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ILLINOIS POWER COMPANY

IP

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

Docket No. 50-461

March 27, 1986

Director of Nuclear Reactor Regulation
Attention: Dr. W. R. Butler, Director
BWR Project Directorate No. 4
Division of BWR Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station
Electrical Circuits Inspection

Dear Dr. Butler:

In Letter U-600477, dated March 17, 1986, Illinois Power Company (IP) provided you with the Illinois Power responses to Mr. J. Lazevnick's findings from his October 29-30, 1985, on-site inspection of electrical circuits and drawing review. Provided as an attachment to the letter was the General Electric (GE) analysis to evaluate electrical and functional independence of electrical protection assembly (EPA) and inverter circuits.

After reviewing the GE analysis, Mr. Lazevnick had comments regarding section 4.2 on functional independency of the inverter and the EPA. These comments were discussed in a conference call between Mr. Lazevnick, GE, and Illinois Power on February 25, 1986. As a result of this conversation, GE has issued the attached revision of section 4.2 of the analysis, which IP understands will resolve the comments raised by Mr. Lazevnick.

Please contact me if additional information is needed.

Sincerely yours,

F. A. Spangenberg
Manager - Licensing and Safety

SWP/ckc

Attachment

cc: B. L. Siegel, NRC Clinton Licensing Project Manager
NRC Resident Office
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

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REVISED 4.2 PARAGRAPH OF THE ANALYSIS

4.2 Functional Independence of Inverter and EPA

The EPA (card J4) and inverter cards, although mounted in the same card cage, can be considered functionally independent because a single failure on a logic card, or of a component connected to a logic card, will not cause unsafe failure of both the EPA and inverter circuits.

4.2.1 All components on the logic cards are of low voltage and/or low current devices except the transistor (Q104 on Alarm Card, location J2) driving Alarm relay K2, and the transistor (Q2 on EPA Card, location J4) driving the undervoltage coil of circuit breaker CB3. Each of these circuits has, on the respective card, a 22 ohm, 1/2 watt current limiting resistor in series between the driving transistor and the load. Should the coil of relay K2 or the undervoltage coil of breaker CB3 become shorted, the full 125 Vdc would be applied across the current limiting resistor, causing it to fail open immediately (act like a fuse), thereby preventing long-term heating of the card cage. In the case of the K2 circuit, there is a card between the Alarm Card and the EPA Card so that the "popping" resistor will not affect the EPA Card. In the case of the undervoltage coil circuit, the current limiting resistor is about 1.75 inches from the adjacent card so that there is minimal chance of affecting the adjacent card. Also, if the undervoltage coil were to short, the breaker contacts would open and remove the inverter power from the RPS bus, thereby rendering the effect of the component failure (resistor popping) irrelevant.

4.2.2 Within card cage assembly, there are no interconnecting wires from EPA Card (J4) and the rest of the inverter cards. The power to the load drivers on the EPA Card is taken directly from the measured voltage (output of inverter or alternate power). For detailed design see FDDR LH1-3001, Rev. 3.

4.2.3 For fault conditions (hot short and ground short conditions) that may cause damage to wires, consideration was given primarily to the possible failure of components in circuits monitoring, or powered by, 125 Vdc or 120 Vac, since these are the only high energy, unfused power signals in the wiring bundle to the card cage. Due to the mechanical layout (location of connectors and spacing of pertinent pins within connectors), and the sizing of the printed circuit wiring of the backplane and the PC cards, all postulated faults on the backplane, or on a card in the card cage assembly, do not result in damage to the wiring. PC wiring on the backplane and PC cards is laid out in four standard widths, the cross-sectional area being equivalent to 70, 140, 175, or 350 circular mils. Cabling to the backplane is either #18 or #22 wire, corresponding respectively to either 1624 or 642 circular mils. The #18 wire is mainly power and is connected to the 175 or 350 circular mils PC wiring. The #22 wire is the standard control signal wiring and is connected to the 70 or 140 circular mils PC wire runs. Therefore, any fault condition on the backplane, or on a card in the card cage assembly, that results in a current of sufficient magnitude to cause cable damage, would first cause failure (open circuit) of the printed circuit wiring on the backplane or on a printed circuit card ("fuse like" action of this small gauge wiring).

4.2.4 For loose wire faults, consideration was given to connector location and relative position between pertinent pins within a connector and between adjacent connectors. The relative positions of the backplane connectors, and of the signals on each connector pin, is such that one loose wire will not fall on another connector pin and cause failure of both the EPA and the inverter (see Figure 1).

4.2.5 The low voltage control power is fused in either the DC to DC converter or by fuse F8 on the I/O Assembly (see Figures 2 and 3).

4.2.6 An open circuit represents a fail-safe condition. Any open circuit condition in the inverter or EPA will initiate a trip signal which is a safe condition.