50-269

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 7, 1978

MEMORANDUM FOR: R. W. Reid, Chief, Operating Reactors Branch #4, DOR

FROM: G. Lainas, Chief, Plant Systems Branch, DOR

SUBJECT: OCONEE NUCLEAR STATION UNITS 1, 2 AND 3: EVALUATION OF THE ELECTRICAL INSTRUMENTATION AND CONTROL (EI&C) ASPECTS OF THE PROPOSED MODIFICATION OF HIGH PRESSURE INJECTION SYSTEM (TACS 10111, 10112 & 10113)

Plant Name: Oconee Nuclear Station
Units 1, 2 and 3
Docket Nos.: 50-269, 50-270, 50-287
Responsible Branch: ORB#4
Project Manager: M. Fairtile
Reviewing Branch: Plant Systems Branch
Review Status: Complete

The Duke Power Company, by letter dated July 14, 1978, submitted its proposed design modification to the High Pressure Injection (HPI) Systems of Oconee 1, 2 and 3. By letter dated November 6, 1978, the licensee provided additional information regarding the system.

The licensee's proposed modification consists of installing cross-connect lines between the discharge lines of the HPI system. Each cross-connect line is provided with an electrically-operated, remote-manually-controlled isolation valve that is capable of being operated for the main control room. The motor operators of these valves will be powered by a source of power supply independent of that supplying power to the HPI A or B flow train valves.

Based on its review, the Plant Systems Branch finds the proposed design modification acceptable. The details of our review are provided in the enclosed report.

G. Lainas, Chief
Plant Systems Branch
Division of Operating Reactors

cc: See next page

Contact:
M. Chiramal
X-28077

Enclosure:
As stated

cc w/enclosure:
V. Stello
D. Eisenhut
G. Lainas
M. Fairtile
D. Tondi
M. Chiramal

SAFETY EVALUATION OF THE ELECTRICAL, INSTRUMENTATION AND CONTROL ASPECTS OF THE PROPOSED MODIFICATION OF HIGH PRESSURE INJECTION SYSTEMS OF OCONEE NUCLEAR PLANT, UNITS 1, 2 AND 3

Introduction

The proposed design modification to the HPI system of Oconee Nuclear Station Units 1, 2 and 3 was submitted by the licensee as the long-term fix intended to effectively mitigate small break LOCA's with minimum operator action.

The proposed design modification was submitted by the Duke Power Company by its letter of July 14, 1978. By its letter dated October 6, 1978, Duke Power Company replied to the NRC letter of September 26, 1978, which presented staff position's regarding operator actions for which credit may be taken following a small break LOCA. By letter dated November 6, 1978, the licensee provided certain additional detailed information regarding the HPI system.

In the existing High Pressure Injection System of Oconee Nuclear Station, three (3) HPI pumps are normally available (see Figure 1), and all three pumps are automatically started when the Engineering Safeguards (ES) signal is actuated. The discharge of these pumps is injected into the reactor coolant system through two independent injection lines, each branching into the smaller lines and terminating in the reactor coolant cold legs. Under normal design conditions HPI flow by two pumps through two injection paths are adequate to provide the necessary flow into the core during small break events. There exists, however, two postulated failure modes of the HPI flow trains, which could render one HPI train inoperable - (1) failure of HPI pump C, and (2) failure of ES valve (HP-26 and HP-27) in the injection line. To assure that two HPI trains are available, as required by the recent analysis of small break LOCA's, the station operating procedures have been revised to require operator action outside the control room to establish flow in applicable HPI flow trains. The proposed modification of the HPI system is intended to eliminate operator action outside the control room and to effectively anticipate the consequences of small break LOCA's.

The proposed modification consists of installing a cross-connect line between the A and C HPI discharge lines downstream from the ES valves (HP-26 or HP-27) and another tie line connecting this cross-connect line and the HPI pumps common discharge header (see Figure 1). Remote-manually-controlled, electrically operated isolation valves HPI-X and HPI-Y, capable of being operated from the control room, will be provided. The motor operators of

isolation valves HPI-X and HPI-Y will be supplied power from the Blue Bux 600V and 208V MCC (depending upon the rating of the motor operator) which is supplied by the 4160V Engineered Safeguards (ESF) Blue Bus XTE (where X = 1, 2 or 3 for Oconee Unit 1, 2 or 3) (Reference FSAR Figures 8-2, 8-3, 8-4). The HPI-A flow train elements (valves HP-24 and HP-26, and HPI pump A) are supplied power from the ESF Gray Bus and the HPI-B flow train element (valves HP-25 and HP-27, and HPI pump CO are supplied by the ESF Yellow Bux. The three redundant ESF buses (Blue, Grey and Yellow) are each in turn supplied power from the two redundant main 4160V feeder buses. With this configuration the operators of isolation valves HPI-X and HPI-Y are seen to be powered by a source of power supply independent of that supplying power to the HPI-A and HPI-B flow trains.

The licensee has stated that the material and equipment involved in the proposed modification will be designed, manufactured, qualified and tested in conformance to the applicable standards and codes that apply to the present HPI system.

Discussion

The proposed modification requires an operator to perform the action of positioning the control switches of isolation valves HPI-X and HPI-Y to the open position, in the event of a small break LOCA and the loss of one of the existing (HPI-A or HPI-B) flow trains. The operator will take this action when no flow occurs (as indicated by control room Class IE flow indicator) in one of the HPI flow trains during a LOCA. The licensee has stated that the analysis provided and the modifications proposed are consistent with the staff positions regarding allowable operator actions for which credit may be taken following a small break LOCA. (This has been reviewed by the Reactor Safety Brancn.)

By supplying power to the motor operators of the proposed isolation valves from a source of power supply independent of that supplying power to the HPI-A and HPI-B trains, the proposed modifications will assure that the HPI trains (two pumps and the two associated flow paths) will be available during design conditions involving worst case single failure.

The Duke Power Company by its letter dated May 15, 1978, submitted ECCS performance analysis of small breaks at the pump discharge, that were performed assuming that HPI flow through one train is available at the time of the transient and that the HPI flow through the other train is established at 10 minutes following the ES actuation. Based on its analysis, the Duke Power Company states that the modified HPI system adequately satisfies the ECCS flow requirements of small break LOCA's.

Conclusion

Based on our review, we find that:

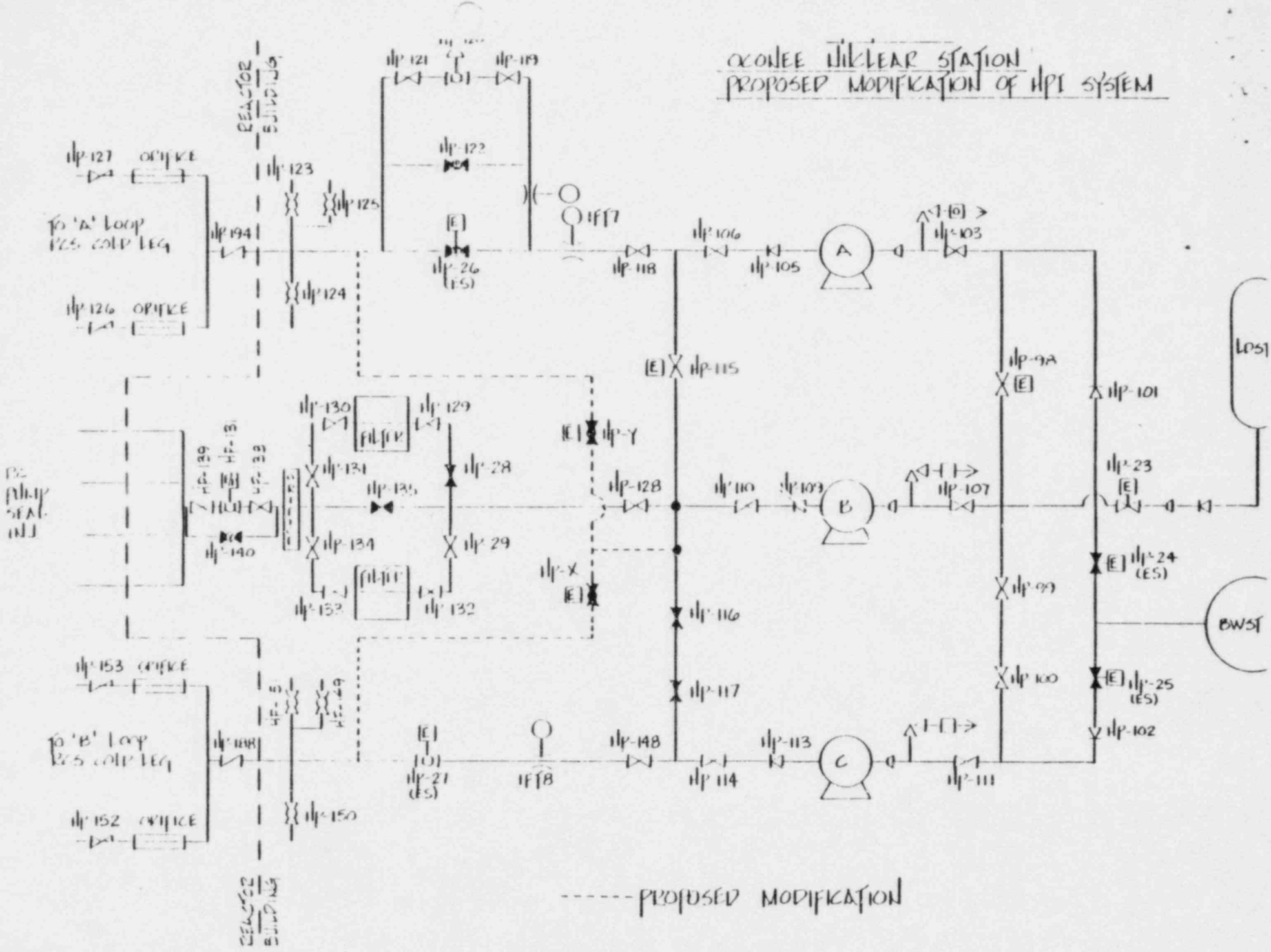
1. The proposed design modification to the High Pressure Injection system will assure that for all postulated single failure conditions the HPI system will be capable of supplying HPI flow by two HPI pumps through two injection paths.

2. The proposed modification will not affect the performance of other systems important to safety.

3. The proposed modification requires an operator to open the electrically operated controlled valves from the control room in the event of a small break LOCA and the failure of one of the HPI flow trains.

4. The material and equipment required to implement the proposed modification will be designed, manufactured, qualified and tested to the applicable standards and codes that apply to the ECCS system.

Accordingly, we conclude that the proposed design modification is acceptable.


OCONEE NUCLEAR STATION
PROPOSED MODIFICATION OF HPI SYSTEM
REACTOR BUILDING
HP-121
HP-122
HP-123
HP-124
HP-125
HP-126 ORIFICE
HP-127 ORIFICE
TO 'A' LOOP RCS COLD LEG
HP-26 (ES)
HP-118
HP-106
HP-105
A
HP-103
HP-115
HP-9A
HP-101
LOST
HP-130
HP-129
HP-131
HP-28
HP-135
HP-128
HP-110
HP-109
B
HP-107
HP-23
HP-134
HP-29
HP-132
HP-133
HP-24 (ES)
HP-99
BWST
HP-116
HP-117
HP-100
HP-25 (ES)
HP-102
HP-153 ORIFICE
HP-152 ORIFICE
TO 'B' LOOP RCS COLD LEG
HP-150
HP-148
HP-114
HP-113
C
HP-111
HP-21 (ES)
IFT8
IFT7
PROPOSED MODIFICATION