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ILLINOIS POWER COMPANY



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

October 24, 1985

Docket No. 50-461

Mr. James G. Keppler
Regional Administrator
Region III
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Subject: Reportable 10CFR50.55(e) Deficiency 55-85-06:
Wiring and Workmanship Deficiencies in
Safety-Related Vendor Supplied Electrical Panels

Dear Mr. Keppler:

On June 26, 1985, Illinois Power Company notified Mr. F. Jablonski, NRC Region III, (ref: IP memorandum Y-36012 dated June 26, 1985) of a potentially reportable deficiency under the provisions of 10CFR50.55(e) concerning various internal wiring and workmanship deficiencies in vendor supplied safety-related electrical panels. The quality and adequacy of certain panels to perform their intended design function was indeterminate. This initial notification was followed by one (1) interim report (Ref: IP letter U-600204, D. P. Hall to J. G. Keppler dated July 26, 1985). Our investigation of this matter is complete. Illinois Power has reviewed and evaluated the findings associated with this investigation and has determined that the identified deficiencies associated with the excessively bent lugs and broken conductor strands could have resulted in a condition adverse to the safety of operations of the Clinton Power Station (CPS). On this basis the issue is considered to be reportable under the provisions of 10CFR50.55(e). This letter is submitted as a final report in accordance with the requirements of 10CFR50.55(e). Attachment A provides the details of our investigation.

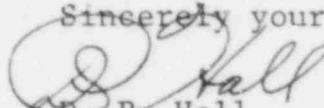
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We trust that this final report provides you sufficient background information to perform a general assessment of this reportable deficiency and adequately describes our overall approach to resolve this issue.

Sincerely yours,


D. P. Hall
Vice President

RLC/ckc

Attachment

cc: NRC Resident Office
Director, Office of I&E, USNRC, Washington, DC 20555
Illinois Department of Nuclear Safety
INPO Records Center
B. L. Siegel, NRC Clinton Licensing Project Manager

ATTACHMENT A

Illinois Power Company
Clinton Power Station
Docket No. 50-461

Reportable 10CFR50.55(e) Deficiency 55-85-06:
Wiring and Workmanship Deficiencies in
Safety-Related Vendor Supplied Electrical Panels

Final Report

Statement of Reportable Deficiency/Background

A condition potentially adverse to quality was identified in the area of vendor supplied safety-related electrical panels involving internal wiring and workmanship deficiencies.

Prompted by reports of documentation, wiring, and workmanship deficiencies at Enrico Fermi, Beaver Valley II, and other nuclear power plants, Illinois Power Quality Assurance (IPQA) Department initiated a sampling inspection program of safety-related electrical panels at the Clinton Power Station (CPS). The initial inspections identified instances of internal wiring and workmanship deficiencies involving various vendors. A 10CFR50.55(e) investigation was initiated to address class IE electrical panels. A list of panels to be inspected was generated from Sargent & Lundy's Mechanical Department Equipment List. Panels with no internal vendor wiring, and panels previously inspected or evaluated as being acceptable were excluded. The following panels were excluded:

1. The General Electric Power Generation Control Complex (PGCC) had previously been inspected on a sample basis with no significant discrepancies identified. The PGCC had also been factory inspected to verify all indent-compression (crimp) connections. Additionally the PGCC was subject to four audits by Illinois Power Quality Assurance (IPQA) Department during the manufacturing period. No findings related to workmanship were issued.
2. MCC Powers' Panels were also excluded from reinspection based on a sample inspection which indicated overall satisfactory workmanship with no significant deficiencies identified.

Investigation Results

Illinois Power Quality Assurance (IPQA) reviewed for adequacy the following Baldwin Associates' procedures for field modifications and inspection of electrical panel equipment:

ATTACHMENT A
(continued)

1. BAP 2.3, Rev. 13, Receiving and Issuance
2. BAP 2.10, Rev. 11, Equipment Installation
3. BAP 3.3.3, Rev. 7, Cable Terminations.

The above review by IPQA concluded that the contractors' procedures were adequate to preclude workmanship deficiencies resulting from work performed on electrical panels by the constructor.

A total of 98 Class IE electrical panels were included in our inspection effort, comprised of medium voltage switchgear, low voltage switchgear, motor control centers, and other electrical equipment. This inspection resulted in the initiation of 77 Nonconforming Material Reports (NCMRs) which documented identified deficiencies. The following major deficiencies were identified:

1. Improperly made indent-compression (crimp) connections.
2. Broken conductor strands in excess of allowable.
3. Conductor insulation not under the jacket of insulated lugs.
4. Missing or incorrect identification on wire or at terminating device.
5. Panel internal wiring not to the vendors'/engineers' drawings.

Corrective Action

Corrective action associated with this investigation includes physical rework of panels as well as vendors' and engineers' drawing corrections as required by the NCMR dispositions.

Some reported differences between physical installations and drawings (at the time of inspections) were simply due to either physical work not yet performed (from design changes) or design change documents still outstanding against drawings. Because no problems were discovered in the tracking mechanisms in these areas, no corrective action for these differences is required.

A small number of vendors' and engineers' (vendor reproduced) drawings contained omissions (i.e., jumper not shown) or did not show as-built wiring. These drawings are being corrected in accordance with approved procedures.

It is anticipated that all corrective action associated with this investigation will be completed by November 30, 1985.

ATTACHMENT A
(continued)

Root Cause

Our investigation of this matter has determined the root cause(s) to be:

- ° A lack of attention to details by the vendor surveillance and receipt inspection personnel regarding the inspection of work performed at the vendors' facilities, and inspection of field modifications performed at the Clinton Power Station (CPS).

Safety Implications of Identified Deficiencies

The following is a discussion of the safety implications associated with the five (5) major deficiencies identified as a result of this investigation:

1. Problems with indent-compression connections (crimping practices).

Of the observed deficient conditions, instances of poorly crimped conductors were the most numerous. If one of the improperly crimped wires were to detach from its lug under vibratory seismic loadings, a loss of function of the equipment could result.

There were two generic problems reported with crimping practices.

The first generic problem concerned the wire not extending to the end of the lug barrel. If the wire extends beyond the barrel indent, the wire is adequately captured within the crimp, and is acceptable.

The second generic problem concerned twisted, or excessively bent lugs. Copper work-hardens, and eventually cracks and breaks. Thus, the condition of a twisted or excessively bent lug is indeterminate, and could crack and break due to vibratory motion.

2. Broken conductor strands.

Several instances were found where conductors were partially cut or nicked, and conductor strands were broken. In specific instances conductor damage was excessive, resulting in reduced

ATTACHMENT A
(continued)

conductor capacity. If left uncorrected, this could cause failure of the equipment to perform its intended functions.

3. Conductor insulation not under jacket of insulated lugs.

A slight gap between the conductor insulation and lug insulation would not adversely affect the termination of the circuit. The installed configuration on the terminal block would have effectively isolated the exposed conductor from possible shorts.

4. Missing or incorrect identification on wire or at terminating device.

A missing or incorrect label has no effect on circuit performance.

5. Panel internal wiring not to engineers' (vendor reproduced) drawings.

One case was found in the hydrogen recombiner panel where the as installed condition did not agree with the engineers' drawings for wiring to several internal devices. However, the panels were functionally correct, and had been checked and tested for proper circuit and system function in the factory.

Safety Implication/Significance

Illinois Power has reviewed and evaluated the findings associated with this investigation and has determined that the identified deficiencies associated with the excessively bent lugs and broken conductor strands could have resulted in a condition adverse to the safety of operations of CPS. On this basis the issue is considered to be reportable under the provisions of 10CFR50.55(e).