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Nuclear Management Company, LLC
Point Beach Nuclear Plant
6610 Nuclear Road
Two Rivers, WI 54241

NPL 2000-0020

January 18, 2001

Document Control Desk
U.S. NUCLEAR REGULATORY COMMISSION
Mail Station P1-137
Washington, D.C. 20555

10 CFR 50.73

Ladies/Gentlemen:

DOCKET NO. 50-301
LICENSEE EVENT REPORT 301/2000-007-00
FAULT ASSOCIATED WITH "C" PHASE MAIN STEP-UP
TRANSFORMER RESULTS IN REACTOR SCRAM
POINT BEACH NUCLEAR PLANT UNIT 2

Enclosed is Licensee Event Report 301/2000-007-00 for the Point Beach Nuclear Plant Unit 2. This report is provided in accordance with 10 CFR 50.73(a)(2)(iv) as, "any event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)". This report documents an automatic reactor shutdown that occurred as a result of a turbine generator trip. The initial indication for the turbine generator trip was the detection of an apparent phase current imbalance by the protective relaying. Subsequent investigation identified the cause of the turbine generator trip was an open circuit in the "C" phase input to the neutral overcurrent relay.

Immediate corrective actions have been completed and are listed in this report. An additional corrective action commitment is identified by italics in this report.

Please contact us if you require additional information concerning this event.

Sincerely,

A. J. Cayia
Plant Manager

Enclosure

CWK/tja

cc: NRC Resident Inspector
PSCW
NRC Regional Administrator
INPO Support Services
NRC Project Manager

IE22

NRC FORM 366 (4-95)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Point Beach Nuclear Plant, Unit 2	05000301	1 of 4

TITLE (4)

Fault Associated with "C" Phase Main Step-up Transformer Results in Reactor Scram

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
										05000
12	20	2000	2000	- 007 -	00	01	18	2001	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	63%		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)		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)	X	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)
Charles Wm. Krause, Senior Regulatory Compliance Engineer	(920) 755-6809

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 December 20, 2000, the Point Beach Nuclear Plant (PBNP) Unit 2 experienced a turbine generator and reactor trip while raising power following completion of the unit's refueling outage. The trip occurred with reactor power at approximately 63% power. The cause of the trip was initially identified as a ground overcurrent relay actuation on the main step up transformer. Subsequent investigation determined the trip was due to the 2-51N neutral overcurrent relay detecting a phase current imbalance; however, no evidence of an actual overcurrent condition was identified. Further investigation determined that the trip resulted from the opening of the current transformer circuit for the "C" phase input to the 2-51N relay. The open circuit occurred due to the failure of a manufacturer's crimp connection. The circuit was repaired and the connections in the current transformer for the other phases were checked and found to be satisfactory. The unit was returned to service on December 21st.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Point Beach Nuclear Plant, Unit 2	05000301	2000	- 007	- 00	2 OF 4

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

Event Description:

On December 20, 2000, at approximately 0417 (all times are CST) Point Beach Nuclear Plant (PBNP) Unit 2 experienced a turbine generator [TG] trip while raising power following completion of the unit's refueling outage. The generator trip occurred with reactor power at approximately 63% power, and therefore also resulted in a reactor [RCT] trip. The apparent cause of the turbine trip was initially identified as a ground overcurrent relay [61] actuation on the main step up transformer [XFMR], 2X01. Subsequent investigation determined the turbine generator trip to be due to the 2-51N neutral overcurrent relay detecting a phase current imbalance. The trip circuit trip value is set at 2.0 Amps. The ratio of the current transformer (CT) [XCT] supplying this signal is 240:1, indicating that an imbalance of some 480 Amps had occurred. However, system monitoring detected no such anomaly. Additional recorders [IR] installed in the switchyard monitoring phase currents also detected no problems.

The plant operating staff responded to the reactor trip by entering the appropriate Emergency Operating Procedure, EOP 0, "Reactor Trip or Safety Injection," followed by EOP 0.1, "Reactor Trip Response." The plant was stabilized at normal hot shutdown temperature and pressure. With the exception of those items discussed in the following, plant systems and components responded as anticipated. Following the shutdown, the intermediate range nuclear instrumentation [IG] start up rate meter was observed to be fluctuating prior to energizing the source range. The pressurizer [PZR] level "white" channel tracked approximately 2% lower than the other two channels. These instrument channels were calibrated and returned to service. The RCS [AB] cool down was greater than expected (lowest temperature observed was 528 degrees F). The cool down was controlled by shutting the moisture separator reheater [MSR] purge valves [ISV]. Concerns with the post trip RCS cooldowns have been identified previously and are being addressed in the licensee's corrective action program (CR 00-3751).

Following the post trip review and extensive trouble shooting and investigation into the conditions which led to the unit trip (see Cause discussion) permission was granted for a reactor restart at 0002 on December 21, 2000. The reactor was critical at 1219. The generator output breaker was closed at 2225 on December 21st and the unit returned to service.

This event was documented in the licensee's corrective action program (CR 00-4185) and a team apparent cause evaluation (RCE 00-117) initiated. In accordance with the requirements of 10 CFR 50.72(b)(2)(i), a four hour notification was made via the ENS at 0531 (Event Number 37621) for this inadvertent and unplanned RPS [JD] actuation.

Cause:

The post trip trouble shooting and investigation revealed that that the cause of the generator trip was the opening of the CT circuit for the "C" phase input to the 2-51N relay. The "C" phase main step up transformer had been replaced in November 1986. The open circuit occurred due to the failure of a crimp connection performed by the manufacturer prior to placing the transformer in service. The crimp connection in question, while not previously examined specifically for crimping problems, was observed by an experienced electrician, supervisor, and system engineer on November 15, 2000, during the process of correcting oil leaks from the gland seal immediately adjacent to the crimp connection. No signs of deterioration (e.g. discoloration of insulation due to excessive heat) were observed at that time. Since it is virtually impossible to determine the nature of the manufacturing conditions at that time, (which occurred more than 14 years ago) the precise root cause for the circuit failure cannot

be determined. However, our analysis of the remains of the crimped connector indicate the failure was probably due to an improperly crimped joint.

Corrective Actions:

An incident investigation and post trip review were conducted in accordance with procedure NP 5.3.3.

The open connection was repaired and a meter installed in the CT circuit to monitor neutral current during the subsequent return to operation and power escalation. No abnormalities were observed.

During the initial investigation a suspected loose lead was identified in the "B" phase upper CT connection box. The "A" and "B" phase CT circuits were initially checked out electrically and found to be satisfactory. Subsequently the connections in both the "A" and "B" phase upper CT connection boxes were mechanically checked. The suspected loose wire in the "B" phase was found to be a loose post and did not affect the electrical connection itself. The loose post in "B" along with loose posts in the "A" phase box were tightened.

An oil sample was taken from the "C" phase transformer and sent off site for analysis. The results of the analysis demonstrated no internal transformer fault or failures had occurred. The transformer and the switchyard were visually inspected with no evidence of damage observed. The System Control fault recorders were checked for any sign of a problem with the transformer. None were indicated. All indications supported the conclusion that no actual fault had occurred on the transformer.

The calibration of the 2-51N relay was checked. The as found calibration data was within the component specifications.

The PBNP Unit 1 X01 "A" phase transformer was manufactured by the same vendor and was installed in 1988. Records indicate that this transformer was manufactured at the same vendor facility. The CT crimp connections in that transformer will be closely examined during the next Unit 1 outage.

Component and System Description:

The 19KV AC Electrical Distribution System [EA] distributes the energy developed by the Pont Beach Nuclear Plant (PBNP) main generator (2-TG01) to the main transformer (2-X01) and the unit auxiliary transformer (2-X02). Each unit at PBNP is equipped with one Westinghouse hydrogen inner-cooled turbine generator. The generator produces and delivers 19 KV, 3 phase, 60 Hz. electric power to the main transformer. Each generator is rated at 582 MVA at a power factor of 0.9. The rotor (field), rotating through the 4-pole per phase armature at 1800 RPM, produces a 60 Hz alternating current. The main transformers provide the means to step up the output voltage of the main generator from 19KV to the 345KV, for use in the electrical power transmission system. The unit auxiliary transformers provide power to PBNP auxiliaries stepped down to 4160 V during normal plant operations. The 19KV system does not perform any safety related function and is classified as non-safety related.

During normal operation each generator delivers power to the main and auxiliary transformers through isolated phase buses [IPBU]. The isolated phase bus is a force-

cooled metal clad bus which connects the output of the main generator to the main transformer.

The main transformer consists of a bank of three separate transformers, one for each phase. Each transformer is a Class FOA, outdoor, shell form power transformer. The FOA class is cooled by forced oil which in turn is cooled by forced air. The main transformers are located outside and adjacent to their respective turbine buildings. The bulk of the power required for station auxiliaries during normal operation of either unit is supplied by an auxiliary transformer connected to the isolated phase bus of that unit. The auxiliary transformers are also located outside, in close proximity to their respective main transformers.

The primary protective relaying for the X01 transformer is provided by the transformer lockout relays. The X01 lockout relays will isolate the main transformer in the event of fault or failure of the 19KV (or connected 345KV) system. FSAR Table 8.3-1 lists the X01 lockout relay inputs. These include reverse power, over excitation, negative sequence, over current and ground overcurrent protective relaying.

Safety Assessment:

The plant response during and following this inadvertent RPS actuation was as expected. With the exception of the circuit failure which precipitated this event, and those minor instrumentation concerns identified in the event description, plant systems and components involved performed as designed. Following the circuit repairs, no further problems were experienced during the subsequent unit restart and return to full power operations. The safety and welfare of the public and the plant staff was not affected by this event. Other than the inadvertent challenge of the reactor protection system and other plant equipment necessary to remove shutdown decay heat and maintain the plant in a stable configuration, the safety significance of this event was negligible. There was at no time a loss of system, structure, or component related safety function; therefore, this event did not involve a safety system functional failure.

Similar Occurrences:

A review of recent LERs (past three years) identified the following similar event involving inadvertent ESF or RPS actuation:

LER Number	Title
301/2000-006-00	Failed Fuse in Intermediate Range Nuclear Detector Results in Reactor Scram
301/2000-005-00	Unplanned ESF Actuation During Calibration and Testing of Safeguards Bus Relays
301/2000-004-00	Unplanned ESF Actuation During Safeguards Bus Restoration
266/98-024-00	Inadvertent Emergency Diesel Generator Start
266/98-014-00	ESF Actuation Automatic Start Of A Service Water Pump
266/98-006-00	Unanticipated Partial Service Water System Isolation During A Special Test
266/98-002-00	Failure Of The High Voltage Station Auxiliary Transformer