NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

# LICENSEE EVENT REPORT (LER)

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

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| Indian Point 3 | 05000286 | 1 OF 15 |

TITLE (4) 480 Volt Bus Inoperable Due to a Failure of the 32 Residual Heat Removal Pump Circuit Breaker to Open; A Condition Prohibited by Technical Specifications

| 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 |
| 12 | 18 | 97 | 97 | - 032 - | 02 | 05 | 28 | 98 | | 05000 |
| | | | | | | | | | FACILITY NAME | DOCKET NUMBER 05000 |

| OPERATING MODE (9) | N |
|---|---|
| POWER LEVEL (10) | 100 |

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

| | | | | | |
|---|---|---|---|---|---|
| | 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) | ✓ | OTHER |
| | 20.405(a)(1)(iii) | ✓ | 50.73(a)(2)(i) | | 50.73(a)(2)(viii)(A) | | (Specify in Abstract below and in Text, NRC Form 366A) |
| | 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 (Include Area Code) |
|---|---|
| Angelo Vai, Design Analysis, Electrical Engineering Supervisor | (914) 788-2647 |

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 |
|---|---|---|---|---|---|---|---|---|---|---|
| X | ED | BKR | W120 | Yes | | | | | | |
| | | | | | | | | | | |

| 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 18, 1997, with reactor power at 100 percent, a plant shutdown was initiated in accordance with the Technical Specifications (TS). Following a surveillance test, the breaker used to power the 32 Residual Heat Removal (RHR) pump could not be opened. Operations concluded that the breaker was not capable of opening and shedding the 32 RHR pump from its associated safety bus following a safety injection or undervoltage signal, therefore, the safety bus could be rendered inoperable. Because the TS do not provide an allowed outage time for an inoperable safety bus, the plant was brought to hot shutdown. On December 22, during testing of additional breakers, another breaker was determined to be potentially degraded. Engineering determined that other breakers could be subject to failure and result in overload of the three emergency diesel generators (EDG). Operations declared the three EDGs inoperable and brought the plant to cold shutdown. The cause of the breaker failure was lack of lubrication at key pivot connections in the breaker mechanism. The missing lubrication was due to a lack of knowledge by the breaker overhaul vendor. A contributing cause was a unique combination of wear, tolerances and adjustments of breaker parts that permitted linkages within the breaker to overtravel to a position where small changes in frictional forces affected the breaker trip capability. Corrective actions include; breaker replacement, testing of like breakers, equipment failure evaluation, development of a process to test/inspect overhauled breakers, and expedite the PM for the vendor overhauled breakers. This report is also a 10 CFR Part 21 notification. There was no effect on public health and safety.

Note: The Energy Industry Identification System Codes are identified within the brackets { }

## DESCRIPTION OF EVENT

On December 18, 1997, at approximately 1050 hours, with reactor power at 100 percent, operators attempted to secure the 32 Residual Heat Removal (RHR) {BP} pump {P} from the control room after completing a monthly functional test. The electrical circuit breaker {BKR} used to power the pump (52/RHR2) from 480 volt AC {ED} bus 6A {BU} would not open. Operators attempted to secure the pump locally from the 480 volt AC switchgear room without success. Operations concluded the breaker was not capable of opening and shedding the 32 RHR pump from its associated safety bus following a safety injection or loss of offsite power signal. Without knowing the cause of the breaker problem, Operations concluded the RHR pump and its safety bus could be rendered inoperable. The 32 RHR pump and 480 volt bus 6A were declared inoperable at approximately 1050 hours. The Technical Specifications (TS) do not provide an allowed outage time (AOT) for an inoperable safety bus, therefore TS 3.0 was entered. At approximately 1145 hours, Operations initiated a plant shutdown in accordance with the TS. Emergency Diesel Generator (EDG) {EK} 32, which supplies emergency power to bus 6A, was declared inoperable at approximately 1308 hours, and its control switch taken to trip pull out. At approximately 1233 hours, Operations provided a one-hour non-emergency notification to the NRC reporting a TS required shutdown (See ENS Report No. 33425). At approximately 1324 hours, the 32 RHR pump breaker opened without operator assistance. Operations declared bus 6A operable at approximately 1344 hours. In accordance with normal plant operating procedures the turbine was manually tripped at approximately 1352 hours, the reactor was shut down and the hot shutdown condition was achieved at approximately 1428 hours. The 32 EDG was declared operable at 1540 hours. Although declared inoperable, bus 6A remained energized during this time period.

During the shutdown all control rods {AA} fully inserted and no engineered safety feature actuated as a result of the event. Primary systems functioned properly, except during plant shutdown, at approximately 1230 hours, control rod (CR) {AA} F-2 in control bank "D" dropped to zero steps at approximately 70 percent reactor power. Operators observed a flux tilt of greater than the TS limit of 1.09 from the Nuclear Instrumentation System (NIS) {IG} power range high flux detectors {DET} and control room alarms {ALM}, "NIS Power Range Dropped Rod - Rod Stop," and "Rod Bottom - Rod Stop." Operations entered the appropriate procedures for a dropped rod.

Also, at 1230 hours, a turbine runback occurred from approximately 70 percent to approximately 61 percent reactor power. The FSAR section for a dropped rod (14.1.4) states that a turbine runback is prevented below 70 percent reactor power. Engineering recorded the CR drop and runback event in deviation event reports (DER 97-2876 and 97-2885) and initiated an investigation.

Operators recorded the failed breaker event in DER 97-2872, commenced a post trip/transient evaluation (Report No.97-6), and initiated equipment failure evaluations (EFE) and investigations of the event. Maintenance removed the failed breaker from its cubicle in 480 volt Switchgear bus 6A and replaced it with a spare breaker. After testing the replacement breaker, the 32 RHR pump was declared operable and its Limiting Condition for Operation (LCO) action statement exited on December 18, at 2229 hours. The failed breaker was visually inspected, tested and evaluated by an inspection team, which included plant and vendor personnel, to determine the cause of the failure.

Instrumentation and Control (I&C) personnel performed troubleshooting of the dropped CR and verified electrical circuit integrity from the CR power cabinet to the CR coil stacks. A failed movable gripper coil blocking diode CR1 (A26 Assembly) was discovered in CR power cabinet 1BD. Further troubleshooting discovered a total of 12 additional failed diodes in other movable gripper assemblies. I&C postulated, with assistance from Westinghouse, that the failure of the 12 diodes was caused by parallel voltage traps which were not functional. I&C further postulates that the diode associated with control rod F-2 was an intermittent failure which may have caused an interruption in the current flow to the movable gripper assembly. Westinghouse also postulated that the dropped rod may have been the result of a particle interfering with the required movement of the movable gripper assembly.

Engineering's investigation of the turbine runback concluded that the setpoint on the pressure switches {PS} associated with the load limit valves (LLV1 and LLV2) of the turbine control oil system {TG} for runback termination were set too low.

The faulty breaker for the 32 RHR pump (52/RHR2) is a 480 volt AC safety related electrical circuit breaker, model DS-416, manufactured by Westinghouse {120} (NYPA ID No. A1033). Westinghouse divested itself of new breaker manufacturing which was procured by Cutler-Hammer Inc. (C770). Westinghouse continues to refurbish breakers. The firm that overhauled breaker A1033 was Power Distribution Technologies (PDT). PDT was a subsidiary of Framatome (F185) but is no longer in business.

The initial investigation of the faulty breaker did not yield a specific cause, but possible causal factors. To address the possibility that the condition may be present in other similar breakers, Engineering developed a sampling plan and a test procedure to determine if there was an extent of condition. The test procedure required cycling the breakers open and close, with and without the breaker's pole shaft reset spring installed. Testing a breaker without its pole shaft reset spring, which provides additional forces to open the breaker, is not a normal configuration for a DS-416 breaker. Engineering concluded that testing without the breaker pole shaft reset spring provided an indication of the additional margin of assurance that the breaker would open when a trip signal was initiated. The pole shaft reset spring is part of the breaker design configuration, but removal for testing was based on a suggestion by an employee of the breaker manufacturer, based on a Westinghouse Technical Bulletin for a different type breaker.

On December 20, Engineering initiated testing of breakers in accordance with the sample plan to determine if they were functioning properly. On December 23, 1997, Operations was notified that a DS-416 breaker (A1042) did not trip with its pole shaft reset spring removed. The breaker (A1042) normally powers the 33 pressurizer backup heater {AB}(52/PBU3). Engineering could not, at that time, provide a reasonable expectation of operability for other DS-416, 480 volt AC safety related electrical circuit breakers used to power plant safety equipment. Without test results for the remaining 480 volt DS-416 breakers, Operations concluded there were an unknown number of breakers that may have been in a degraded condition. The plant design requires that plant loads be shed and then sequenced onto their assigned 480 volt AC safety buses for proper Emergency Diesel Generator (EDG) operation. Without assurance of proper breaker operation, on December 23, at approximately 0300 hours, Operations conservatively declared the three EDGs inoperable and initiated plant cooldown to the cold shutdown condition. Cold shutdown was achieved on December 24, 1997, at approximately 0240 hours.

As a result of finding the 33 pressurizer backup heater breaker (A1042) potentially degraded, Engineering developed a revised sampling plan that included additional breaker testing and measurements of breaker components. Testing and evaluation of the failed breaker (A1033) revealed that it would not repeat its failure in its design configuration (pole shaft reset spring installed). With the breaker's pole shaft reset spring removed, the failed breaker (A1033) would repeatedly fail to trip. Testing of the expanded sample breaker population showed that the remaining DS-416 breakers in the test sample satisfactorily tripped in their design configuration.

Four breakers were identified as potentially degraded when tested with their pole shaft reset spring removed and they were replaced. On December 26, Engineering performed an operability determination (OD) which concluded the breakers were operable. Operations declared the EDGs operable and exited the LCO on December 26, at approximately 1925 hours.

The testing that was performed for the extent of condition failure evaluation provided assurance that the remainder of the installed DS-416 breakers would operate as designed in their normal configuration (pole shaft reset spring installed). There are 60 DS-416 breakers installed in safety related applications. Post event review of Authority documentation determined that 17 of the installed breakers were overhauled by PDT. As a result of the event and extent of condition testing, two breakers (A1033, A1042) were removed. Breakers other than A1033 and A1042 that were overhauled by PDT were suspected of not having the proper lubrication. Consequently, those remaining breakers whose documentation indicated an overhaul by PDT were tested with the pole shaft reset spring installed and removed. Testing of the remaining PDT overhauled 480 volt breakers was satisfactory. Three other breakers of the expanded sample set that were overhauled by Westinghouse the Original Equipment Manufacturer (OEM) tripped with their pole shaft reset spring installed, but did not consistently trip with the pole shaft reset spring disconnected. The OEM considered a successful test with the reset spring installed as acceptable. Engineering concurred with the OEM since the OEM was aware of the lubrication requirements. The successful operation of the remaining PDT overhauled breakers during testing with their pole shaft reset spring removed provided confidence that these breakers would provide reliable operation. An inspection of seven breakers was performed to determine if Poxylube was evident. Breaker A1042 was the only breaker of the test sample that did not have the Poxylube lubricant present on all the key pivot points. Breaker A1033 and A1042 were part of the breaker population overhauled by PDT in 1994. The remaining sampled breakers were either overhauled by the OEM or had not had an overhaul performed. The OEM confirmed that after final testing, prior to shipment, a refurbished breaker will not contain a lockup condition. Because the lack of lubrication was attributable to a non-OEM vendor, the breaker history was investigated. Engineering identified two other non-OEM vendors besides PDT, Nuclear Logistics Inc.(NLI), and Satin American Co.(SAC). Thirteen breakers were supplied by NLI, two of which were installed and used in safety applications. These two NLI breakers were removed, tested and verified properly lubricated and capable of opening with and without their pole shaft reset spring.

The remaining 11 breakers are spares and were verified as properly lubricated. In 1984 and 1985, SAC was used to refurbish four breakers one of which was permanently removed and the other three subsequently overhauled by others [See Information Notices 89-45, and IN 93-73].

As a result of troubleshooting and assessment of the dropped rod event, the control rod movable gripper coil diodes and VR-10 voltage traps were replaced for all of the control rods. Control rod F-2 drop test timing was performed satisfactorily. The F-2 rod drop test results were compared to previously performed rod drop tests for rod F-2 and no anomalies were identified. All control rod banks were successfully exercised. Exercising the control rod would have dislodged any particle interfering with the proper operation of the control rod.

On May 1, during review for Part 21 reporting, two breakers (A1083, A1114) were identified as having been overhauled by PDT but not tested during the extent of condition testing. Maintenance Engineering (ME) confirmed the documentation identifying these breakers as overhauled by PDT. An OD was performed that concluded breaker A1114 was operable and that breaker A1083 was a manual breaker used in a non-safety application. On May 7, ME discovered a PDT label on a breaker after it was removed from service for preventive maintenance. ME performed an assessment and determined the breaker for the Containment Recirculation Fan 32 (A1015) had been overhauled by PDT, but had not been previously identified or tested. ME performed a plant walkdown of installed DS-416 breakers and re-assessed breaker work history documentation and walkdown data. ME's review identified four additional breakers (A1037, A1068, A1020, A1035) not previously identified as overhauled by PDT. Two breakers (A1037, A1068) had been tested during the extent of condition testing. Breaker A1068 was removed from service on March 6, 1998 because it failed to close on demand during testing. It was not known at the time that A1068 was a PDT overhauled breaker. The cause of breaker A1068 failure was determined to be binding due to dirt and degraded lubricant. The two remaining breakers (A1020, A1035) were determined to be operable in an OD. The difficulty in positively identifying breakers as overhauled by PDT is a result of a weakness in the identification (ID) system used to identify breakers. In the past the complete ID number for a breaker was not always used in a purchase order and its tracking number changed due to changes in the ID system. As a result, the work history for specific breakers is difficult to determine. The weakness in the ID system used to uniquely identify breakers was previously identified in the EFE/Root Cause report for the 32 RHR breaker and corrective action taken. An independent re-assessment will confirm that all PDT overhauled breakers have been identified.

I&C adjusted the setpoints on the pressure switches associated with the turbine control oil system load limit valves (LLV1/LLV2) to terminate turbine runback at 70 percent reactor power.

## CAUSE OF EVENT

The cause of the event was a failure of the 32 RHR pump circuit breaker (A1033) to open on demand. The primary cause of the breaker failure (A1033) was lack of the manufacturers recommended lubrication (Poxylube) on key pivot points in the breaker mechanism. This lack of the proper lubrication resulted in an increase in frictional forces to a point where the force needed to initiate an opening sequence was not adequate.

A contributing cause of the breaker's failure to open was a unique combination of parts wear, part tolerances and adjustments that allowed linkages between the moving contact assemblies and the pole shaft to over-travel. The combination of higher frictional forces due to improper lubrication and linkage over-travel caused the breaker to lockup in the closed position. Inadequate lubrication, binding, and clearances in the linkage connections (clevises, pins, and support points) increased the frictional forces that counteracted the trip force and allowed the linkage to remain in a lockup position. The EFE determined that the lubricant was removed from the breaker during an overhaul in 1994 by a non Original Equipment Manufacturer (OEM) vendor, PDT. The EFE concluded the lubricant was removed as part of PDT's normal cleaning process and was not reapplied. The failure to reapply the lubricant was due to a lack of knowledge by the vendor of the lubricant and its critical function for breaker operation. NYPA also lacked this knowledge. The original OEM, Westinghouse, considered the application of the lubricant (Poxylube) as an original factory manufacturing process which was within the scope of what the OEM considers proprietary information.

The OEM only provides information in their breaker manuals on items they consider replaceable by the user or those that should be maintained by the user. Information on parts or assemblies that the OEM considers factory maintenance or factory replaceable only are not included in the published documentation. The published Westinghouse breaker manual states what a utility or vendor (user) can perform. The breaker manual requires that for any activity not identified, the user should contact Westinghouse or send the component to Westinghouse for repair or replacement.

PDT did not adhere to the OEM manual requirements, and removed parts, cleaned them and failed to re-apply proper lubrication. The Authority performed a receipt inspection of the breaker after overhaul but failed to discover the lack of proper lubrication due to the unpublished information. Engineering determined the cause of the breaker over-travel was a combination of OEM specified adjustment criteria applicable to the insulating links, parts wear and manufacturing tolerances associated with the pole linkages. Adjustment of the pole insulator linkage lengths affects whether the linkage will travel far enough to be allowed to lockup. The cause of the EDGs being declared inoperable was the failure of breaker A1042 to open with its pole shaft reset spring removed, which called into question the operability of the remaining DS-416 breakers.

## CORRECTIVE ACTIONS

The following corrective actions have been or will be performed to address the causes identified for this event and prevent recurrence:

- The breaker for the 32 RHR pump was replaced with a spare breaker and satisfactorily tested.

- A sample set of model DS-416 480 volt AC electrical circuit breakers were tested, and a sample of breakers had detailed measurements of selected components and parameters. Four breakers failed to open with their pole shaft reset spring removed and they were replaced and satisfactorily tested. Engineering concluded, based on its investigations and testing, that a unique combination of circumstances existed with the 32 RHR pump breaker.

- The breaker for the 32 RHR pump (A1033) was initially inspected then shipped to Westinghouse where a detailed EFE was completed. NYPA performed a root cause investigation based on the completed EFE.

- An inspection/test process was developed for overhauled breakers that included the lessons learned. The new inspection/test process was incorporated into the breaker maintenance procedure.

- The breakers that were overhauled by PDT will be replaced and refurbished on an expedited schedule. Scheduled completion date for all but six is August 31, 1998. The remaining Six breakers will be replaced during the next refueling outage (RO 10).

## ANALYSIS OF EVENT

The event is reportable under 10 CFR 50.73 (a)(2)(i)(B). The licensee shall report any operation or condition prohibited by the plants TS. This event meets the reporting criteria because bus 6A was declared inoperable.

The cause of the breaker failure was not known and although the bus was energized in accordance with the TS, Operations conservatively concluded the failed breaker's assigned safety bus 6A could be rendered inoperable. Because TS 3.7 requires the four 480 volt buses 2A, 3A, 5A, and 6A to be energized above cold shutdown, but does not have an AOT for an inoperable 480 volt bus, Operations concluded the plant was in a condition that met the requirements of TS 3.0. TS 3.0, which is similar to Standard Technical Specification 3.0.3, requires that for LCOs where no exception time is specified for inoperable components, the time is assumed to be zero. Operators initiated plant shutdown in accordance with TS 3.0, with hot shutdown achieved on December 18, 1997, at approximately 1428 hours. Operations notified the NRC in accordance with 10 CFR 50.72(b)(1)(i)(A) of the initiation of a nuclear plant shutdown required by the plant's TS (i.e., TS 3.0). 480 volt bus 6A was declared operable at 1344 hours. The 32 RHR pump breaker was replaced, tested, and the pump declared operable on December 18, 1997, at approximately 2229 hours.

Subsequently, on December 22, Operations was notified that during testing of other breakers for extent of condition, another breaker was determined to be in a potentially degraded condition when tested in a modified configuration. Engineering determined that other 480 volt DS-416 breakers could be subject to failure. Because failure of the breakers assigned to the four safety buses could result in overload of the three EDGs, Operations declared the three EDGs inoperable on December 23, at approximately 0300 hours. Operations initiated action to bring the plant to cold shutdown, which was achieved at 0240 hours on December 24, 1997. TS 3.7.F.4 requires as a minimum, under all conditions including cold shutdown that two EDGs be operable. Because three EDGs were declared inoperable, the plant was in a condition prohibited by TS which would be reportable under 10 CFR 50.73 (a)(2)(i)(B). However, after successful testing of applicable breakers the three EDGs were determined to be operable on December 26, at approximately 1925 hours.

As described below, an engineering evaluation determined that bus 6A would not have been overloaded and it remained energized per the TS although declared inoperable. Also, as previously described, the spring off test is not a normal configuration and on December 26, engineering concluded the breakers were operable. Based on these findings, the Authority is reviewing the requirement to report these events. If upon further review the Authority concludes that any circumstances are not, we will supplement this LER.

A review was performed of Licensee Event Reports (LER) over the last three years. No events reporting failure of 480 volt breakers to open were identified.

## SAFETY SIGNIFICANCE

This event had no significant effect on the health and safety of the public. There were no actual safety consequences for the event because the 32 RHR pump was running for a test, but not providing any required flow. The RHR system is not required to be operating during normal plant operation at power. An engineering evaluation determined that the run time of the 32 RHR pump during this event did not affect its operability or cause undue wear. The bus that powers the 32 RHR pump (bus 6A), although declared inoperable, remained energized in accordance with the TS and available for powering assigned loads. The bus was considered inoperable because it would not shed loads (i.e., 32 RHR pump) and sequence them in accordance with design for proper EDG operation (overloading). Other DS-416 breakers would not have failed based on subsequent testing and investigation of a sample of 480 volt DS-416 breakers that demonstrated their operability. 480 volt bus overloading would not have occurred and proper EDG operation would have been maintained.

There were no potential safety consequences for the event because an engineering evaluation determined that the 32 EDG will perform its design safety function during a DBA (LOCA with LOOP) with the 32 RHR motor continuously running due to a failure of its feeder breaker to trip (open). No overload condition would have occurred. The 32 RHR pump was running and capable of providing its required flow. The redundant pump (31 RHR) for the 32 RHR pump was operable and would have performed the required safety function. The safety related recirculation pumps (2) inside containment would be used during the recirculation phase of a LOCA. The RHR pumps would only be used if backup capacity to the recirculation loop is required. The redundant 480 volt safety buses (bus 5A, 2A/3A) were operable and capable of performing their function during and after the event.

The possible use of the defective breaker to power other safety components was considered. Breaker A1033 was one of six 480 volt breakers modified to charge on closure. This breaker feature is unique to specific components that are required to be immediately sequenced onto a safety bus. Therefore, these modified breakers are only used in six locations for powering specific safety related components. Engineering determined that had the A1033 breaker been used in one of the other designated locations and failed to open, no EDG overload condition would have occurred.

Use of this set of breakers in other locations is prevented because there are plant procedures that require the specified breaker be used in its assigned location. Overload of a bus from other installed PDT overhauled breakers would not occur because no other sampled breaker failed to operate properly in its design configuration (pole shaft reset spring installed). Engineering concluded that other 480 volt DS-416 breakers would not have failed based on subsequent testing and investigation of a sample of 480 volt DS-416 breakers that demonstrated their operability. 480 volt bus overloading would not have occurred and proper EDG operation would have been maintained. Since the 32 RHR breaker provides fault protection, the effects of an electrical fault on the 32 RHR motor was evaluated. A postulated electrical fault on the 32 RHR pump motor whose feed breaker fails to open could result in the loss of its assigned 480 volt bus 6A. This failure scenario is bounded by plant design since the two remaining 480 volt safety buses (5A and 2A/3A) provide adequate power for one minimum set of safeguards equipment.

There was no safety impact from the dropped F-2 control rod because the plant is analyzed for a dropped rod in FSAR Section 14.1 and the analysis shows that safety limits are not exceeded. The turbine runback did not have a safety impact because the plant is analyzed for the effects of a turbine runback and the analysis shows that safety limits are not exceeded. This analysis is based on a runback from 100 to 70 percent power. The event was a runback from 70 to 60 percent power which is bounded by the analysis because it was initiated at a lower power, which is a less limiting condition.

There was no actual or potential safety impact of the three EDGs being declared inoperable, based on the subsequent successful testing and evaluation of other DS-416 breakers. The EDGs remained available and functional even though they were administratively declared inoperable.

**Reporting of Defects and Noncompliance Pursuant to 10 CFR Part 21**

1. NAME AND ADDRESS OF THE INDIVIDUAL INFORMING THE COMMISSION

   Robert J. Barrett, Indian Point Unit 3, P.O. Box 337, Buchanan, N.Y.

2. IDENTIFICATION OF THE FACILITY, THE ACTIVITY, OR BASIC COMPONENT SUPPLIED FOR SUCH FACILITY OR SUCH ACTIVITY WITHIN THE UNITED STATES WHICH FAILS TO COMPLY OR CONTAINS A DEFECT

   480 volt AC circuit breakers, Westinghouse Model DS-416, overhauled by Power Distribution Technology (PDT)

3. IDENTIFICATION OF THE FIRM CONSTRUCTING THE FACILITY OR SUPPLYING THE BASIC COMPONENT WHICH FAILS TO COMPLY OR CONTAINS A DEFECT

   Power Distribution Technology (PDT),750 Middle Ground Blvd., Newport News, VA, 23606 (no longer in business)

4. NATURE OF THE DEFECT OR FAILURE TO COMPLY AND THE SAFETY HAZARD WHICH IS CREATED OR COULD BE CREATED BY SUCH DEFECT OR FAILURE TO COMPLY

   A 480 volt circuit breaker for the 32 RHR pump (breaker A1033) failed to open on demand. Further investigations and evaluations concluded the cause of the failure was missing lubrication at key pivot points in the breaker mechanism. The lack of lubrication was determined to be a result of a 1994 breaker overhaul performed by Power Distribution Technology (PDT). Other breakers were overhauled by PDT under the same and different purchase orders (POs).

   In 1994, PDT overhauled the breaker for the 32 RHR pump (A1033) and three (3) other DS-416 breakers in accordance with an Authority purchase order (PO). That Authority PO contained specific requirements for lubrication, and a requirement to certify that the refurbishment was performed to the original OEM technical requirements. PDT failed to comply with the OEM technical manual and PO requirements by removing lubricants and not reapplying them. Without the proper lubrication the breaker is not qualified and may not operate and perform its function. After further testing, another breaker (A1042) was considered to be in a degraded condition. Further investigation determined that breaker A1042 lacked lubrication on pivot points in the breaker mechanism. Both breakers (A1033 and A1042) were overhauled by PDT in 1994 under an Authority PO.

Engineering determined that the A1042 breaker could have been used in any location requiring a DS-416 breaker except the six locations that require a breaker with the charge-on-close feature. The initial failed breaker (A1033) for the 32 RHR pump contained the charge-on-close feature.

Engineering's evaluation of the deviation concluded it could result in a substantial safety hazard. Lack of the proper lubrication for breaker A1042 could have prevented the breaker from performing a safety function (i.e., open on demand) in several applications.

The defective breaker could have resulted in a loss of a safety function necessary to mitigate the consequences of an accident, in the event of an accident due to other causes, considering an independent single failure. Had breaker A1042 been used to power the Turbine Oil Pump (52/TAO) and failed to trip open in response to a DBE with a resultant Loss of Offsite Power (LOOP), the 480 volt safety bus and/or its assigned EDG could have become overloaded or faulted. The EDG overload would be due to the additional load from the Turbine Oil Pump which was required to be shed from its assigned bus. An independent single failure to a redundant EDG or safety bus during this postulated event would result in the loss of a second of three onsite AC power sources.

The plant design requires two on-site AC power sources to supply the power of one minimum required set of safeguards equipment. This possible scenario could result in a loss of safety function to the extent that there would have been a reduction in the degree of protection provided.

5. THE DATE ON WHICH THE INFORMATION OF SUCH DEFECT OR FAILURE TO COMPLY WAS OBTAINED

On April 1, 1998, Engineering determined that the information supplied by Westinghouse in their Equipment Failure Evaluation report of the 32 RHR breaker dated March 19, 1998, identified a defect that was a potential 10 CFR Part 21 notification.

6. IN THE CASE OF A BASIC COMPONENT WHICH CONTAINS A DEFECT OR FAILS TO COMPLY, THE NUMBER AND LOCATION OF ALL SUCH COMPONENTS IN USE AT, SUPPLIED FOR, OR BEING SUPPLIED FOR ONE OR MORE FACILITIES OR ACTIVITIES SUBJECT TO THE REGULATIONS IN THIS PART

The number of DS-416 breakers overhauled by PDT is twenty two (22).

The four breakers that were overhauled by PDT under a 1994 Authority PO, and their location at the time of the event, are as follows (includes the failed breaker reported in the event):

A1010, Pressurizer Heater Backup Group 32 (52/PBU2)
A1033, Residual Heat Removal Pump 32 (52/RHR2)
A1042, Pressurizer Heater Backup Group 33 (52/PBU3)
A1062, Rod Power Supply Motor Generator Set 31 (52/MG1)

The following DS-416 breakers are the remaining breakers and their location at the time of the event with documentation that indicates they were overhauled by PDT:

A1012, 225KVA Lighting Transformer 32 (52/LT2)
A1015, Containment Recirculation Fan 32 (52/CRF2)
A1016, Pressurizer Heater Backup Group 31 (52/PBU1)
A1020, 225KVA Lighting Transformer 33 (52/LT3)
A1021, Rod Power Supply Motor Generator Set 32 (52/MG2)
A1023, Containment Recirculation Fan 34 (52/CFR4)
A1027, Component Cooling Pump 31 (52/CC1)
A1031, Component Cooling Pump 33 (52/CC3)
A1035, Recirculating Pump 32 (52/R2)
A1037, PAB CB Purge Exhaust Fan 32 (52/EXF2)
A1038, Turbine Auxiliary Oil Pump (52/TAO)
A1049, Safety Injection Pump 33 (52/SI3)
A1053, Service Water Pump 37 Backup (52/SW7)
A1058, Service Water Pump 31 (52/SW1)
A1068, Containment Recirculation Fan 31 (52/CRF1)
A1081, Charging Pump 33 (52/C3)
A1083, 480 Volt Feeder to MCC B (52/313-6C)
A1114, 480 Volt Feeder to MCC 33 (52/MCC3)

In addition to four DS-416 breakers PDT overhauled in 1994, one (1) DS-532 breaker was also overhauled. This breaker (A1074) is currently installed as a tie breaker for 480 volt bus 2A to 5A (52/2AT5A).

7. THE CORRECTIVE ACTION WHICH HAS BEEN, IS BEING, OR WILL BE TAKEN; THE NAME OF THE INDIVIDUAL OR ORGANIZATION RESPONSIBLE FOR THE ACTION; AND THE LENGTH OF TIME THAT HAS BEEN OR WILL BE TAKEN TO COMPLETE

   See the corrective actions which were taken and will be taken, and their scheduled completion dates discussed in this LER. The expedited replacement and refurbishment of breakers that were overhauled by PDT, is the responsibility of the Authority's Maintenance department.

8. ANY ADVICE RELATED TO THE DEFECT OR FAILURE TO COMPLY ABOUT THE FACILITY, ACTIVITY, OR BASIC COMPONENT THAT HAS BEEN, IS BEING, OR WILL BE GIVEN TO PURCHASERS OR LICENSEES

   Operating Experience (OE) notices 8712 and 8899 were prepared and issued on the INPO Nuclear Network on the findings of the failure evaluation.