

AEOD TECHNICAL REVIEW REPORT*

UNIT: Fort Calhoun, Unit 1
DOCKET NO.: 50-285
LICENSEE: Omaha Public Power District
NSSS/AE: Combustion Engineering/Gibbs & Hill

TR REPORT NO. AEOD/T409
DATE: 5/10/84
EVALUATOR/CONTACT: F. Ashe

SUBJECT: MULTIPLE FAILURES OF BELL AND HOWELL DUAL POTENTIOMETER MODULES
WHICH OCCURRED AT THE FORT CALHOUN NUCLEAR STATION

EVENT DATES: July 9, 1983, July 14, 1983 and July 22, 1983

- REFERENCES:
- (1) Omaha Public Power District, LER 83-005/03L-0, Docket No. 50-285, dated July 12, 1983.
 - (2) Omaha Public Power District, LER 83-006/03L-0, Docket No. 50-285, dated July 22, 1983.
 - (3) Omaha Public Power District, LER 83-007/03L-0, Docket No. 50-285, dated August 9, 1983.
 - (4) Letter from R.R. Mills, Project Manager Fort Calhoun, to W.C. Jones, Omaha Public Power District, Subject: Upgraded RPS Potentiometer Modules for Fort Calhoun, dated January 26, 1984.
 - (5) Memorandum from R. L. Baer, NRC, to R. P. Denise, NRC, "Potential Generic Failures in RPS Systems - Bell and Howell Dual Potentiometers," April 12, 1984.

SUMMARY

This Technical Review Report provides information concerning three events involving failures of Bell and Howell dual potentiometer modules which occurred at the Fort Calhoun Nuclear Station. These modules are used in the Reactor Protection System at the station. A description of these three events are provided in References 1, 2 and 3.

As a result of these events, IE Headquarters and AEOD conducted activities for the purpose of identifying additional events involving failures of Bell and Howell potentiometer modules. The results of these activities were that no additional significant failures of these devices were identified. However, Reference 4 which was provided by Combustion Engineering (CE) identifies a potential common cause type of failure mechanism for these devices. In time, this failure mechanism could result in the simultaneous failure of redundant potentiometer modules.

*This document supports ongoing AEOD and NRC activities and does not represent the position or requirements of the responsible NRC program office.

Recognizing the common cause type of failure mechanisms identified in Reference 4, we believe that further actions regarding this issue are not warranted at this time in view of the lack of sufficient bases for such actions. However, on the basis of the identified failure mechanism, it is suggested that AEOD monitor such potentiometer modules for future failures.

DISCUSSION

References 1, 2, and 3 (Licensee Event Reports) provide descriptions of three events involving failures of Bell and Howell dual potentiometer modules at the Fort Calhoun Nuclear Station. These three events occurred on July 9, 1983, July 14, 1983 and July 22, 1983.

The Reactor Protection System (RPS) at the Fort Calhoun Station uses 36 Bell and Howell dual potentiometer modules. Each of the four channels provided in the RPS to monitor axial power distribution uses 9 of these devices. Each of the three events which occurred in July, 1983 resulted in one of the four channels provided for axial power distribution being declared inoperable, since the failure of the dual potentiometer module caused the trip setpoint for that channel to be improper. However, for each of these three events, the remaining three channels monitoring axial power distribution were operable, available and fully capable of performing the required function (i.e. providing adequate reactor protection) if the need for this function had occurred. Corrective actions for each of these three events were to replace the faulty module with an upgraded one (improved design) and recalibrate the associated channel.

As a result of the three failures of this device occurring within a two week period of time, the licensee initiated an Engineering Evaluation and Assistance Request (EEAR) to investigate whether or not the failures of the dual potentiometer modules were generic and if so to investigate a reasonable course of action. The results for this EEAR was that based on the information obtained during this investigation, there appeared to be no indication of a generic problem with these modules. Accordingly, following the completion of this investigation, it was recommended that no further action be taken regarding this issue. However, informal discussions (about the reported failed modules) between instrumentation and control personnel at Combustion Engineering (CE) and the Fort Calhoun Station resulted in CE indicating that the type of failure observed at Fort Calhoun is generic in nature. This result is documented in Reference 4. Further, this reference indicates that CE attributed these failures to an electrical/chemical phenomenon common to the usage of wire wound potentiometers used in direct current circuits in which the potentiometer setting is never or rarely moved. In addition, CE indicated the problem appeared to be related to corrosion of the wire wound potentiometer at the point of contact by the wiper, and is a function of the current through the potentiometer and time. The replacement for this module is an upgraded module which has been designed to eliminate this problem by the use of a buffer amplifier and a wire wound potentiometer impregnated by a conductive plastic.

With regard to this issue, the plant systems unit obtained additional information from the Nuclear Plant Reliability Data System (NPRDS) regarding failures

of Bell and Howell instrumentation. One result of our review of this information was that Bell and Howell potentiometer modules appeared to be used only at CE plants. Also, based on the review of this data, no failure mechanism identical or similar to the one identified for the failed modules at the Fort Calhoun Station could be identified for such modules at any other CE Station.

In addition to the above, IE Headquarters requested information from the NRC Regional Offices concerning failures of Bell and Howell dual potentiometer modules. This information was requested for selected CE plants. The results of this request are provided in Reference 5 and summarized below:

<u>Date as of Which Response Is Current</u>	<u>Plant Name</u>	<u>Responding Regional Office</u>	<u>Response</u>
3/22/84	Palisades	RIII	Does not use identified dual potentiometer module
3/29/84	Arkansas 1	RIV	No failure identified
4/6/84	Calvert Cliffs 1 and 2	RI	No failure identified
4/6/84	Maine Yankee	RI	1 failure identified
4/6/84	Millstone 2	RI	No failure identified
4/6/84	St. Lucie 1 and 2	RII	No response

Based on the responses to the request (as shown above) and follow-up investigations with Bell and Howell and CE, IE Headquarters did not consider the failures of the dual potentiometer modules which occurred at Fort Calhoun to indicate a generic problem and therefore do not intend to issue an IE Information Notice at this time.

FINDING

In view of the information presented in the discussion above, the following findings are provided.

1. The results of the activities conducted by IE Headquarters and AEOD for the purpose of identifying additional failures of Bell and Howell dual potentiometer modules was that no additional significant failures of these devices were identified.
2. The failure mechanism identified by CE for these dual potentiometer modules is a common cause type of failure mechanism which in time could result in the

simultaneous failures of redundant modules. Further, such a failure mechanism is typical for potentiometers used in the identified application.

CONCLUSIONS

Based on the results of their activities which included follow-up investigations with Bell and Howell and Combustion Engineering (CE), IE Headquarters does not consider this issue to be generic and therefore they do not plan any further actions for this issue at this time.

Notwithstanding the common cause type of failure mechanism identified for these potentiometer modules, we believe that further actions on this issue are not warranted at this time in view of the lack of sufficient bases for such actions. However, on the basis of the identified failure mechanism, it is suggested that AEOD explicitly monitor such potentiometer modules for future failures.