-22H Fan Motor). The contactor picked up at 102 VAC versus the 90 VAC Level 2(1) Acceptance Criteria. A calculation was performed to determine Level 1(1) Acceptance Criteria for this application. The Level 1 Acceptance Criterion was established as 97 VAC. The failure to meet the Level 1 Acceptance Criteria is a reportable condition because the Unit Cooler would not have been able to perform its support function to provide cooling to ECCS subsystems in the East Crescent Area. TRM Specification 3.7.C requires that at least 4 unit coolers in each crescent are functional in Modes 1-3 also Crescent Area Unit Cooler performance testing establishes a maximum UHS Temperature at which 4 unit coolers will maintain the Operability of the ECCS. During the period evaluated in this LER there were 1) multiple occasions when other unit coolers in the East Crescent Area were out of service concurrent with 66UC-22H being non-functional; and 2) there were no occasions where the temperature allowed by the performance testing was exceeded for a period of time greater than allowed by the TRM. Exceeding the TRM allowed out of service time requires an Operability Determination (OD) for the ECCS and RCIC systems. Failure to perform the OD is a condition prohibited by the TRM. The definition of Operability requires that support systems be functional. Since the cooling system did not meet the system performance criteria it was non-functional, therefore, the supported systems did not meet the definition of Operability. This results in a potential loss of safety function for the single train HPCI system.

NARRATIVE

BACKGROUND

In August 2005, during a Nuclear Regulatory Commission (NRC) inspection, the NRC inspection team requested verification that 600 Volts-Alternating Current (VAC) Motor Control Centers (MCC) control circuits [EIIS System Identifier: ED] provided the required minimum pickup voltage to the contactors. On August 10, 2005, JAF-CALC-05-00117 Revision 0 was issued to document the results. This calculation showed that the minimum pickup voltage of the installed General Electric (GE) contactors was at least 85% of the rated contactor voltage of 120 VAC, or 102 VAC. However, based on Stone and Webster calculation E-81, Rev. 0, "Under Voltage Study of Class 1E Equipment" and GE Topical Report NEDC 30694-P, "7700 Series Motor Control Center Qualification Report", which documented that electromechanical devices such as contactors pick up at voltages lower than published, 90 VAC was used as the low voltage pickup setpoint. The selected value provided a minimum of 5 VAC margin below the calculated worst case available voltage across the contactor coils of 95 VAC.

On December 15, 2005, as part of corrective actions, Procedure MP-056.01, Revision 56, "AC Motor Control Center Maintenance and Subcomponent Replacement" was revised to perform low voltage pickup testing of all safety related NEMA size 1, size 2, and size 3 contactors to verify contactor pickup at 90 VAC in the preventative maintenance (PM) program. This testing was scheduled to be performed as part of the James A. FitzPatrick Nuclear Power Plant (JAF) PM program for safety related MCC contactors. All safety related contactors were included as part of this population.

Between December 15, 2005, and January 26, 2012 several contactors were tested using the revised PM strategy for low voltage testing. Condition Reports were initiated documenting nine (9) failures, including the failure described in this LER, to meet the established Level 2 acceptance criterion. Except for the failure described in this LER, each of the other documented failures was classified as non-significant. The previous eight (8) failures were classified as non-significant because either the contactor pick-up: 1) met the Level 1 acceptance criterion; 2) did not occur on the contactor required for performance of the Technical Specification / safety function; 3) resulted from using incorrect M&TE; or 4) were associated with equipment that is not required to pick-up under degraded voltage conditions.

As a result of the failure identified in this LER, an extent of condition review determined that there was an additional failure that was not documented in the corrective action program at the time of failure. When that failure was identified and evaluated, it was determined that the subject contactor would have failed Level 1 criteria. If that failure had been known at the time of the evaluation of this condition, it would have constituted a history of similar failure and this LER would have been submitted at that time.

EVENT DESCRIPTION & ANALYSIS

On January 26, 2012, MP-056.01, Revision 74, was performed on 71MCC-163-OE5, 66UC-22H (M) East Crescent Area Unit Cooler Breaker [EIIS System Identifier: BI]. This was the first time the low voltage pickup test had been performed for this contactor. The PM found that the as-found pickup voltage was 102 VAC versus the required value of 90 VAC (Level 2 acceptance criterion). As part of the corrective actions, the contactor was subsequently cleaned, lubricated, and the coil replaced. Return to service testing was satisfactory and the unit cooler was returned to service. To assess the significance of the contactor failure, electrical design engineering calculated the available voltage across the contactor coil for a postulated worst case degraded grid voltage condition concurrent with a design basis, loss of coolant accident (LOCA) (Level 1

Acceptance Criterion). The preliminary calculation determined that 97 VAC would have been available at the contactor. As a result, it was determined that the contactor would not have picked up if required during a design basis LOCA concurrent with a worst case degraded voltage scenario. Therefore, the unit cooler was assumed to have been non-functional for a period of time longer than allowed by Technical Requirements Manual (TRM),Technical Requirements of Operation (TRO) 3.7.C.

Since this is the first time that the low voltage test has been performed since the requirement originated in 2005 and, there are additional cases where the Level 2 acceptance criterion was not met, it is assumed that the unit cooler was non-functional prior to the time of discovery. A recently identified failure of a similar contactor to meet Level 1 criteria prior to the identification of this failure supports this assumption. Based on the guidance in NUREG 1022 this LER will assume a period of three years prior to the time of discovery. For this reason, a review of past functionality of the East Crescent Unit Coolers was performed from January 2009 until the present. On several occasions, other unit coolers were out of service for maintenance concurrent with the assumed non-functional status of 66UC-22H.

In addition, the functionality of the unit coolers is assessed by thermal performance testing. TRO 3.7.C requires a minimum of four unit coolers in each crescent area to support the Operability of the Emergency Core Cooling Systems (ECCS) and the Reactor Core Isolation Cooling (RCIC) System. Thermal performance testing periodically establishes the maximum Ultimate Heat Sink (UHS) temperature at which four (4) functional unit coolers can support Operability of the ECCS and RCIC. The following table summarizes the maximum temperatures for the period analyzed in this LER, and the time the maximum UHS temperature was exceeded.

Year	Calculated Max Allowable Lake Temperature*	Time that Lake Temperature Was Above Max
2009	79.56 deg F	~ 7 days from 8/16 – 8/23/09
2010	79.92 deg F	~ 1.5 hours on 5/5/10
2011	80.95 deg F	Didn't exceed
2012	77.8 deg F	Haven't exceeded to date
* Assumes 4 coolers are functional		

TRO 3.7.C, Condition A allows seven (7) days to restore a train of Crescent Area Ventilation. If the 7 days is not met, the TRO requires an immediate Operability Determination (OD) be performed on the ECCS and RCIC. While the above table shows that the thermal performance criteria was not exceeded for a period that exceeded the TRO allowance, 66UC-22H was in operation and credited as being one of the four functional unit coolers for greater than 7 days. Since 66UC-22H was non-functional for greater than 7 days, ODs should have been performed for the ECCS and RCIC Systems. Failure to perform the required ODs create a condition prohibited by the Technical Specifications (TS) which is reportable under 10 CFR 50.73(a)(2)(i)(B).

The TS define OPERABILITY as follows: "A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant Instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s)."

Since the Crescent Area Cooling System is required to support OPERABILITY of the ECCS and RCIC, the failure to perform an OD for ECCS and RCIC required by TRO 3.7.C resulted in the ECCS in the East Crescent Area being INOPERABLE because the required support system did not meet its requirements for being Functional. This condition affects only the East Crescent Area; therefore, the Core Spray (CS) and Residual

Heat Removal (RHR) Systems would not experience a loss of safety function because the subsystems in the West Crescent Area would remain OPERABLE. However, the single train HPCI system would be INOPERABLE, resulting in a loss of safety function which is reportable under 10 CFR 50.73(a)(2)(v)(D).

Summary of Facts:

- The contactor coil picked up at 102 VAC versus the required 90 VAC (Level 2 acceptance criterion).
- The 90 VAC setpoint was established in December 2005 based on input from Stone and Webster Calculation E-81, Rev. 0, "Under Voltage Study of Class 1E Equipment". This is documented in JAF-CALC-05-00117.
- The 90 VAC setpoint was chosen as the Level 2 acceptance criterion for the initial low voltage pickup test based upon bounding initial calculations. Calculating the voltage required for each of the 179 contactors was not practical as it would be different for each application. Specific calculations to establish Level 1 acceptance criterion were to be performed on an as needed basis.
- For the 71MCC-163-OE5 (MC) failure, engineering calculated the available voltage across the contactor coil in the case of a postulated worst case degraded grid voltage concurrent with a design basis LOCA (Level 1 acceptance criterion). The value was calculated to be 97 VAC.
- The condition is reportable per 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(v)(D).

CAUSE OF EVENT

Mechanistic

The most probable mechanistic cause of this event is that a higher coil impedance, consisting of higher than expected resistance and inductance, resulted in lower current within the coil. This reduced current resulted in less magnetic force which required a higher voltage to pickup the contactor. This could have been caused by either a newly installed coil that would not pass the low voltage test or a coil that degraded over time. Since this is a first time PM activity, there is no historical information available to establish if the low voltage pickup test value of 102 VAC had degraded over time or if the originally installed coil would not have satisfied the low voltage acceptance criteria when it was first installed.

Programmatic

The programmatic cause of this event was inadequate program monitoring or management as evidenced by a lack of program improvement over time (i.e. failure to predict this failure based on the prior 8 failures). Even though the contactors were rated for a pickup voltage of 102 VAC, other contactors of this type had been previously tested as low as 85 VAC which supported the 90 VAC setpoint. As a result, JAF relied on the manufacturing qualification testing to meet its design.

EXTENT OF CONDITION

The extent of condition review considered all safety related NEMA 1 contactors that have not been tested at least once. This population was further broken down into two groups: (1) Crescent Area Unit Coolers, and (2) All others. The first group for the Crescent Area Unit Coolers is more safety significant because they provide cooling to Emergency Core Cooling System (ECCS) components.

Among the 10 unit coolers in East and West Crescent Areas:

- Six unit cooler contactors have been tested and this is the first failure.

- Two coolers (71MCC-153-OE4 (MC) for 66UC-22E and 71MCC-163-OE4 (MC) for 66UC-22F) are manually controlled and are continuously operating. Because these unit coolers are manually controlled the main contactor coil would be energized prior to a design basis LOCA coincident with a degraded voltage condition, so the coils would remain energized and would not have to pick up under the degraded voltage scenario.
- The remaining two contactors have not been tested for their minimum pickup voltage. However, they are scheduled for periodic PM.

FAILED COMPONENT IDENTIFICATION

Description: Main Contactor Coil
Manufacturer: General Electric Company
Model/Part Number: 15D21G22
NPRDS Manufacturer Code: G080
FitzPatrick Component ID: 71MCC-163-OE5(MC), Motor Controller

CORRECTIVE ACTIONS

Completed

- Cleaned, lubricated and reused contactor with a new coil. The low voltage test was performed satisfactorily. Complete 1/26/2012
- Performed an extent of condition review to determine which crescent area unit cooler contactors have been tested. Identified results of a failure of a contactor pick up test performed in 2010 which had not been documented in the condition reporting system.
- Performed preliminary calculations to determine the voltage available at the remaining unit cooler contactors.
- The aforementioned preliminary calculation required the other unit cooler contactors below to be tested before the lake reached summer temperatures:
    - 71MCC-163-OE2 (MC) for 66UC-22B
    - 71MCC-153-OE3 (MC) for 66UC-22C

Future Actions

- Perform the low voltage test yearly for three consecutive performances on 71MCC-163-OE5(MC).
- Review each remaining contactor that has not been tested to determine if its safety function will require an immediate performance of this first time low voltage pick up test. Due 08/15/2012.

ASSESSMENT OF SAFETY CONSEQUENCES

The significance of this condition is based on the safety function performed by 71MCC-163-OE5 (MC). This contactor supplies power to safety related 66UC-22H(M), East Crescent Area Unit Cooler Fan Motor. The unit coolers provide cooling to various safety related ECCS and RCIC systems in the East and West Crescent Area.

Radiological & Industrial Safety

There were no actual or potential radiological or industrial safety consequences as a result of this condition.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV N0.	
James A. FitzPatrick Nuclear Power Plant	05000333	2012 –	001	– 00	6 OF 7

Nuclear Safety

There were no actual nuclear safety consequences associated with this condition. At no time during previous three (3) years was the coil for 66UC-22H(M) required to pick up under degraded voltage conditions. As discussed above, it has been determined that during the past three years the thermal performance criteria was not exceeded for a period greater than allowed by TRO 3.7.C.

The potential nuclear safety consequences are described as follows: if the115KV offsite voltage remains just above its degraded voltage setpoint with accident loads, the resultant voltage drop in the circuit could have resulted in the inability of the 66UC-22H(M), East Crescent Area Unit Cooler fan to automatically start during an accident concurrent with a worst case degraded voltage. This would have resulted in one known Crescent Area Unit Cooler failure. With one unit cooler out of service, the ability to ensure cooling to the ECCS pumps is reduced. This condition could have had a safety impact based on the potential impact on the OPERABILITY of the ECCS in the East Crescent Area. However, the maximum lake temperature to maintain ECCS Operability in the East Crescent Area is 77.8°F with one unavailable unit cooler, according to Step 8.23.1 of ST-8Q, Testing of the Emergency Service Water System (IST). At the time of discovery, there would not have been a challenge to nuclear safety since the lake temperature was below 77.8°F (winter months). Finally, there were no instances where the offsite voltage was below the degraded voltage setpoint when the maximum UHS temperature was exceeded. Therefore, the four unit coolers were sufficient to support the Operability of the ECCS and RCIC systems.

SIMILAR EVENTS

A review of Entergy conditions reports did not identify any relevant information across the Entergy fleet.

A review of Operating Experience on the INPO website, however, identified several related issues. One plant reported loose coil retaining clips. The loose clips could cause a voltage drop across the coil terminal connections. During interviews with JAF electricians there was no report of loose coil retaining clips, which supported the cause determination for this condition. In addition, several plants documented sticking auxiliary contacts and sticking grease. This condition was also not reported during interviews with JAF electricians.

NRC INFORMATION NOTICE 94-50, “FAILURE OF GENERAL ELECTRIC CONTACTORS TO PULL IN AT THE REQUIRED VOLTAGE”, documented an instance at Nine Mile Point Unit 2 where the incorrect coil was installed in certain contactors. This resulted in pickup voltages of 96 VAC. GE stated that special coils should have been installed which would have allowed a lower pickup voltage and that an incorrect or degraded coil would be identified by testing prior to installation. This OE is not applicable at JAF because the correct coils were installed.

REFERENCES

- JAF Condition Reports: CR-JAF-2005-03427, CR-JAF-2006-01333, CR-JAF-2006-04202, CR-JAF-2006-05358, CR-JAF-2007-02313, CR-JAF-2008-00922, CR-JAF-2008-03340, CR-JAF-2009-02853, CR-JAF-2011-04593, CR-JAF-2012-00584, CR-JAF-2012-2288, CR-JAF-2008-03338
- JAF-CALC-05-00117, Perform 600 Volt MCC Control Circuit Voltage Drop Calculation To Verify The Minimum Pickup Voltage For Selected Contactor Circuits
- Technical Requirements Manual TRO 3.7.C, Crescent Area Ventilation System
- Technical Specification 3.5.1, ECCS – Operating
- Technical Specification 3.5.3, RCIC System
- MP-056.01 AC Motor Control Center Maintenance and Subcomponent Replacement
- GE Topical Report NEDC-30694-P, 7700 Series Motor Control Center Qualification Report for the James FitzPatrick Nuclear Power Plant
- AP 19.01, Surveillance Testing Program

Endnotes

(1) Definitions – Source: AP 19.01, Surveillance Testing Program

Level 1 Acceptance Criteria:
The measure that defines characteristics of a system or component that, if not met, result in a violation of TS, TRM, ODCM or plant safety design bases as stated in the UFSAR or Procedure EN-DC-167.

Level 2 Acceptance Criteria:
The measure that defines performance expectations of a system or component not addressed in Level 1 Acceptance Criteria. A failure to meet Level 2 criteria may be a precursor to Level 1 failure but should not result in components or systems being inoperative (JTS-94-0378).