U. S. NUCLEAR REGULATORY COMMISSION
REGION I

REPORT NOS.	50-220/92-19 50-410/92-21
DOCKET NOS.	50-220 50-410
LICENSE NOS.	DPR-63 NPF-69
LICENSEE:	Niagara Mohawk Power Corporation
FACILITY NAME:	Nine Mile Point Nuclear Station Units 1&2
INSPECTION AT:	Salina Meadows, Scriba, New York and Corporate Office, New York
INSPECTION DATES:	July 6-10, and August 24-28, 1992

INSPECTOR: R. Bhatia, Reactor Engineer, Electrical Section, Engineering Branch, DRS — 11-9-92 Date

APPROVED BY: W. Ruland, Chief, Electrical Section, Engineering Branch, DRS — 11/10/92 Date

Area Inspected: This was an announced inspection to review the licensee's corrective action on previously identified inspection findings.

Results: No violations or deviations were identified. Of the five open unresolved items reviewed in Unit 1, three items were closed. Two items remained unresolved. The corrective actions reviewed for IIT concerns were found adequately resolved. These are discussed in sections 2.0 and 3.0.

1.0 PURPOSE

The purpose of this inspection was to review and verify the licensee's corrective actions for previously identified NRC findings of Electrical Distribution Systems Functional Inspection (EDSFI) for Nine Mile Point Unit 1 and resolution of Uninterruptible Power Supply (UPS) issues from the investigation of the incident at Nine Mile Point Unit 2 of August 13, 1991, documented in the NUREG-1455.

2.0 FOLLOWUP OF PREVIOUS IDENTIFIED FINDINGS (UNIT 1)

2.1 (Closed) Violation Item (50-220/91-80-002)

During the previous EDSFI inspection, the licensee's diesel generator load calculation indicated that the core spray topping pump motors and the reactor building closed loop cooling pump motors were required to operate at 109% and 105%, respectively, of their rated horsepower. The test report in the Nine Mile Point 1, Environmental Qualification (EQ) file indicated that these motors were tested only at 100% of their rated horsepower. At the time of the inspection on October 23, 1991, there was no engineering analysis in the EQ file to demonstrate that they were qualified for operation at greater than 100% of their rated horsepower. However, at that time the licensee was able to show by analysis that the core spray topping pump motors and the reactor building closed loop cooling pump motors could be qualified to operate at required higher limits.

In this inspection, the inspector reviewed the licensee's final evaluation and analysis to support qualification. The licensee final EQ analysis verified that the additional heat generated under the new conditions for the above motors did not exceed the levels of qualification already established in the original qualification report. In addition, the inspector reviewed the licensee's root cause analysis and other corrective actions taken to ensure that the remaining motors in the EQ qualification program were within the required operational limits. It was noted by the inspector that the lessons learned, in this case knowledge of EQ requirements, were disseminated to other engineering personnel.

Based on the licensee's adequate established EQ qualification data for above motors and other corrective actions to prevent future occurrence, this item is closed.

2.2 (Closed) Non-Cited Violation (50-220/91-80-003)

During the previous inspection, a review of procedure N1-ESP-GEN-333, Revision 0, revealed that the as-found "dropout" value for the emergency bus undervoltage relays for degraded voltage was incorrectly specified as "pickup" value. In addition, this procedure had omitted the requirements to test and verify these relay "pickup" voltages.

During this inspection, the inspector noted that the licensee resolved this discrepancy promptly by issuing a temporary change notice to the procedure N1-ESP-GEN-333. Subsequently, the Procedure N1-RCSP-GEN-333, Revision 0, was issued on March 26, 1992, to supersede the above procedure N1-ESP-GEN-333. The inspector's review of the new procedure revealed that the pickup and dropout relay steps have been adequately reflected. In addition, the required emergency bus undervoltage relays have been tested and adjusted as required to satisfy the procedure revision.

Based on the above corrective actions, this item is closed.

2.3 **(Open) Unresolved Item (50-220/91-80-006)**

In the previous inspection, the team found that there were no formal calculations to demonstrate adequate cable ampacity for 600 Volt plant cables. The team was concerned that a fire retardant material, "Flameastic," had been applied to a number of cables without considering ampacity derating.

The licensee issued a Deviation/Event Report (DER), DER-1-91-Q-1073, to resolve this concern. Three samples of cable trays in the turbine and reactor building were evaluated by the licensee by February 29, 1992, as part of short-term action commitment agreed upon at the conclusion of the original inspection. The inspector's review of this analysis performed by the licensee revealed no concerns. It was noted that a significant number of cables in these trays had sufficient ampacity margins.

This item remains open pending the licensee's compete long-term corrective action to determine cable ampacities and derating effects for the remaining cables in the plant (50-220/91-80-006).

2.4 **(Closed) Unresolved Item 50-220/91-80-012**

This item pertains to the ability of the battery room ventilation systems to maintain hydrogen concentration below a safe limit of one percent following a loss of the turbine building exhaust fans.

During this inspection, the inspector noted that the licensee completed calculation S10-H2GAS-HV01, Revision 0, to evaluate the hydrogen concentration levels in the battery rooms. This calculation revealed that the hydrogen concentration level in the battery rooms could be maintained well below the 1% safe limit level when the forced ventilation system becomes inoperable under the worst case hydrogen generation scenario with a slight modification in duct work. Based on the results of this study, the existing ventilation exhaust duct work configuration in each battery room was modified to add a 3" diameter hole on the top of the room duct (per modification 5380). This configuration will allow the hydrogen gas to escape into the turbine building large volume. This ventilation arrangement maintains hydrogen concentration low in the battery rooms without significantly affecting the turbine building air composition under a worst case scenario.

Based on the licensee's above corrective actions and the inspector's review of the calculation, this item is closed.

2.5 (Open) Unresolved Item 50-220/91-80-14

This item pertains to an inadequate EDG loading calculation identified in the previous inspection. The team noted that the licensee's calculation No. 4.16 kVAC-DG-ES, Revision 0, found that the EDG loading under worst case scenario to be 2675 kW and 1559 kVAR (3096 kVA at 0.864 p.f.). This was above the continuous nameplate rating of the machine. In response to this concern, the licensee stated that the above calculation had used incorrect motor efficiencies in the conservative direction. At the conclusion of the inspection, the team estimated that by using the correct data the design loads may fall within the continuous rating of the EDGs. The licensee committed to revise this calculation and establish the maximum EDG design loading.

During this inspection, the inspector noted that the licensee has revised the previous EDG loading calculation. The applicable motor data were verified to be corrected in this calculation by the inspector. The worst case EDG loading per calculation 4.16 kVAC-DG-ES, Revision 1, shows EDG loads to be 2479.6 kW and 1468.8 KVAR (2881.8 KVA at 0.86 p.f.), which is within the manufacturer's nameplate continuous rating of 2586 kW and 1754.5 KVAR (3125 KVA at 0.828 p.f.).

The inspector's review of the above calculation showed no technical concerns; however, a safety evaluation to reflect the latest EDG loading needs to be revised in the FSAR and other applicable documents. This item remains open until NRC confirms that such actions are complete.

3.0 BACKGROUND OF PREVIOUSLY IDENTIFIED IIT CONCERNS (UNIT 2)

On August 13, 1991, at Nine Mile Point 2 Nuclear Power Plant, the main transformer failed, resulting in degraded voltage and simultaneous loss of five nonsafety-related uninterruptible power supplies. This caused the loss of several nonsafety systems, including the reactor control rod position indications, some reactor power and water indications, control room annunciators, the plant communications system, the plant process computer, and lighting at some locations. The reactor was subsequently shutdown to a safe condition. Following this event, the U.S. Nuclear Regulatory Commission dispatched an Incident Investigation Team (IIT) to the site to identify the probable causes, findings and conclusions. The NUREG-1455 was issued on October 19, 1991, as the IIT report.

The primary focus of this inspection was to review and verify the licensee's corrective actions to resolve the UPS power supply concerns identified in the IIT report (NUREG-1455) and the licensee's response letter to the NRC, dated May 11, 1992 (NMP2 L1345).

3.1 Uninterruptible Power Supplies (UPS)

3.1.1 General Design

Uninterruptible Power Supplies (UPS) are designed to provide continuous power to important electrical loads should the UPS lose their normal ac power. UPS are designed to preclude the three most common power disturbances which affect the reliable operation of electrical equipment loads: (1) power line noise, (2) power fluctuation, and (3) sudden loss of power. See Section 4.3 of NUREG-1455 for a complete description of the UPS design. A typical electrical simplified single line diagram of a UPS unit is shown in Figure 1.0.

3.2 Adequacy of Uninterruptible Power Supply Installation

3.2.1 UPS Design Concern

The IIT team, in Section 4.3.4 of their report, identified a concern with the UPS logic power supply. If the maintenance voltage supply degrades, this will result in a loss of the UPS. This concern, a common mode failure of all five UPS units, was confirmed on August 13, 1992, at the Nine Mile Point 2 event.

The Restart Readiness Assessment Team (RRAT) in September 1991, reviewed the licensee's corrective action. The licensee had switched the power supply for the UPS control logic from the maintenance power supply to the more reliable UPS inverter output. In addition, the licensee had replaced all the associated control logic supply batteries for each unit prior to restart.

During this inspection, the inspector noted that the licensee has made additional design changes in the UPS logic power control panel to make these units more reliable and maintainable. A simple design change, SC2-0309-91, implemented by the licensee, has modified the UPS-1A, 1B and 1G UPS units. This modification replaced the existing power supply panel (A27 Pan) internal to the UPS units with an upgraded version. The old power supply panel had two internal power supplies (the maintenance and inverter power supplies). In the old design, a relay (K5) was used to switch the power from one source to another upon failure of the preferred source for the control logic, as shown in Figure 2.0.

The new power supply panel has four power supply units. In this design, each power source (preferred and alternate power source) is connected to two power supplies. There is no switching function required upon a failure of a power source. Thus, in this design, power to control logic is available at all times. Based on the more reliable power source design feature added by the licensee, the battery back-up source to the logic was deleted. The deletion of the batteries resolves the concerns of battery depletion and detection.

UPS-1C and 1D retain the pre-startup design feature where the logic control power is still powered from the inverter sources which is considered more reliable than pre-event design condition. The inspector noted that a modification to reduce the loading on these units was ongoing. The licensee is committed to replace these two units by November 30, 1992.

The inspector's review of the design documentation and as-built conditions, and walk down of equipment revealed no concerns. The design package pertaining to the above modification was found to be of good quality with sufficient details and adequate supporting documents. The changes to the instruction manual and affected procedures were adequately addressed in this design package. Several component level vendor drawings were added by the licensee as a part of this modification.

The inspector also noted that the technical description regarding control logic power supply differences, labels and non-applicable functions were clearly outlined in the UPS vendor manual. The changes made in the manual were further verified by walkdown.

The inspector had no further questions based upon: the availability of both power sources simultaneously for the logic control circuitry for three UPS units; reduced loads on the remaining two units; routine replacement of control logic batteries; established procedures; and the replacement plan for the remaining two units by the end of 1992.

3.3 Other Plant System Internal Batteries Concern

The IIT post-event testing revealed that all UPS unit internal batteries were found fully depleted. The licensee had no schedule to replace them. The team was concerned that a similar problem may exist for other plant hardware which uses internal batteries.

To address the above NRC concern, the licensee initiated a DER-2-91-Q-875. A list of installed plant equipment with self-contained batteries was created. The licensee maintenance, engineering and other disciplines reviewed this list to ensure that applicable preventive maintenance (PM) for other system installed batteries was addressed in their respective procedures. The licensee developed PM requirements after reviewing the consequences of inoperable battery and equipment environmental conditions. For specialized equipment, such as NSSS systems, vendors were consulted.

The inspector's review of this list revealed that the licensee had reviewed the consequences of an inoperable battery function for Modicon programmable controllers on recirculation control system, drywell drains, gaseous monitoring system, reactor water cleanup system controls, rod worth minimizer system, the General Electric transient analysis recorders (GETARS) and fire protection panels.

Further review by the inspector of the developed PM program for various systems revealed that the licensee has reflected the replacement frequency of batteries for the above systems on the preventive maintenance/surveillance test computer database. A sample review of the battery replacement database was found adequate by the inspector.

Based on the above licensee corrective actions, the inspector had no further questions.

3.4 Circuit Breaker Concerns

The IIT team found that several circuit breakers experienced problems during the August 13, 1991, event and during subsequent troubleshooting. The feeder breaker to UPS-1A tripped twice when the damage control team attempt to restore the normal power for the UPS units. On UPS-1B, CB-3 would not close. Also, CB-2 on UPS-1D had been cycled 15 times during troubleshooting and finally would not close. Replacements were installed for UPS-1B and 1D.

The licensee took several actions to correct the circuit breakers problems. The overcurrent trip setpoints on all feeder breakers have been revised and documented. The failed breakers were replaced as required. The licensee completed a root cause evaluation with Wyle Laboratories to determine the causes of breaker failures. The CB-2 breaker failure was caused by a defective spot weld. Also, no failures occurred on similar breakers in the other UPSs. The license with Wyle Labs concluded that the failure was an isolated case.

The licensee found that the failure of CB-3 and CB-4 was caused by inadequate lubrication. These breakers were manufactured prior to 1985. The evaluation concluded that, due to a lack of adequate lubrication, metal-to-metal contact between the offset metal portion of the handle and the pivot brackets of the breakers (CB-3 and CB-4 are called GE switches, catalog Number TJK436Y400) caused gouging of the two surfaces. Ultimately, the increased friction led to the breaker failures. The licensee also sent a new breaker to Wyle Laboratory for inspection. The inspection found that the new breaker was operationally sound, with no binding of any sort. The licensee verified recently replaced breakers on all UPS units and confirmed they were manufactured during or after 1985, including the spare breaker in the warehouse.

During this inspection, the inspector reviewed the above documentation and verified the licensee corrective actions on a sample basis. The root cause evaluation performed by the licensee appeared to be adequate. In addition, the inspector verified that all breakers, CB-3 on UPS unit 1B and 1D and CB-4 on UPS 1B were manufactured during and after 1985. The inspector had no further concerns.

3.5 Other UPS System Enhancement

The inspector reviewed the licensee's detailed UPS load evaluation, and potential enhancements with implementation schedules. Two nuclear commitment tracking items,

NCTS-ID502882-02 and NCTS-ID502864-02, were opened to track the evaluation of the loads of all five UPS concerning plant impact resulting from the loss of a single unit and the design evaluation to enhance the UPS logic power supply, respectively. The inspector found that the following significant potential enhancements were considered by the licensee.

3.5.1 Stairwell Lighting Concern

This problem was noticed during the event. The corridor lights powered by the normal lighting system were on while those powered by the essential lighting (from UPS 1C & 1D) were off. The stairway lights were off because they were powered from the essential lighting system. In addition, some stairways had both essential and 8-hour battery pack lighting, but these stairways were dark since, per the 8-hour battery pack design, they come on only if normal ac power is unavailable. In this event, since some normal ac power was available, these lights stayed dark. To resolve the above concern, the licensee designed a modification, N2-89-042. This modification changes the stairwell lighting existing essential power supply to normal plant power. In the event UPS power is not available to these lighting fixtures, the backup power supply (8-hour battery pack) will be available per the new design.

During this inspection, the above modification was about 90% complete. The inspector reviewed several fixture replacements and changes to normal lighting from essential lighting.

Based on the above modification and sample review of the current installed conditions of the stairwell lighting fixtures, the inspector concluded that the above concern was adequately addressed by the licensee.

3.5.2 Communication System

A communication console in the control room and dial telephones are powered from UPS 1C and 1D at Nine Mile Point 2. During the event, the communication system was not available because of loss of all UPS units. A loss of both UPS would disable the control room announcement system.

The licensee designed a communication system, divided in two halves, with loads distributed between UPS 1C and 1D. Thus, a loss of a single UPS would only disable a single communication system. In addition, modification N2-87-038 is adding additional handsets in various areas to enhance the present communication. The new design will also be less susceptible to failure because of the enhanced UPS design.

3.5.3 Annunciator/Computer System

During the event of August 13, 1991, the control room annunciator powered from UPS 1A and 1B failed. After the initial event, the few annunciators that were reported functioning had backup batteries. If one UPS is lost, the other UPS should supply the load. The IIT team had a concern that, depending on the number of annunciators on at the time of the transfer, all annunciation could be lost due to an overload on the supply circuit.

The existing annunciator power distribution system is rated for 100% maximum load; however, a portion of it receives power from UPS 1A, while the remaining portion receives power from UPS 1B. Loss of power from either UPS will result in a loss of control room annunciator or associated computer inputs. The current design changes ensure complete operability of the annunciator system upon an individual loss of UPS 1A or UPS 1B. This is accomplished by providing an auctioneering circuit that selects between the two banks of power supplies each rated for 100% maximum load. One power supply bank will receive power from UPS 1A while the other will receive power from UPS 1B.

The inspector's review of the design change package revealed no concern. The inspector noted that the licensee has completed the NSSS portion of the annunciator circuit modification by implementing a single design change, SC2-0094-92. In addition, this design change added a loss of power alarm circuit that will detect the loss of power to the NSSS annunciation system from a single UPS and alert the operators in advance to a complete loss of annunciators.

The balance of plant portion of the annunciation system and the plant computer system are not scheduled for further enhancement since the new UPS design should improve annunciator reliability. Several other concerns such as alternate methods for rod position indication, reactor water level upset range indication and others were evaluated by the license. Based on their evaluation, no additional corrective actions are required at this time. In the case of a rod position indication alternative method, the licensee is awaiting BWR owners group final resolution with the NRC. Upon resolution, the licensee will take appropriate corrective action.

Based on the above licensee actions, the inspector had no further questions.

3.5.4 UPS Load Reduction

UPS units, UPS-IC, and ID were slightly overloaded. To maximize the reliability, maintainability, and performance of these units, the licensee has completed an engineering load shedding study and determined that approximately 30% of the UPS load can be reduced from the existing UPS 1C & 1D loads. The study accomplishes the 30% load reduction on the UPS 1C & 1D unit by considering the following changes:

1. Some of the dome lights in the egress lighting system in the turbine and screenwell buildings can be replaced with lower wattage fixtures.

2. Where there is both essential lighting and 8-hour battery pack lighting, change the essential lighting to normal.

3. Powering those receptacles that do not require UPS power from normal power.

During the inspection, the above modification was about 90% complete. The inspector reviewed several fixture replacements and changes to normal lighting from essential lighting. The inspector compared the calculated load on UPS units (approximately 54 kW) with actual load and found the existing load to be well below the (75 kW) ratings of the UPS units.

Based on the above modification and review of field conditions, the inspector concluded that the concern of overloading of UPS units 1C & 1D and the stairwell lighting concern was adequately addressed by the licensee.

4.0 UNRESOLVED ITEMS

Unresolved items are matters about which additional information is necessary to determine whether they are acceptable or they constitute a violation. Several unresolved items are discussed in detail under Section 3.0 and 4.0.

5.0 EXIT MEETING

The inspector met with the licensee's personnel denoted in Attachment 1 of this report at the conclusion of the inspection period on August 28, 1992. At that time, the scope of the inspection and the inspection results were summarized. At no time during the inspection was written material given to the licensee.

ATTACHMENT 1

PERSONS CONTACTED

Niagara Mohawk Power Corporation

*J. Bunyan, Senior Engineer
*B. Crandall, System Engineering
*M. McCormick, Plant Manager - Unit 2
*T. McMahon, Supervisor, Electrical Design - Unit 1
*A. Pinter, Site Licensing Engineer
*R. Tessier, Acting Plant Manager - Unit 1
*A. Zallwick, Supervisor, Site Licensing
J. Kroehler, Manager, QAE
L. Klosowski, General Supervision, Unit 1 (design)
J. Sullivan, Supervisor, Project Management, Unit 2
A. Rajun, Sr. Electrical Engineer, Unit 2
M. Ritzner, Project Engineer
K. Ward, General Supervisor, Unit 2 (design)
D. Goodney, Lead Electrical Engineer

U.S. Nuclear Regulatory Commission

*W. Schmidt, Senior Resident Inspector

*Attended the exit meeting.

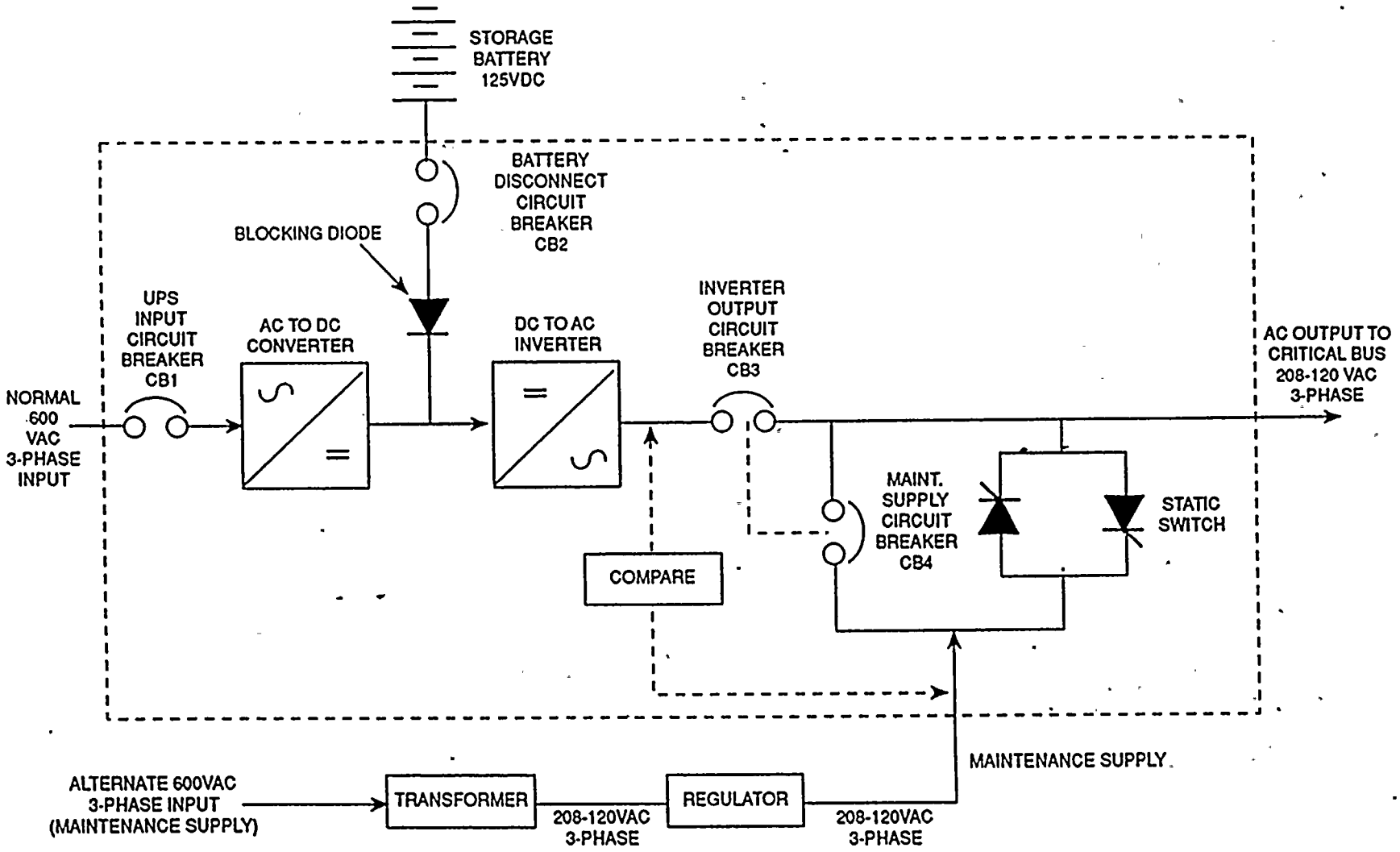

FIGURE 1.0 Simplified electrical single line diagram for a UPS unit

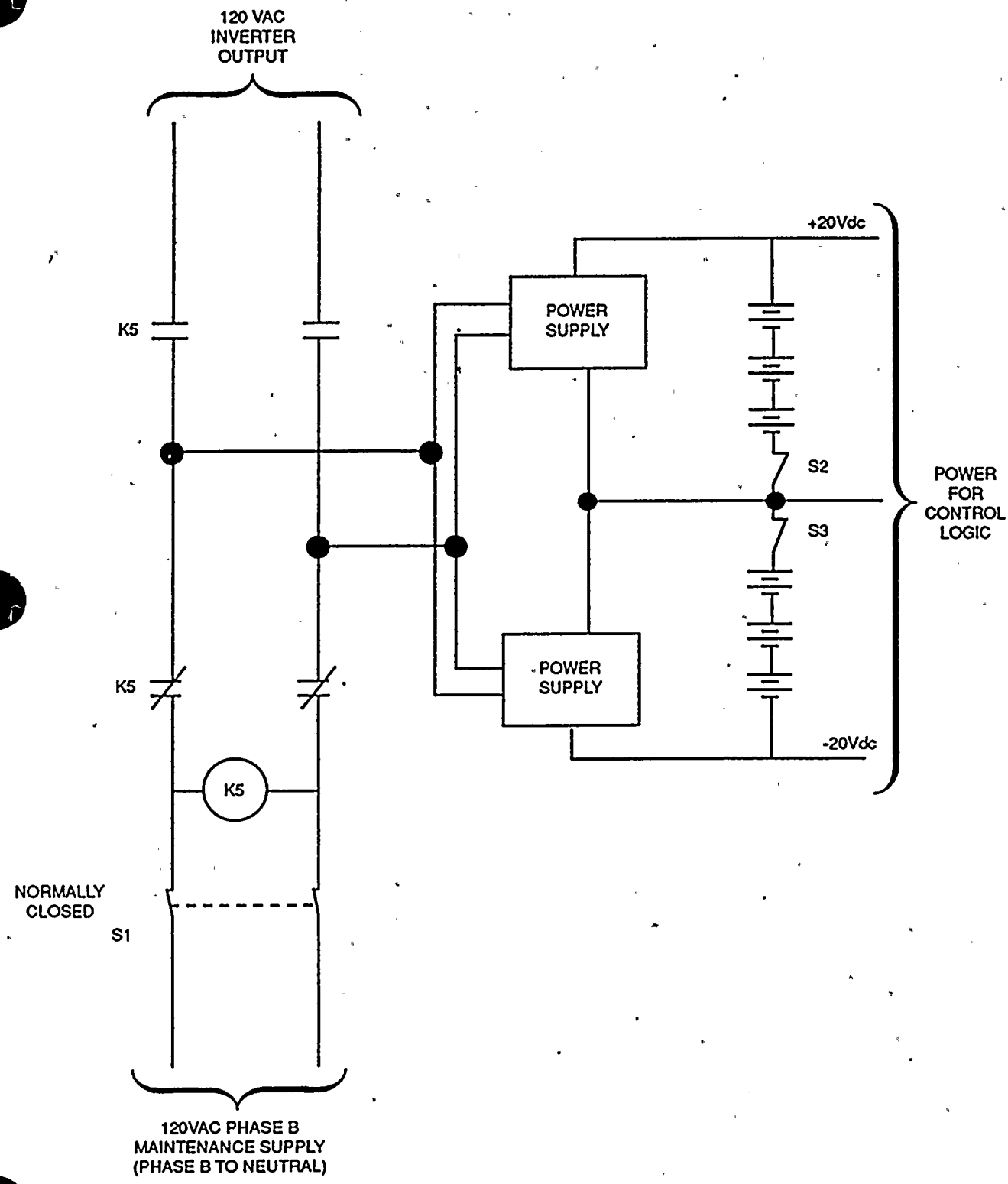

FIGURE 2.0 Simplified diagram for UPS control logic power supply (shown at time of event)

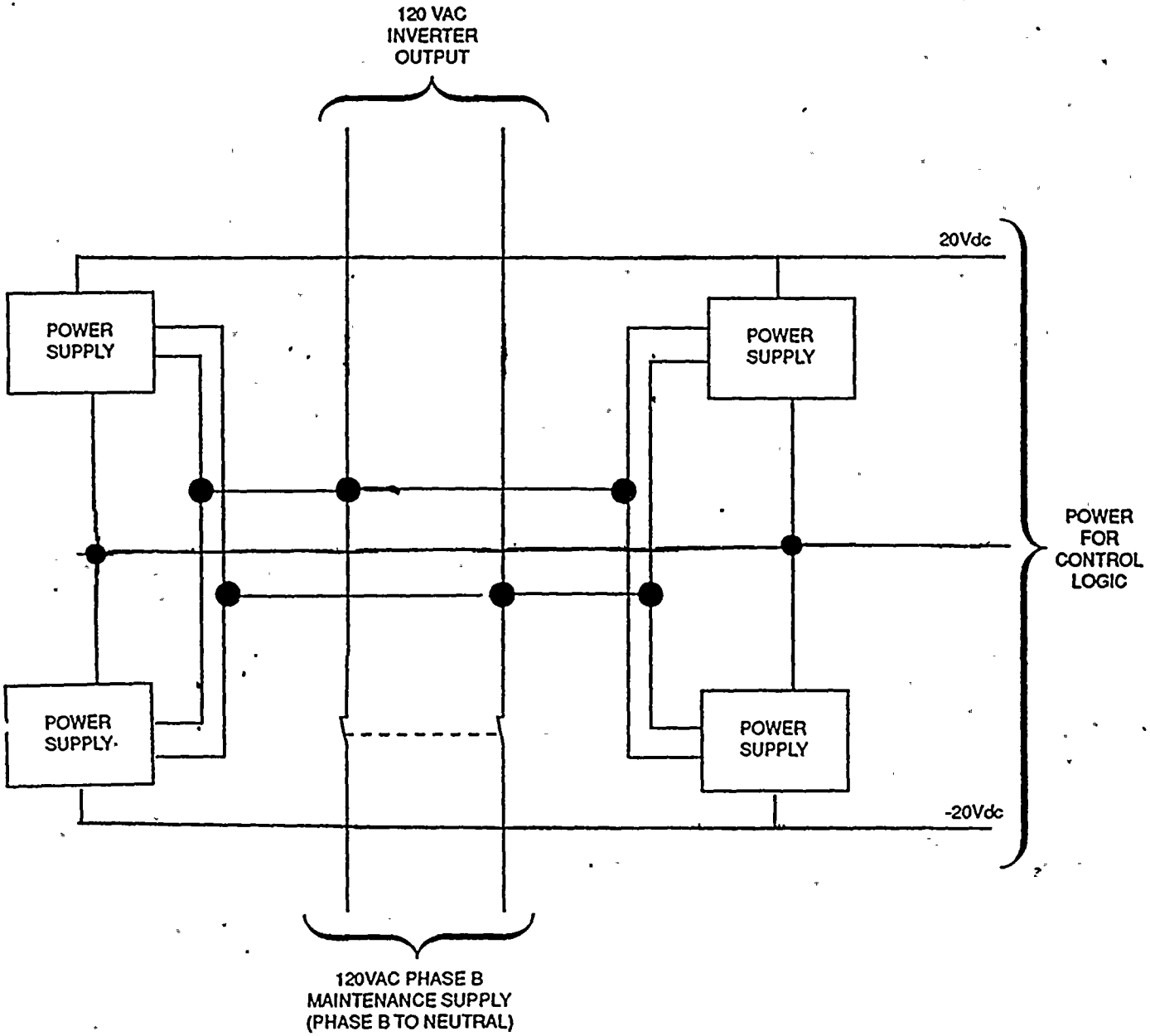

FIGURE 3.0 Simplified diagram for new UPS design of control power supply UPS-1C, 1D & 1F