RJ

From: Neil Sheehan
To: David Pelton
Date: 9/13/04 12:23PM
Subject: Fwd: AP questions on VY LER

Dave,

Rick suggested I run these by you. Can you help?

Thanks,
Neil

CC: Beth Sienel

C-88

RJ

From: Neil Sheehan
To: Rick Ennis
Date: 9/13/04 11:59AM
Subject: AP questions on VY LER

Rick,

The AP reporter for Vermont, Dave Gram, has now picked up on the LER filed by VY on 8/16 regarding the 6/18 transformer fire. He has a few questions about the report:
* Was the INPO report cited on Page 4 ("Significant Operating Experience Report (SOER) 90-01 for 'Ground Faults on AC Electrical Distribution' ") issued in 1990? It's obvious why he's asking that. If it was issued that long ago, isn't that a greater indictment of the plant's adherence with industry operating experience than if it was just issued, say, six months ago?
* Does the NRC have any general commentary on the report's conclusions? If not now, when might we?
* This is not in the report, but someone (maybe Ray Shadis) told the reporter that wind speed in the ductwork increased after a new transformer (as part of the uprate modifications) was installed and that, in turn, increased the likelihood of failure of the expansion joint. Is that true?

I owe him answers to these this afternoon.

Thanks,
Neil

CC: Cliff Anderson

Mail Envelope Properties (4145C99A.758 : 9 : 35118)

Subject:	Fwd: AP questions on VY LER
Creation Date:	9/13/04 12:23PM
From:	Neil Sheehan
Created By:	NAS@nrc.gov

Recipients
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BEK CC (Beth Sienel)
DLP1 (David Pelton)

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Options

Expiration Date:	None
Priority:	Standard
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Return Notification:	None
Concealed Subject:	No
Security:	Standard

Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
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Brattleboro, VT 05302
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August 16, 2004
BVY 04-080

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

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Reportable Occurrence No. LER 2004-003-00

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence LER 2004-003-00. No Regulatory Commitments have been generated as a result of this event.

Sincerely,

Entergy Nuclear Operations, Inc.
Vermont Yankee

Kevin Bronson
General Manager

cc: USNRC Region I Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS
Vermont Department of Public Service

IE22

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 bis1@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 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
VERMONT YANKEE NUCLEAR POWER STATION (VY)	05000271	1 of 4

4. TITLE
Automatic Reactor Scram due to a Main Generator Trip as a result of an Iso-Phase Bus Duct Two-Phase Electrical Fault

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
									N/A	05000 -
06	18	2004	2004	- 003	- 00	08	16	2004	FACILITY NAME N/A	DOCKET NUMBER 05000 -

9. OPERATING MODE	N	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
10. POWER LEVEL	100	☐ 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)	☐ 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)
Kevin Bronson, General Manager	(802) 257-7711

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	EL	FCON	P295	Yes	E	EL	IPBU	P295	Yes
E	EL	BDUC	P295	Yes	E	EL	LAR	G066	Yes

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐	YES (If yes, complete EXPECTED SUBMISSION DATE)	☒ NO		N/A	N/A	N/A

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

On 06/18/04 at 0640, with the plant at full power, a turbine load reject scram occurred due to a two phase electrical fault to ground on the 22 kV iso-phase bus. All safety systems responded as designed and the reactor was shutdown without incident. Offsite power sources and station emergency power sources were available throughout the event. Arcing and heat generated during the fault damaged an area around the iso-phase bus ducts and Main Transformer low voltage bushings. The electrical faults disrupted an oil line flange between the Main Transformer oil conservator (expansion tank) and the "C" phase low voltage bushing box, and the leaking oil ignited. Fire suppression systems activated automatically. An Unusual Event was declared at 0650 for a fire lasting greater than 10 minutes. The VY fire brigade and local community fire departments extinguished the oil fire at 0717. At 1245, the Unusual Event was terminated. The electrical grounds that initiated the event were caused by loose material in the "B" iso-phase bus duct as a result of the failure of a flexible connector. The grounds raised the voltage on the "A" iso-phase bus contributing to the failure of the "A" phase surge arrester. The root causes of the event were determined to be inadequate preventative maintenance on portions of the iso-phase bus and failure to monitor age related degradation on the surge arresters. There was no release of radioactivity or personnel injury during this event.

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

DESCRIPTION:

On 06/18/04 at 0640, with the plant operating at full power, a two-phase electrical fault-to-ground occurred on the 22kV System (EIIS=IPBU, BDUC). The "B" phase faulted to ground in the low voltage bushing box on top of the Main Transformer (EIIS=XFMR), and the "A" phase faulted to ground in the surge arrester cubicle of the Generator Potential Transformer (PT) Cabinet through the "A" phase surge arrester (EIIS=LAR).

Within less than one cycle (11 milliseconds) of the initial electrical fault, the Main Generator protective relaying sensed the condition and isolated the generator from the grid within the following 5 cycles (80 milliseconds). A generator load rejection reactor scram then occurred. Approximately 400 milliseconds following the initial electrical faults to ground from "A" and "B" phases, arcing and ionization in the "B" phase low voltage bushing box carried over to the "C" phase low voltage bushing box on top of the Main Transformer. The electrical faults disrupted a flange in the oil piping between the Main Transformer oil conservator (expansion tank) and the "C" phase low voltage bushing box. The arcing or heat from the fault ignited the oil, resulting in a fire. Fire suppression systems activated automatically as expected.

The plant response following the scram was as expected, with the exception that both Recirculation pumps tripped and other AC voltage effects were observed as a result of the voltage transient associated with the high fault current. All safety systems functioned as designed and the reactor was shutdown without incident. There was no release of radioactivity and no personnel injuries.

The VY fire brigade was dispatched at 0641. An Unusual Event was declared at 0650 due to "Any unplanned on-site or in-plant fire not extinguished within 10 minutes". The VY fire brigade initiated fire hose spray from a nearby hydrant and quenched the fire. Local fire departments began arriving at 0705. The fire was completely extinguished at approximately 0717and re-flash watches were established. Offsite power sources and station emergency power sources were available at all times throughout the event.

The States of Vermont, New Hampshire and Massachusetts were provided with initial notification of the event at 0721. The NRC Operations Center was notified of the event at 0748, recorded as NRC Event Number 40827. In addition to the declaration of the emergency classification, a 4-Hour NRC Non-Emergency Notification was completed due to an RPS actuation with the reactor critical, pursuant to 10 CFR 50.72(b)(2)(iv)(B). At 1245, the Unusual Event was terminated.

The isophase bus flexible connector that failed (expansion joints) was part of the original bus supplied and designed by H.K. Porter, Drawing Numbers G-191144 & G-191146. All flexible connectors were replaced with an upgraded design supplied by Delta-Unibus. The surge suppressors were GE Alugard Station Arrestors, Model Number 9L11LAB, installed as original plant equipment. All of the surge suppressors were replaced.

CAUSES:

The electrical grounds that initiated the event were caused by loose material in the "B" iso-phase bus duct as a result of the failure of a flexible connector (EIIS=FCON) that allows the iso-phase bus to thermally expand and contract. The grounds raised the voltage on the "A" iso-phase bus, contributing to the failure of the "A" phase surge arrester. The root causes of the event were determined to be inadequate preventative maintenance for cleaning and inspections during outages and failure to monitor age related degradation.

Although the iso-phase bus is subjected to preventative maintenance cleaning and Doble Testing each refueling outage, the cleaning and inspection is limited to the stand-off insulators. Additional inspections to evaluate the condition of the bus (including its flexible connectors) would have detected the degraded flexible connectors or the presence of loose/foreign material with the potential to ground the bus. The need for

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

Inspecting the flexible connectors was identified during a recent review of industry operating experience (OE). This OE is being included as recommended preventative maintenance for future outages; however, it was not included in the preventative maintenance inspection performed during RFO-24.

The "A" surge arrester failure was the result of the combination of a ground occurring on the "B" iso-phase bus that caused an increase in voltage on the "A" iso-phase bus and not performing preventative maintenance necessary to monitor age related degradation of the "A" surge arrester. Industry experience has revealed that surge arrestors degrade over time due to a combination of age, service environment and service conditions. Periodic inspection/testing could have detected degradation and allowed replacement prior to failure.

A contributing cause to both of the conditions previously described was identified by the investigation team as a failure to effectively use industry OE to prevent similar events from occurring at VY. Specifically, it was noted that; the actions taken by VY in response to recommendations provided within the INPO Significant Operating Experience Report (SOER) 90-01 for "Ground Faults on AC Electrical Distribution" were inadequate. In addition to the SOER, guidance provided within EPRI's "Isolated Phase Bus Maintenance Guide" TR-112784 (1999) for the 22 kV flexible connectors and periodic inspections/testing was not utilized.

ASSESSMENT OF SAFETY CONSEQUENCES:

All safety systems and fire suppression systems responded as designed. The reactor was shutdown without incident. Offsite power sources and station emergency power sources were available at all times throughout the event. Emergency reponse personnel acted promptly to prevent the fire from significantly damaging or breeching the adjacent turbine building. There was no release of radioactivity or personnel injury during this event. Therefore, this event did not significantly increase the risk to the health and safety of the public.

CORRECTIVE ACTIONS:

Immediate:

1. An Unusual Event was declared at 0650.
2. The station fire brigade on scene to combat the fire at 0652. Local fire departments arrived on-site at 0705 to provide assistance. The fire was extiguished at 0717.
3. Completed the initial notification to the States of Vermont, New Hampshire and Massachusetts at 0721.
4. Notifed the NRC Operations Center of the Unusual Event at 0748.
5. Secured all affected site and plant areas for personnel safety and isolated affected equipment as necessary to maintain investigation integrity.
6. Condition Reports were generated for this event and potentially associated issues as appropriate for entry into the Corrective Actions Program.
7. A Root Cause Investigation team was established to assess damage and to secure the area.
8. Initial testing was completed on the main transformer, station auxiliary transformer, and main generator with no indication of damage that would affect the operation of the transformers or generator.
9. A Preliminary Nuclear Network Entry was completed to inform the industry of the initial findings and conditions of the event.

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

Prior to Plant Start Up:

1. The phase A, B, and C 22 kV surge arresters and capacitors were replaced prior to energizing the 22kV bus.
2. The phase A, B, and C 22 kV flexible connectors were replaced with an upgraded design supplied by Delta-Unibus prior to energizing the 22kV bus.
3. A cleanliness inspection was performed and documented as part of Iso-Phase Bus Duct Modification.
4. Maintenance department personnel inspected the cooler and leads fans for foreign material. Following operation of the fans, an additional inspection of the fans and coolers was performed.
5. Operator Alarm response sheets were revised to enhance operator actions in the event of future ground faults.
6. A preventative maintenance schedule was established for increased sampling of transformer oil for the main, auxiliary, and two startup transformers for four weeks after start-up.
7. The isophase bus duct system was monitored after assembly with the fans running to ensure that vibration levels are acceptable.
8. VY discussed this event and associated issues with the Entergy Fleet and industry experts as necessary to gather information pertinent to the root cause investigation and equipment recovery.

Long Term:

1. Include the 22kV surge arresters and capacitors in the preventative maintenance program and define periodic testing requirements.
2. Revise the 22kV isophase bus preventative maintenance program and periodic inspection requirements as necessary to improve performance and to prevent recurrence of this event.
3. Complete the testing of selected components involved in the event to validate the initial conclusions of the root cause investigation team, and revise the root cause analysis report if needed.

ADDITIONAL INFORMATION:

No similar events with a related cause have occurred at Vermont Yankee.