SAFETY EVALUATION

THE EFFECTS OF A DIRECT CURRENT POWER SOURCE

FAILURE ON EMERGENCY CORE COOLING SYSTEM

AVAILABILITY

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 & 3

I. Introduction

Emergency Core Cooling System (ECCS) equipment receives instrument and control power from direct current (DC) power supply systems. The loss of a DC power supply and its effect on the ability to operate and control ECCS equipment could result in a limiting single failure condition for some reactor coolant system pipe breaks. In 1978 the NRC staff raised this concern to the General Electric Company (GE) for GE's Boiling Water Reactors (specifically for BWR/3's and BWR/4's).

To address the above concern, GE performed a generic study using an NRC approved ECCS model and input changes. In order to make the generic analysis applicable to all operating BWR/3's and BWR/4's, GE studied operating plant designs having the most limiting ECCS equipment availabilities during DC power supply failures. The study was further subdivided into plants equipped with Low Pressure Coolant Injection (LPCI) loop selection logic (non-LPCI mod plants) and those modified to remove the loop selection logic feature (LPCI mod plants) to accomodate difference in accident response for each. The results and conclusions of the GE generic study were submitted to NRC on November 1, 1978 (Reference 1).

Subsequent to a detailed NRC review of GE's generic studies, on April 25, 1980, the Office of the Nuclear Reactor Regulation requested (Reference 2) the licensee to:

(1) confirm the conclusions of the GE generic analyses for Peach Bottom 2 and 3,

(2) assure that the system combinations and the ECCS equipment availability assumed in the generic analyses are conservative, and

(3) provide a list of ECCS equipment that would be available for large and small recirculation loop discharge breaks and recirculation loop suction breaks following a DC Power Supply failure and loss of equipment due to water spillage.

The licensee responded to the above request on August 15, 1980 (Reference 3), documenting the available ECCS equipment for Peach Bottom Units 2 and 3 following a DC Power Supply failure.

On July 29, 1982, NRC Region I personnel conducted an announced inspection at the licensee's corporate headquarters (Reference 4) to review technical basis for the licensee's August 15, 1980 submittal. The inspection included review of licensee's supporting documents, discussions with the licensee's cognizant engineers and independent verification of the licensee's conclusions.

II. Evaluation

Peach Bottom Units 2 and 3 are BWR/4 designs modified by removal of the LPCI loop selection logic (LPCI Mod Plants). Each unit's ECCS systems consist of: one High Pressure Coolant Injection System; two Low Pressure Coolant Injection subsystems, each subsystem having two LPCI pumps; two Core Spray subsystems, each subsystem having two Core Spray pumps; and, an Automatic Depressurization System. DC power is provided from two batteries each feeding a pair of distribution busses.

As documented in Reference 4, the licensee reviewed the effects of a DC power supply failure and equipment losses due to water spillage on ECCS equipment availability and prepared a matrix to identify the equipment affected by each DC power supply loss. From this matrix, the licensee has concluded that each unit would have the Automatic Depressurization System, one Core Spray loop and one LPCI pump available if a DC power supply failure occurs during a large or small recirculation loop discharge break. For a large or small recirculation loop suction break under similar conditions, each unit would have the Automatic Depressurization System, 2 pumps on one Core Spray loop, 2 pumps on one LPCI loop and 1 pump in the other LPCI loop.

The licensee compared the above worst-case ECCS equipment availability to that provided in Reference 1 and concluded that the worst-case equipment availability at Peach Bottom Units 2 and 3 is equal to or better than that assumed for the LPCI mod plants. Thus, the assumptions of the generic analysis are conservative for Peach Bottom Units 2 and 3. Consequently, the peak clad temperature (PCT) obtained from the generic analyses, 1950°F, is also conservative.

III. Conclusions

Based on our review of the licensee's submittal and inspection of the supporting documents for the submittal we conclude:

1) The licensee has arrived at the list of available ECCS equipment following a DC Power Supply failure and loss of equipment using reasonable and valid methods.

2) The ECCS equipment availability at Peach Bottom Units 2 and 3 is within the bounds of the assumptions used in GE's generic analysis

3) GE's generic analysis is conservative for Peach Bottom Units 2 and 3, and

4) The effects of DC Power Supply failure and loss of equipment at Peach Bottom Units 2 and 3 would not result in PCT's in excess of 1950°F.

In light of the above, we have confirmed the licensee's conclusions regarding the conservatism of GE's generic analysis and the validity of the assumptions used in GE's generic analysis as they apply to Peach Bottom 2 and 3. We consider the effects of DC power supply failure to have been properly addressed.

IV. References

1. GE letter from R. E. Engel to P. S. Check (NRC) dated November 1, 1973, Subject: DC Power Source Failure for BWR/3 and 4.

2. NRC letter from T. A. Ippolito to E. G. Bauer (Philadelphia Electric Company (PECo) dated April 25, 1980, Subject: Effect of DC Power Supply Failure on ECCS Performance.

3. PECo letter from S. L. Daltroff to T. A. Ippolito (NRC) dated August 15, 1980 (Response to Reference 2).

4. NRC Region I Inspection Report Number 50-277/82-18; 50-278/82-17.