

AEOD ENGINEERING EVALUATION REPORT*

UNIT: Shoreham Nuclear Power Station
DOCKET NO.: 50-322
LICENSEE: Long Island Lighting Company
NSSS/AE: General Electric/Stone & Webster

EE REPORT NO. AEOD/E407
DATE: March 26, 1984
EVALUATOR/CONTACT: F. Ashe

SUBJECT: INITIATION AND INDICATION CIRCUITRY FOR HIGH PRESSURE
COOLANT INJECTION (HPCI) SYSTEMS

REFERENCE: IE Inspection Report No. 50-322/83-28, dated September 14, 1983

SUMMARY

This Engineering Evaluation Report provides information concerning the initiation and indication circuitry for HPCI systems at boiling water reactor (BWR) facilities.

As described in item 7 of the referenced report, the inspector noted that the HPCI circuitry did not appear to meet the intent of IEEE Standard 279-1971. The concern noted was that for certain conditions, the HPCI system function would not go to completion once initiated, although the indication circuitry would respond as though the system had gone to completion. As a result of this observation by the inspector, the licensee committed to initiate a design change to remove the concern regarding compliance with the required IEEE Standard.

In view of the identified concern regarding the HPCI circuitry at the Shoreham Nuclear Power Station, the Plant Systems Unit reviewed the HPCI initiation and indication circuitry for three additional BWR facilities to identify if a similar concern is applicable to these facilities. The results of this review was that the concern is applicable to the HPCI circuitry for two of the three facilities.

Based on our review of this issue, we believe that the actions taken at the Shoreham Nuclear Power Station were appropriate, and if implemented properly, they should remove the concern regarding compliance with the intent of the required IEEE Standard. Also, in view of the finding regarding two additional facilities, we believe that consideration should be given to reviewing the identified area of the HPCI circuitry of other BWR facilities so as to verify that this area of the circuitry is in conformance with the intent of the required standard.

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

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DISCUSSION

Item 7 of the referenced report addresses the initiation and indication circuitry for the High Pressure Coolant Injection (HPCI) system at the Shoreham Nuclear Power Station. As described in this reference, 10 CFR 50.55a(h) states that plant protection systems must meet the requirements of IEEE Standard 279-1971. The Final Safety Analysis Report (FSAR) for the Shoreham Station commits to this standard and Chapter 7.3 of the FSAR describes how the standard is implemented for the Emergency Core Cooling System. Paragraph 4.16 of IEEE 279 requires that the protection system be designed so that, once initiated, a protective action at the system level shall go to completion. During reviews of electrical wiring drawings, the inspector noted that the HPCI initiation system did not appear to meet the intent of paragraph 4.16 for either automatic or manual initiation.

Specifically, the HPCI can be initiated by low reactor water level, high drywell pressure or a manual pushbutton. Any of these signals will energize the K2 and K3 relays, which do not seal in. The K3 relay in turn energizes the K6 relay which does seal in. Contacts from the K2 and K6 relays actuate the various HPCI components. Even if the manual pushbutton is released or the automatic signals clear, all attendant actions with one exception will go to completion. The one exception is motor-operated valve E41-035 which is the HPCI pump discharge valve. In order for this valve to open, the HPCI turbine steam inlet valves must be off their closed seats and the K2 relay energized. There is an eleven to thirteen second time delay in getting the turbine inlet valves off their closed seats, hence, if the manual pushbutton is released or if the automatic signal clears before eleven to thirteen seconds, the K2 relay de-energizes and motor-operated valve E41-035 will not open. The net result of this design for such conditions is that the HPCI system will operate in a recirculation mode which injects water into the suppression pool rather than the reactor vessel. An associated concern for such conditions is that the HPCI initiation light would light and seal in even though the pump discharge valve has not opened. Such a situation may tend to confuse the operator, since the HPCI initiation light would indicate that the system is operating in its normal mode when in actuality the system would be operating in a recirculation mode. Such a design does not appear to be in compliance with the intent of the required IEEE Standard. As a result of these observations by the inspector, the licensee committed to initiate a design change for the HPCI system to ensure that this system goes to completion once initiated. This item is unresolved at this time for the Shoreham Station and is pending implementation of the design change.

Based on the information contained in the referenced report, AEOD conducted a review of the diagrams for the HPCI systems at three additional boiling water reactor (BWR) facilities. The purpose of conducting this review was to determine if a similar concern regarding the initiation and indication circuitry for the HPCI system also existed at these facilities. The three facilities selected were Browns Ferry, Hatch, and Brunswick. Using the elementary electrical diagrams along with the piping and instrument diagrams for these facilities, we have determined that a similar concern relating to the HPCI circuitry also exist at the Hatch and Brunswick facilities.

FINDINGS

Based on the preceding discussion and follow-up activities conducted for the referenced report, the following findings are provided:

1. We believe that the HPCI initiation and indication circuitry for the Shoreham Station is not in compliance with the intent of the required IEEE Standard.
2. Our review of the applicable diagrams for three other operating BWR (Browns Ferry, Hatch, and Brunswick) facilities shows that at two of these facilities the HPCI initiation and indication circuitry is similar to that at the Shoreham Station.

CONCLUSION

Based on our review and follow-up activities conducted for the referenced report, we believe that the action taken at the Shoreham Station regarding the HPCI circuitry was appropriate. Also, if the design of the HPCI circuitry is properly modified and implemented, such action should remove the identified concern. In addition, in view of the second finding above, we believe that the identified area of the HPCI circuitry for other BWR facilities should be reviewed to verify that this circuitry is acceptable in terms of complying with the required Standard.

SUGGESTED ACTION

In view of the preceding information, we believe it would be appropriate to consider reviewing the identified area of the HPCI circuitry of other BWR facilities to verify that this area of the circuitry is in compliance with the intent of the required IEEE Standard (279).