

DEC 23 1985

Mr. William D. Harrington  
Senior Vice President, Nuclear  
Boston Edison Company  
800 Boylston Street  
Boston, Massachusetts 02199

Dear Mr. Harrington:

SUBJECT: NUREG-0737, ITEM II.K.3.28

Re: Pilgrim Nuclear Power Station

We have completed our review of your submittals concerning the qualification of accumulators on automatic depressurization system (ADS) valves at the Pilgrim Station and find that Boston Edison has satisfactorily addressed the requirements of NUREG-0737, Item II.K.3.28. This issue is, therefore, closed.

Enclosed is a copy of our Safety Evaluation.

Sincerely,

*Original signed by*

John A. Zwolinski, Director  
BWR Project Directorate #1  
Division of BWR Licensing

Enclosure:  
Safety Evaluation

cc w/enclosure:  
See next page

DISTRIBUTION

<u>Docket File</u>	JLombardo
NRC PDR	RHermann
Local PDR	JZwolinski
BWD#1 Reading	GHolahan
RBernero	
OELD	
EJordan	
BGrimes	
JPartlow	
PLeech	
CJamerson	
ACRS (10)	
Pilgrim File	

DBL:PD#1  
CJamerson  
12/17/85

DBL:PD#1  
PLeech:tm  
12/18/85

DBL:PD#1  
JZwolinski  
12/23/85



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

December 23, 1985

Docket No. 50-293

Mr. William D. Harrington  
Senior Vice President, Nuclear  
Boston Edison Company  
800 Boylston Street  
Boston, Massachusetts 02199

Dear Mr. Harrington:

SUBJECT: NUREG-0737, ITEM II.K.3.28

Re: Pilgrim Nuclear Power Station

We have completed our review of your submittals concerning the qualification of accumulators on automatic depressurization system (ADS) valves at the Pilgrim Station and find that Boston Edison has satisfactorily addressed the requirements of NUREG-0737, Item II.K.3.28. This issue is, therefore, closed.

Enclosed is a copy of our Safety Evaluation.

Sincerely,

A handwritten signature in dark ink, appearing to read "J A Zwolinski", is written over the typed name.

John A. Zwolinski, Director  
BWR Project Directorate #1  
Division of BWR Licensing

Enclosure:  
Safety Evaluation

cc w/enclosure:  
See next page

Mr. William D. Harrington  
Boston Edison Company

Pilgrim Nuclear Power Station

cc:

Mr. Charles J. Mathis, Station Mgr.  
Boston Edison Company  
RFD #1, Rocky Hill Road  
Plymouth, Massachusetts 02360

Resident Inspector's Office  
U. S. Nuclear Regulatory Commission  
Post Office Box 867  
Plymouth, Massachusetts 02360

Mr. David F. Tarantino  
Chairman, Board of Selectman  
11 Lincoln Street  
Plymouth, Massachusetts 02360

Office of the Commissioner  
Massachusetts Department of  
Environmental Quality Engineering  
One Winter Street  
Boston, Massachusetts 02108

Office of the Attorney General  
1 Ashburton Place  
19th Floor  
Boston, Massachusetts 02108

Mr. Robert M. Hallisey, Director  
Radiation Control Program  
Massachusetts Department of  
Public Health  
150 Tremont Street  
Boston, Massachusetts 02111

Regional Administrator, Region I  
U. S. Nuclear Regulatory Commission  
631 Park Avenue  
King of Prussia, Pennsylvania 19406

Mr. A. Victor Morisi  
Boston Edison Company  
25 Braintree Hill Park  
Rockdale Street  
Braintree, Massachusetts 02184



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO NUREG-0737, ITEM II.K.3.28

"VERIFY QUALIFICATION OF ACCUMULATORS ON ADS VALVES"

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-213

1.0 BACKGROUND

The safety analysis reports for boiling water reactors present that air or nitrogen accumulators for the automatic depressurization system (ADS) valves are provided with sufficient capacity to cycle the valves open five times at design pressure. General Electric Company (GE) has also stated that the emergency core cooling (ECC) systems are designed to withstand a hostile environment and still perform their function for 100 days following an accident. To satisfy NUREG-0737, Item II.K.3.28, a licensee must demonstrate that the ADS valves, accumulators, and associated equipment and instrumentation meet the requirements specified in the plant's Final Safety Analysis Report (FSAR) and are capable of performing their functions during and following exposure to hostile environments, taking no credit for non-safety-related equipment or instrumentation. Additionally, air (or nitrogen) leakage through valves must be accounted for in order to assure that enough inventory of compressed air is available to cycle the ADS valves. If this cannot be demonstrated, the licensee must show that the accumulator design is still acceptable.

The commitment by Boston Edison Company (the licensee) to satisfy II.K.3.28 for Pilgrim Nuclear Power Station (PNPS) is discussed in the licensee's submittals dated January 18, 1980 and December 3, 1981. Additional information was provided in its submittals dated July 29, 1983, July 31, 1984 and July 3, 1985.

2.0 DISCUSSION

There are four ADS accumulator systems at Pilgrim Station, one for each mainsteam line. Each of these systems includes one each of the following components:

- a. accumulator
- b. accumulator pressure relief valve
- c. accumulator drain line isolation valve
- d. solenoid valve (between accumulator and pressure relief valve)
- e. check valve between accumulator and air supply (instrument air)

All of these components are located within the drywell. As outlined in the licensee's letter of December 3, 1981, the design basis for Pilgrim's ADS accumulators requires that they be able to provide five operations against atmospheric pressure or two operations against drywell design pressure. Under the worst case accident conditions requiring ADS (small and intermediate pipe breaks), the most extensive mission time for ADS is less than 8 hours. The ADS is not required on a long-term basis.

The licensee's letter of July 29, 1983 further states that calculations show that, for a 41.7 psia drywell pressure, the accumulators maintain capacity for 20 actuations within a time period of 8 hours following a loss of instrument air supply. This pressure corresponds to approximately 50% of drywell design pressure and is consistent with the highest pressure specified in the FSAR for ADS operation (Section 5.2). Analysis of accidents which lead to higher drywell pressure does not consider the use of the ADS. The July 29, 1983 letter also states that this is in accordance with FSAR requirements (Section 7.4) and that the 8-hour time limit is consistent with the analysis of the integrated operation of core standby cooling systems given in the FSAR Section 6.5 and the Pilgrim operating procedures.

### 3.0 DEMONSTRATION OF QUALIFICATION

According to the licensee's letter of January 18, 1980, the original hard-seat check valves have been replaced with soft-seated check valves and a leak rate test program has been implemented to insure adequacy of supply for the FSAR required number and duration of valve actuations. With the letter of July 29, 1983, the licensee submitted a copy of Pilgrim Nuclear Power Station Procedure number 8.7.1.10, entitled "Pressure Test ADS Accumulator System Integrity." The procedure outlines a test to be performed on each accumulator system during each refueling outage (not to exceed 2 years between tests). The acceptance criterion given in the procedure is that accumulator pressure shall not drop below 70 psi in 4 hours. Starting pressure is given as 84 psig and P&ID M252 indicates a normal supply pressure of 90 psi. The licensee states that the allowable leakage will maintain the capability of the ADS system to function as described in Section 2.0 above. The licensee has reviewed the design for all the equipment (including piping) included in the ADS system and concluded that it meets the standards of Seismic Class I. The licensee stated that only electrical equipment requires qualification for the potential harsh environment of the drywell and that the only pertinent equipment are the solenoid valves. These are part of the plant maintenance program to insure continued qualification. The licensee presents that, since the components are seismically qualified and harsh environments do not adversely affect the mechanical components of the ADS system, seismic or other accidents should not increase the allowable leakage rate.

### 4.0 EVALUATION

The licensee has defined the number of times the pneumatically operated relief valves are capable of cycling using only the accumulator as a source of air. The licensee has defined the number at normal drywell pressure and also at two higher pressures (41.7 psia and drywell design pressure). The staff finds these acceptable.

The licensee states that long-term post-accident operability of the ADS pneumatic supply would be necessary only for small breaks in containment. In a small break accident there would be no significant environmental effects on components outside primary containment. Therefore, it may be assumed that make-up nitrogen or instrument air would be available to power the ADS because of their location away from the small break. Additional features of these two systems provide further confidence of post-accident availability in that air compressors K104A, B, and C are powered from vital buses B15, B14, and B10, and the nitrogen system is fed from an outside tank, T-212, which is required by PNPS Technical Specification 3.7.A.7.b to have a minimum of 1500 gallons of liquid nitrogen. The staff finds this acceptable.

In the unlikely event that both instrument air and nitrogen become unavailable to the ADS valves, other systems can be used to depressurize the reactor. Emergency Operating Procedure (EOP) 3 directs the operator to the Reactor Core Isolation Cooling (RCIC) system and the High Pressure Core Injection (HPCI) system, both of which include a turbine driven by reactor steam, to effect long-term reactor depressurization if the ADS pneumatic supply is lost. Because the accident of concern is a small break inside containment, there is no environmental threat related to that accident which would deny the long-term use of the HPCI or RCIC system for depressurization. The subject small break would also allow personnel access to perform repairs to HPCI and RCIC, although individuals would be restricted to short intervals in these areas to minimize their exposure.

At the start of the postulated accident, the increase in drywell temperature would cause accumulator absolute pressure to increase from 105 psia to 110 psia, while the increase in drywell pressure would cause the accumulator differential pressure to go from 90 psid to 68 psid. Assuming leakage is 4 psi/hr, 78 psid would be the pressure at the end of 8 hours. The initial accumulator pressure required for a single ADS valve actuation is 25 psid, which is equal to 67 psia under post accident conditions. The initial accumulator pressure required for 20 successive actuations under post accident conditions is 74 psia. Thus, there is a 4 psi margin in the pressure available after 8 hours. The staff finds this acceptable.

The procedure for ADS accumulator leakage testing specifies that acceptable leakage is 84 psid decreasing to not less than 70 psid over 4 hours, which is 3.5 psi/hr average. Since 84 psid is greater than accumulator differential pressure under accident conditions, the use of 4 psi/hr is acceptable. Although it would be more conservative to assume an increased leakage rate after a seismic event or an accident, the licensee has examined the effects of these events and concluded that there will be no increase in the leakage rate. The staff finds this acceptable.



The licensee states that the accumulator pressure available 8 hours after loss of the instrument air supply under post accident conditions would be 78 psig, which is equal to 36 psid with respect to drywell pressure under those conditions. Post accident conditions are taken from the LOCA containment response curves in the FSAR (Figures 14.7-10 and 14.7-11). The pressure used is 27 psig, which is the maximum drywell pressure from 10 seconds after the accident, and the temperature used is 167°F, which is the lowest temperature. The licensee believes that choosing a lower temperature is conservative since lower temperatures lead to lower pressures in an isolated accumulator.

The licensee has indicated that periodic (once per operating cycle, not to exceed 2 years) leak tests of the accumulator system will be made and a procedure for doing this is in use at the present time. The staff finds this acceptable.

The licensee has stated that the ADS accumulator system (components and interconnecting piping between check valve and relief valve) was designed to the requirements of Seismic Class I. The staff finds this acceptable. Equipment within the scope of 10 CFR 50.49 associated with the ADS (solenoid valves) was previously addressed by our Safety Evaluation dated March 26, 1985. In that document, the staff concluded that the licensee was aware of and had appropriately considered the requirement to environmentally qualify equipment important to safety.

## 5.0 CONCLUSION

Based on the information provided by the licensee and the above evaluation, the staff concludes that the Boston Edison Company has verified qualification of the accumulator(s) on ADS valves at the Pilgrim Station, thereby satisfying NUREG-0737, Item II.K.3.28.

Principal Contributors: J. Lombardo and W. Hodges

Dated: December 23, 1985