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

NPL 2001-0003

January 2, 2001

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

10 CFR 50.73

Ladies/Gentlemen:

DOCKET NUMBER 50-266
LICENSEE EVENT REPORT 266/2000-011-00
LOSS OF 120 VAC VITAL INSTRUMENT BUS DURING INVERTER MAINTENANCE
POINT BEACH NUCLEAR PLANT UNIT 1

Enclosed is Licensee Event Report 266/2000-011-00 for the Point Beach Nuclear Plant Unit 1. This report is provided in accordance with 10 CFR 50.73(a)(2)(i)(B), as "Any operation or condition prohibited by the plant's Technical Specifications." This report documents the entry into the action statement for Technical Specification 15.3.0.B during a short term (less than one minute) interruption of power to the "white" channel vital instrumentation buses for Unit 1. This loss of the "white" instrument buses occurred while removing a instrument bus inverter from service to replace input fuses.

Corrective action commitments are identified in this report by italics.

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

Sincerely,

A. J. Cayia
Plant Manager

Enclosure
CWK/jlk

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

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)

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TITLE (4)

Loss of 120 VAC Vital Instrument Bus During Inverter Maintenance

| 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 | 02 | 2000 | 2000 | - 011 - | 00 | 01 | 02 | 2001 | FACILITY NAME | DOCKET NUMBER 05000 |

| OPERATING MODE (9) | 1 |
|---|---|
| POWER LEVEL (10) | 100 |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 20.2201(b) | | 20.2203(a)(2)(v) | X | 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) | | 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 |
|---|---|---|---|---|---|---|---|---|---|
| B | EF | INVT | E209 | Y | | | | | |
| | | | | | | | | | |

| 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 2, 2000, the "white" channel 120 VAC vital instrumentation buses, 1Y-03 and 1Y-103, for the Point Beach Nuclear Plant (PBNP) Unit 1, were deenergized for approximately 30 seconds. This event occurred while an auxiliary operator (AO) was removing the DY-0C inverter from service to replace the input fuses. The AO was isolating the inverter using the instructions posted on the inverter which included a step to open the breaker for the backup power supply. This step was inappropriate for the conditions present at that time. Upon hearing the announcement regarding the loss of the white instrument buses, he immediately re-closed the backup supply breaker. This event caused PBNP Unit 1 to enter TS 15.3.0.B for approximately one minute because of conditions or limitations beyond those specified in the permissible conditions of the Limiting Conditions for Operation (LCO). This event is reportable as "any operation or condition prohibited by the plant's Technical Specifications." PBNP Unit 1 was operating at full power prior to this event. Power was manually reduced to 95% and control rods switched to manual control after the rods stepped in during the event. A team root cause evaluation has been initiated. This event had no impact on the health and safety of the public or the plant staff.

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

## Event Description:

On December 2, 2000, at approximately 0425 (all times cited are CST) the white channel 120 VAC vital instrumentation buses, 1Y-03 and 1Y-103, for the Point Beach Nuclear Plant (PBNP) Unit 1, were deenergized for approximately 30 seconds while conducting repairs to the white instrument inverters, DY-0C and 2DY-03 (CR 00-4026). This event caused PBNP Unit 1 to enter Technical Specification (TS) 15.3.0.B for approximately one minute because of conditions or limitations beyond those specified in the permissible conditions of the Limiting Conditions for Operation (LCO). This event is reportable in accordance with the requirements of 10 CFR 50.73(a)(2)(i)(B) and the guidance of NUREG 1022 Revision 1 as "any operation or condition prohibited by the plant's Technical Specifications." PBNP Unit 1 was operating at full power during this event. Unit 2 was in hot shutdown while recovering from a refueling outage.

On November 26, 2000, problems were experienced with blown fuses on the normal 120 VAC power supply to the Unit 1 "white" instrument buses, inverter 1DY-03. The inverters are powered from the 125 VDC battery buses and convert the DC to 120 VAC and supply the vital instrumentation buses (See "Component and System Description" and attached figure.) While trouble shooting inverter 1DY-03, power to the Unit 1 "white" instrument buses was being supplied from the "white" alternate inverter, DY-0C.

During the early morning of December 2, 2000, continued troubleshooting of 1DY-03 was in progress. At 0157, while using an alternative fusing device to continue the maintenance activities on 1DY-03, a surge on the DC power supply bus resulted in the input fuses opening on both the alternate inverter, DY-0C, and the Unit 2 normal supply inverter, 2DY-03. Upon the loss of these inverters, a automatic fast transfer occurred to a non-safety related backup power supply, regulating transformer XY-08. This transfer was annunciated in the control room. All equipment operated as expected, the "white" instrument buses stayed energized and Unit 1 remained in operation at full power. In accordance with TS 15.3.7.B.1.j, a TS Action Statement was entered for Unit 1 to restore loads to a safety related inverter power supply within eight hours or be in hot shutdown within an additional six hours. Trouble shooting of 1DY-03 was suspended and a work plan was developed to replace the open fuses in the DY-0C and 2DY-03 inverters.

At approximately 0400 a work plan was completed by electrical maintenance personnel. A discussion of the plan was held in the control room between the maintenance supervisor and the SRO assigned to monitor the inverter recovery. At that time, the SRO had cautioned the maintenance supervisor that the standard operating procedure for restoring the inverters could not be used because of the current alignment of the "white" instrument buses to the backup power supply. A pre-job briefing was conducted in the maintenance shop by the maintenance supervisor, a maintenance electrician and the operations auxiliary operator (AO) designated to shutdown and secure the inverters (the AO missed the first few minutes). The caution conveyed by the SRO earlier concerning the process for securing and restoring the safety related inverters was either not adequately covered in the briefing or not completely understood by the craft electrician and the AO. Both individuals understood that the inverters were to be removed from service in accordance with the instructions posted on the information plaque on the inverters.

At 0425 the assigned AO commenced securing the inverter. The third step of the instructions posted on the inverter directed that the bypass source input breaker on the static transfer switch be placed in the "off" position. As a result of that action, the power from XY-08 was interrupted and the Unit 1 "white" instrument buses deenergized. Numerous alarms were immediately received in the control room and the

loss of the instrument bus was announced over the plant wide public address system. The AO recognized his contributing action and closed the bypass source input breaker. This re-energized the Unit 1 "white" instrument bus.

As a result of this event, the following actions were taken:

- The TS 15.3.0.B Action Statement was entered for the short time that the bus was de-energized

- The power to the "white" channel containment hydrogen monitor for Unit 1 was interrupted. Unit 1 entered a 30 day required action per TS Table 15.3.5-5, item #10 to restore the monitor. This hydrogen monitor channel was restored and the action statement exited at 1200 that day.

- Unit 1 experienced a containment vent isolation and loss of the containment gaseous and air particulate monitors, 1RE-211 and 1RE-212, and entered a 48 hour required action per TS 15.3.1.D.7, for reactor coolant leak rate detection. At 0945 on the 2nd the 1RE-211 and 1RE-212 monitors were returned to service and the action statement exited.

- As a result of the loss of the "white" inverter supplied power range nuclear instrumentation, a temporary mismatch between 1st stage turbine generator pressure and reactor power resulted in the control rods stepping in. Abnormal operating procedure AOP-6C, "Uncontrolled Rod Motion" was entered and manual control of the rods was taken. The control rods stepped in a total of 18 steps. Unit 1 power was reduced to 95% by manually reducing turbine load. The Unit 1 control rods were returned to automatic control at 0445 and the unit was restored to full power at 0940 that day.

- At 0428 AOP-6C was exited and AOP-24, "Response to Instrument Malfunction," was entered. AOP-24 was exited at 0456.

- At 0510 the "white" instrument channel inverter DY-0C was restored and buses 1Y-03 and 1Y-103 were energized with that safety related power supply. The eight hour action statement declared for Unit 1 at 0157 per TS 15.3.7.B.1.j was exited.

- The 2DY-03 instrument bus inverter was restored at 0536 and the Unit 2 2Y-03 and 2Y-103 buses switched to the safety related power supply.

- The trouble shooting and repair of the 1DY-03 inverter has been completed. That inverter was returned to service on December 17, 2000.

**Cause:**

The cause of this event was a programmatic breakdown that resulted in inadequate work controls being applied to the work plan for the fuse replacement evolution. A more detailed and thorough work plan should have been developed considering and given the abnormal status of the instrument bus power supplies. Contributing factors to the event included an incomplete or ineffective pre job briefing. Another factor was the wrong assumptions by the AO, the maintenance supervisor, and the maintenance electrician concerning how to secure the inverters. These assumptions were based on not having been properly informed of the current conditions and system limitations. There was also an inadequate knowledge of how the inverter and static transfer switch

would react under the abnormal system conditions.

## Corrective Actions:

*A team root cause evaluation (RCE) has been initiated to examine the event in detail and identify the reasons for the apparent programmatic breakdowns in development and implementation of the work plans for the repair and restoration of the normal power supply to the vital instrument system inverters.*

*Preliminary results of the investigation indicate that a "trouble shooting" policy should be developed to establish adequate procedure steps and specific controls on activities that can effect operational equipment (i.e., situations where the equipment is not physically isolated from the operating unit).*

Additional corrective actions identified in the RCE will be assigned to the appropriate work groups and managed within the licensee's corrective action program.

## Component and System Description:

The 120V AC vital instrument power system provides and distributes reliable 120 VAC power to plant safety related and non-safety related instruments and controls systems from diverse power sources (AC and DC). The system consists of sixteen buses, divided among four instrument channels. Each of the four channels (which are designated as red, white, blue, and yellow) are allocated to four buses. The distribution buses are further subdivided into two bus groups, one group serving Unit 1 and the other serving Unit 2.

Each channel is powered by three inverters (see attached figure). One inverter is dedicated to the Unit 1 bus group and a second inverter is dedicated to the Unit 2 bus group. The third inverter is an alternate, and can swing between the Unit 1 and Unit 2 buses. Shifting between normal and alternate inverters is accomplished using manual make-before-break transfer switches. Use of the alternate inverter allows either dedicated inverter to be removed from service for maintenance. The function of the inverters is to convert 125 volt DC from the station batteries to 120 volt AC. The inverters are; therefore, powered from the 125 volt DC system.

The three inverters powering any one instrument channel share a common supply from one of the main 125 volt DC buses. The red channel inverters (1/2DY-01 and DY-0A) are powered from bus D-01 through panel D-12. The blue channel inverters (1/2DY-02 and DY-0B) are powered from bus D-02 through panel D-14. The white (1/2DY-03 and DY-0C) and yellow channel (1/2DY-04 and DY-0D) inverters are powered directly from buses D-03 and D-04, respectively.

Although normally powered from an inverter supply, each instrument channel can be powered from a backup power source. The backup power source is from non-safety-related Y-15 or Y-16 buses which are supplied from 480V bus B-09 via regulating transformer XY-08. The output of each inverter is connected to a static transfer switch that will automatically transfer the associated instrument buses to the backup power source in the event of an inverter failure, with little or no power interruption. Signals causing the transfer of the static switches include high voltage (white and yellow channels only), low voltage, current overload, and inverter failure signal (anticipatory to loss of voltage). The backup source is designed to maintain power to affected buses only until they can be manually transferred back to an operable safety

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related inverter. The backup source is designed to supply the Unit 1 and Unit 2 loads of one instrument bus channel. It will therefore maintain power to the affected instrument bus channel in the case of a main DC bus failure. Electrical interlocks are in place to prevent static switches from more than one instrument bus channel from transferring to the backup source at the same time.

The White and Yellow instrument channels supply XY-113 and XY-114 isolation transformers which supply the Radiation Monitoring (RM) Systems non-safety-related instrument panels 1/2Y-11, 1/2Y-21, 1/2Y-31 and 1/2Y-41 in addition to other non-safety related loads. The isolation transformers are used to prevent remote faults from non-safety related components from feeding back to the protection buses.

In the event of an inverter or bus failure of a 120V vital instrument protection channel(s), multiple alarms will sound in the control room. The alarms are located on the auxiliary safety instrument panel in the control room. The inverters are operated locally at the inverter panels. In addition to the four 120 volt instrument channels there are two (per unit) non-safety related portions of the 120 VAC Instrument power system (Y). These four additional instrument buses supply power to non-protection, non-redundant instruments. These buses reduce the required load on the static inverters supplying the protection channels.

The 120V AC Vital Instrument System provides power to various instrument racks for the Reactor Protection System (RPS), the Engineered Safety Feature (ESF) Actuation System, the Nuclear Steam Supply System (NSSS) Controls, and other miscellaneous instrumentation and control systems. This system is described further in Section 8.6 of the PBNP FSAR.

## Safety Assessment:

Although the loss of power to the Unit 1 "white" channel of vital instrumentation created an unnecessary challenge to the facility operating staff and plant systems and equipment, no equipment damage, personal injury or radioactive release resulted from this event. All equipment operated as expected under the circumstances of the event and the plant remained in a stable configuration. The loss of the "white" instrument bus occurred for less than one minute. Plant operating temperature and pressure limits were not exceeded. The automatic rod control signal which caused the rods to step in was compensated by taking manual rod control and initiating a manual 5% power reduction. Therefore, this event had no affect on the health or safety of plant personnel or the public. A review of the revisions to 10 CFR 50.72 and 50.73 which will become effective on January 23, 2001, indicates that an event of this type would not be reportable after that date.

This event did not result in the loss of any system or component safety function.

## System and Component Identifiers:

The Energy Industry Identification System component function identifier for each component/system referred to in this report are as follows:

| Component/System | Identifier |
|---|---|
| Low Voltage Power System - Class 1E | ED |
| Instrument and Un-interruptible Power System - Class 1E | EF |
| DC Power System - Class IE | EJ |
| Control Rod Drive System (PWR) | AA |
| Inverter | INVT |
| Fuse | FU |
| Switch, Power | JS |
| Monitor, (Hydrogen) | MON |

## Similar Occurrences:

A review of recent LERs (past three years) identified no similar events involving maintenance of instrument bus inverters or failure of an instrument bus power supply.

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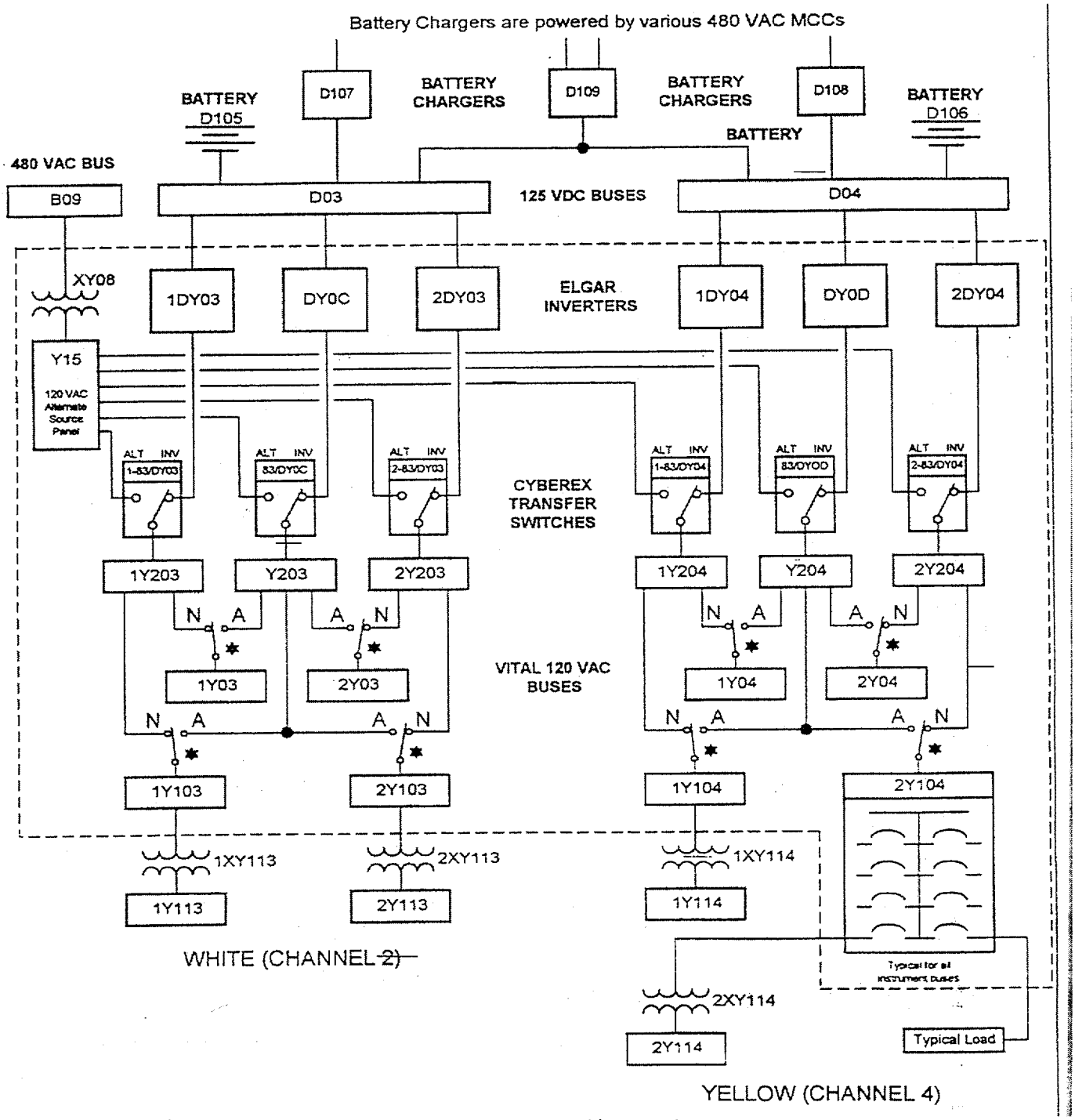


**Figure 1-4: White and Yellow Instrument Bus Configuration**