SSINS No.: 6835
IN 86-70

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

August 18, 1986

IE INFORMATION NOTICE NO. 86-70: POTENTIAL FAILURE OF ALL EMERGENCY DIESEL GENERATORS

Addressees:

All nuclear power reactor facilities holding an operating license or a construction permit.

Purpose:

This notice informs recipients of multiple design deficiencies in a vital ac power system that could potentially result in the loss of all emergency diesel generators (EDGs). It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On June 10, 1986, in accordance with 10 CFR Part 21, Florida Power & Light (FP&L) reported the results of a failure modes and effects analysis (FMEA). This analysis identified multiple design deficiencies in the Turkey Point Units 3 and 4 vital ac power system that could potentially result in the loss of both EDGs due to overloading. In addition, one deficiency was identified that could result in the loss of all ac power to Unit 4. Turkey Point Units 3 and 4 share two EDGs. Simplified diagrams of part of the Turkey Point 3 & 4 electrical distribution system are provided as Figures 1 and 2.

One design deficiency involved a "swing bus." As shown on Figure 1, 480 volt MCC "D" is normally supplied from EDG "B" but will shift its power supply to EDG "A" if needed. MCC "D" also feeds a non-safety stub bus through a single circuit breaker. This breaker is normally opened by the 4B load sequencer to isolate the non-safety loads from MCC "D" when the 4B 4160V bus is loaded on EDG "B". A single failure in that circuit breaker would leave the non-safety loads connected to MCC "D". During safety injection for one unit, the additional non-safety loads could overload EDG "B", possibly resulting in a trip of this EDG. MCC "D" would then transfer its power supply and could overload EDG "A" as well.

In addition to the above design deficiency, five deficiencies in the EDG load evaluation were found, each of which could contribute to an overloading of both EDGs. Both EDGs could be overloaded in the event of a safety injection on one unit and a loss of offsite power to both units. In some cases this could occur without a single failure. These deficiencies are as follows:

- The post-TMI Emergency Operating Procedures require an additional charging pump and high head safety injection pump in the 1-30 minute and 30-60 minute EDG load interval, respectively.

- In the event of a single failure of one EDG, actual testing of component cooling water and intake cooling water showed that pump loads (KW) were higher than expected. Under this condition, the cooling water pumps provide flow to parallel hydraulic trains. Since the flow resistance is lower, the pump flow rate is greater and the pump motor horsepower would increase. This in turn may increase the load on the EDG to an unacceptable value.

- Recent environmental qualification evaluations per 10 CFR 50.49 assumed that the emergency containment coolers operate longer than previously assumed.

- Load center transformer losses had not been accounted for in prior EDG load evaluations.

- Some nonsafety loads that are auto-start enabled when the safety injection signal is reset could result in EDG overloading. These loads would not always immediately start, but would auto-start when their start setpoints were reached after the reset.

In addition to the overloading deficiencies above, a design deficiency was found that could result in the loss of one EDG, and at the same time could result in the loss of all ac power to Unit 4 as mentioned earlier. In the event of a single failure of the 4A battery or the 4A load sequencer subsequent to a loss of off-site power, the 4A 4160V bus shown in Figure 2 would be prevented from automatically loading onto the "A" EDG. It would also prevent the transfer of the 4A MCC swing bus from 4A load center to 4B load center. The "B" EDG has a self-contained supply of fuel oil that lasts about one hour. After that time, fuel must be gravity supplied by the day tank via a solenoid operated valve. However, this valve is powered from MCC 4A. Therefore, the above mentioned single failure would also cause the loss of the "B" EDG and the loss of all ac power to Unit 4. The Unit 3 3B 4160V bus would also be deenergized, along with three of the four high head safety injection pumps and the control room air-conditioning.

Discussion:

The single failure vulnerability of the non-safety stub bus discussed above may have been evaluated during the licensing review and the loads on the EDGs found to be low enough so that failure of the stub bus breaker would not overload the diesel. Subsequent to initial operation, however, additional loads have been

added on the diesels. Prior to November, 1985, there was the potential for loading the EDGs to 3544 kw in the 1-30 minute period and 3451 in the 30-60 minute period following a LOCA in one unit with a loss of offsite power in both units. These load levels exceed the highest FSAR value (1/2 hour exceptional rating) of 3050 Kw by a substantial margin. With the EDGs overloaded, the potential exists that safety-related loads would not start or would not operate at design ratings. Under these conditions, the EDG engines could stall and damage to the generator and/or engine could occur. There are no test data available to demonstrate that the EDGs could accept the above load levels.

As an interim solution to the above design deficiencies, FP&L disabled the automatic transfer between EDGs and established a dedicated operator to take corrective action (i.e., manipulate appropriate breakers) as necessary. The licensee has now modified EDG loads, loading sequences and plant procedures. This example illustrates the importance of reviewing EDG load limits under all possible operating configurations for a range of design basis accident conditions. FP&L, through an FMEA, system testing, and evaluation of EDG load limits, found design deficiencies that may have prevented one or both EDG's from performing their required function.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.

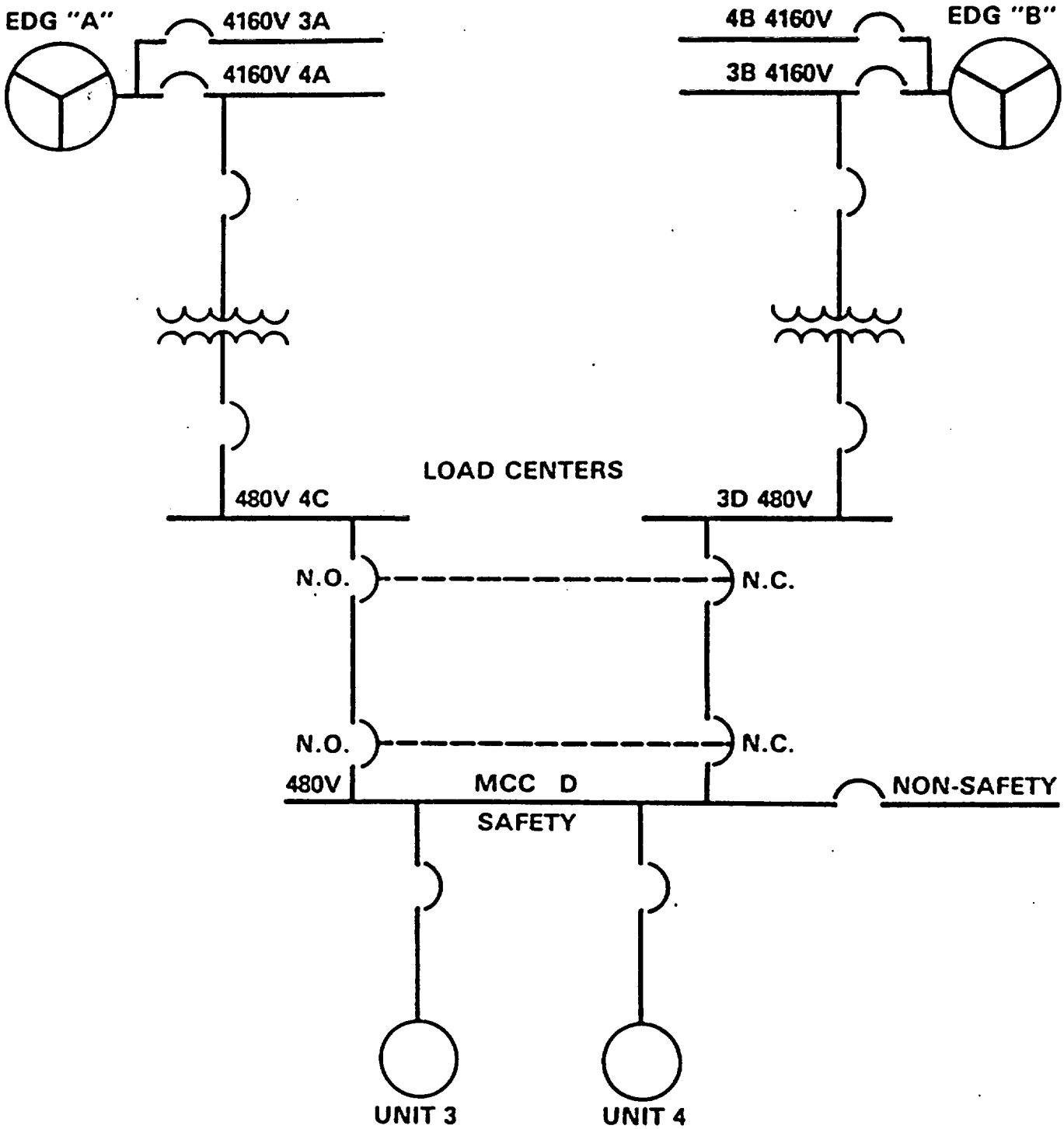
Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contacts: Henry Bailey, IE
(301) 492-9006

Joseph Giitter, IE
(301) 492-9001

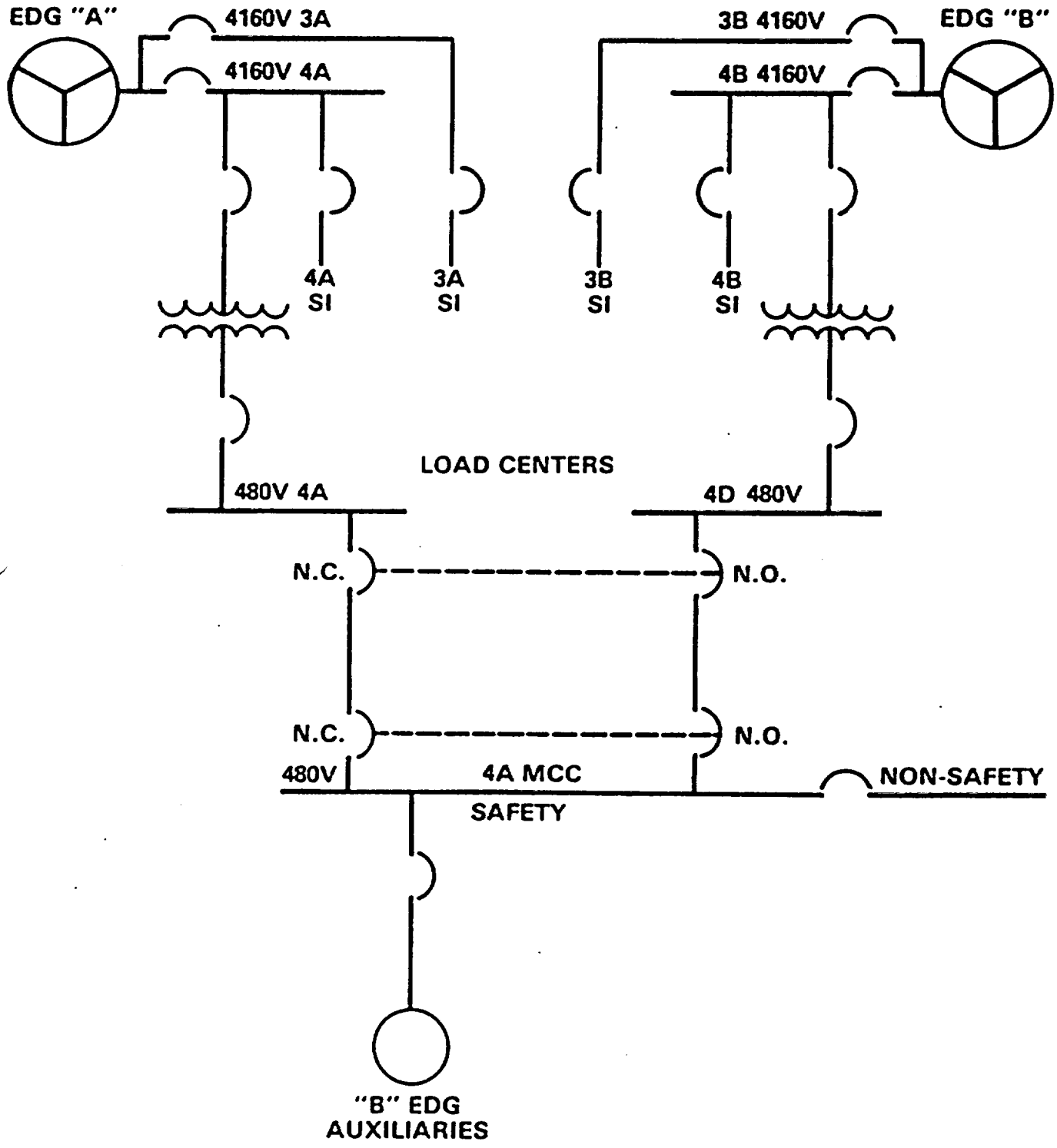
Attachments:
1. Figures 1 and 2, Turkey Point - Units 3 & 4*
2. List of Recently Issued IE Information Notices

FIGURE 1
TURKEY POINT - UNITS 3 & 4*



*Simplified Diagram of Portion of Electrical Distribution System.

FIGURE 2
TURKEY POINT - UNITS 3 & 4*



*Simplified Diagram of Portion of Electrical Distribution System.

LIST OF RECENTLY ISSUED IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
86-69	Scram Solenoid Pilot Valve (SSPV) Rebuild Kit Problems	8/18/86	All BWR facilities holding an OL or CP
86-68	Stuck Control Rod	8/15/86	All BWR facilities holding an OL or CP
86-67	Portable Moisture/Density Gauges: Recent Incidents And Common Violations Of Requirements For Use, Transportation, And Storage	8/15/86	All NRC licensees authorized to possess, use, transport, and store sealed sources
86-66	Potential For Failure Of Replacement AC Coils Supplied By The Westinghouse Electric Corporation For Use In Class 1E Motor Starters And Contractors	8/15/86	All power reactor facilities holding an OL or CP
86-65	Malfunctions Of ITT Barton Model 580 Series Switches During Requalification Testing	8/14/86	All power reactor facilities holding an OL or CP
86-64	Deficiencies In Upgrade Programs For Plant Emergency Operating Procedures	8/14/86	All power reactor facilities holding an OL or CP
86-63	Loss Of Safety Injection Capability	8/6/86	All PWR facilities holding an OL or CP
86-62	Potential Problems In Westinghouse Molded Case Circuit Breakers Equipped With A Shunt Trip	7/31/86	All power reactor facilities holding an OL or CP
86-61	Failure Of Auxiliary Feedwater Manual Isolated Valve	7/28/86	All power reactor facilities holding a CP

OL = Operating License
CP = Construction Permit