August 9, 1985

Docket No. 50-298

Mr. J. M. Pilant, Technical
Staff Manager
Nuclear Power Group
Nebraska Public Power District
Post Office Box 499
Columbus, Nebraska 68601

Dear Mr. Pilant:

SUBJECT: TMI ITEM II.K.3.28, QUALIFICATION OF AUTOMATIC DEPRESSURIZATION SYSTEM (ADS) ACCUMULATORS

Re: Cooper Nuclear Station

We have completed our review of your submittals dated January 16, 1980, December 28, 1981, August 26, 1983, July 26, and September 21, 1984 and February 26, 1985 regarding TMI Action Plan Item II.K.3.28, "Verify Qualification of Accumulators on ADS Valves." The NRC staff, with the assistance of Brookhaven National Laboratory, has prepared the enclosed Safety Evaluation in which we conclude that the requirements of II.K.3.28 have been satisfactorily addressed and that qualification of ADS accumulators at Cooper has been verified.

Sincerely,

Original signed by PHLeech for/

Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Enclosure:
As stated

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cc:

Mr. G. D. Watson, General Counsel
Nebraska Public Power District
Post Office Box 499
Columbus, Nebraska 68601

Mr. Arthur C. Gehr, Attorney
Snell & Wilmer
3100 Valley Center
Phoenix, Arizona 85073

Cooper Nuclear Station
ATTN: Mr. Paul Thomason, Division
Manager of Nuclear Operations
Post Office Box 98
Brownville, Nebraska 68321

Director
Nebraska Dept. of Environmental Control
Post Office Box 94877
State House Station
Lincoln, Nebraska 68509

Mr. William Siebert, Commissioner
Nemaha County Board of Commissioners
Nemaha County Courthouse
Auburn, Nebraska 68305

Mr. Dennis DuBois
U. S. Nuclear Regulatory Commission
Resident Inspector
Post Office Box 218
Brownville, Nebraska 68321

Robert D. Martin
Regional Administrator
Region IV Office
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

H. Ellis Simmons, Director
Division of Radiological Health
Department of Health
301 Centennial Mall, South
Post Office Box 95007
Lincoln, Nebraska 68509

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TMI ACTION PLAN II.K.3.28 - VERIFY QUALIFICATION OF ACCUMULATORS ON ADS VALVES

COOPER NUCLEAR STATION

DOCKET NO. 50-298

1.0 BACKGROUND

Safety analysis reports claim that air or nitrogen accumulators for the automatic depressurization system (ADS) valves are provided with sufficient capability to cycle the valves open five times at design pressures. General Electric (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. Licensees and applicants 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, it must be shown that the accumulator design is still acceptable.

The commitment to satisfy the requirement of II.K.3.28 for the Cooper Nuclear Station is discussed in the licensee's submittals dated January 16, 1980 and December 28, 1981, and its response to the requests for additional information dated August 26, 1983, July 26, 1984 and February 26, 1985.

2.0 DISCUSSION

As described in the FSAR, there are four main steam lines with three safety valves and eight relief valves. The relief valves provide overpressure protection and can function as safety valves, or be opened manually (from the control room). Six of the relief valves are part of the ADS system and function automatically so that the low pressure core injection (LPCI) and core spray systems can be used to protect the core in cases of small line breaks. For this mode of operation, each of the ADS valves is provided with a power-actuated device capable of opening the valve at any steam pressure above 100 psig and capable of holding the valve open until the steam pressure drops to 50 psig. The power-actuated device is a pneumatic operated piston within the relief valve which opens the pilot valve and causes the main valve to lift off its seat. Each of the relief valves in the ADS is equipped with an accumulator and check valve which will maintain sufficient air or nitrogen for a minimum of five valve operations

(cycles). The ADS valves, accumulators, and check valves are all located within the drywell.

The licensee's letter of January 16, 1980 states that the check valves are a soft seat (BUNA-N) design manufactured by Dragon Valves, Inc.

The licensee's letter of December 28, 1981 indicates that the normal gas supply for the pneumatically actuated ADS valves is nitrogen from the containment inerting system. The backup supply is the instrument air system which consists of three air compressors acting in parallel. The licensee's letter of December 28, 1981 states that the instrument air floats on the system and will provide a pneumatic supply if the nitrogen system fails. The term "floats" as used here is interpreted to mean that instrument air is always available behind a check valve, and does not require startup of compressors or changing valve position to be effective. The check valve direction is from the instrument air system to the ADS. The plant air compressors are supplied by on-site power (main generator or diesels).

3.0 DEMONSTRATION OF QUALIFICATION

3.1 Although the FSAR indicates that the accumulators are sized to contain sufficient air for a minimum of five valve actuations, it does not specify the drywell pressure during these actuations, nor does it specify the time period allowed for these actuations. The licensee's letter of August 26, 1983 states that the ADS accumulators will provide the "required" actuation, with leakage taken into account, at 70% of drywell pressure but does not specify the time period allowed for these actuations, however, from the test summarized in Section 3.3 below, it is assumed that 1 hour is the maximum time period allowed for these actuations.

3.2 The letter of August 26, 1983 indicates that the licensee has performed calculations which show that the accumulators are sized to perform the required relief valve actuations at both normal containment pressure and at 70% of drywell pressure.

3.3 The basis for the allowable leakage criteria is given in the licensee's letter of August 26, 1983. The system will maintain at least the minimum required pressure for 1 hour and still provide more than adequate relief valve actuation time with the leakage of the relief valve actuator taken into account. The accumulators are leak tested once per operating cycle at normal containment pressure for 1 hour to assure that minimum required accumulator pressure can be maintained. By letters dated July 26, 1984 and February 26, 1985, the licensee committed to replace the accumulator check valves with qualified components if documentation cannot be obtained to verify that they meet seismic Category I requirements. Therefore, since the accumulator systems are or will be Class I seismic and environmentally qualified, no additional leakage due to seismic events or harsh environments are considered.

3.4 Long-term (100 day) capability of the ADS was addressed by the licensee in a letter dated December 28, 1981 describing two independent pneumatic supplies, a normal and a backup system. The first, which is also used to maintain the containment atmosphere, is an 8,000 gallon liquid nitrogen storage tank. The backup supply is the instrument air system. There are pressure switches for each accumulator system which cause an alarm to annunciate in the control room when a low pressure condition exists and compressors for the instrument air system are supplied with on-site power (diesels or main generator).

The accumulators, piping, and check valves associated with the ADS (i.e., all components of ADS within the drywell) are installed to seismic Class I criteria. The two independent pneumatic supplies (i.e., components outside of containment), are seismic Class II.

3.5 The environmental qualification of ADS components was addressed in the licensee's letter of August 26, 1983. This letter states that the licensee is verifying that the electrical components meet the qualification requirements of 10 CFR 50.49 in conjunction with final environmental qualification of the plant electrical equipment as described in a letter from J. M. Pilant to D. B. Vassallo dated May 20, 1983.

4.0 EVALUATION

4.1 The licensee has defined and verified the number of times the ADS valves are capable of cycling using only the accumulators, and the length of time the accumulators are capable of performing their function following the loss of pneumatic supply. The licensee states that the preoperational test results of the three-stage Target Rock safety relief valves showed that the valves are capable of at least five actuations at normal drywell pressure while relying on only the accumulators for pneumatic supply. In 1980 these valves were replaced with two-stage Target Rock safety valves. Even though the present valves are not the same as those used for preoperational testing, the results are more conservative because the present valves require less differential pressure to operate and have less piston displacement. Calculations by the licensee show that one actuation of ADS valves is possible 1.6 hours after a loss-of-coolant accident (LOCA) has occurred. The accumulator volume is 1.05 SCF, and by surveillance procedure the maximum allowable accumulator leakage is 0.25 SCFH (0.35 SCFH total system leakage when the valve is open). The accumulator pressure at the end of this 1.6 hour period would be 53.4 psig, while 51 psig is required to keep the valve open, thus allowing reactor pressure to decrease from approximately 1,000 psig to 50 psig. This calculation is conservative in view of the fact that the maximum drywell pressure required to keep the valve open would be lower. After further discussion with the staff, this calculation was again performed assuming only a seismic event and realistic average leakage rates based upon the licensee's previous surveillance tests. It was determined that the two ADS valves required for controlled depressurization per Appendix G of the USAR could be expected to be available on the order of 40 hours after the seismic event isolated the

seismically qualified accumulators. As indicated in the February 14, 1973 Safety Evaluation for Cooper, residual heat may be removed from the core in nonaccident situations by the Class I seismic RCIC system and the three modes of RHR.

The relief valves may actuate to remove core decay heat through blowdown of steam to the torus, but this does not require the ADS N_2 supply. Cooper also has a steam condensing mode of RHR where the RHR heat exchangers are used to condense reactor steam withdrawn through the HPCI steam line. Shortly after shutdown, both RHR heat exchangers can be used to handle essentially all of the decay heat and after approximately 2 hours, one heat exchanger is adequate.

The ECCS subsystems and ADS system provide emergency core cooling during postulated accident conditions where it is assumed that mechanical failures occur in the primary coolant system piping resulting in a LOCA. The licensee believes that the ADS system is only required to reduce primary system pressure in the event the HPCI system fails to function properly during a small break LOCA. Given a seismic or nonseismic event, all of the systems mentioned above should be available to bring the plant to safe shutdown without the need for the ADS system long term.

For any nonseismic event in the long term (100 days), Cooper could replenish the outdoor liquid N_2 tank if required which is accessible during a design basis accident. The licensee has demonstrated that the Cooper Nuclear Station has the capability for both short and long term cooling. The staff finds this acceptable.

4.2 The licensee has provided a detailed summary of the periodic leak test that is used to demonstrate the ADS accumulator system capability. With the reactor and the drywell at atmospheric pressure, six ADS accumulators are designed to actuate the main steam relief valves at least five times. This corresponds to two actuations with the drywell at 70% of its design pressure. Two additional accumulators are larger and designed to actuate the main steam relief valves at least 14 times as part of the ADS Low-Low Set logic. Check valves in the accumulator system prevent back leakage if the supply air is lost.

The accumulator test is performed by isolating and bleeding the air supply to the accumulators, then attaching a pressure test gauge to the system. Accumulator pressure is adjusted to the normal minimum supply pressure (95 psig). After 1 hour, the gauge pressure is observed and recorded. A minimum of 68.6 psig is required to assure five actuations under the test conditions for the six ADS accumulators. A minimum of 70 psig is required to assure 14 actuations under the test conditions for the two larger accumulators. The staff finds this acceptable.

4.3 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 on the leakage rate and concluded that there will

be no increase. The licensee has stated that it will make periodic leak tests of the accumulator system for the ADS at each refueling outage. The staff finds this acceptable.

4.4 The seismic qualification of ADS components and piping within the drywell has been verified by the licensee.

The licensee states that the ADS electrical equipment is within the scope of 10 CFR 50.49 and will be addressed by Multi-Plant Action Item B-60, Environmental Qualification of Electrical Equipment for Nuclear Power Plants. The staff finds the licensee is aware of and has considered the requirements of environmental qualification of equipment important to safety. The staff finds this acceptable.

5.0 CONCLUSION

Based on the evaluation given above in Sections 4.1, 4.2, 4.3 and 4.4, the staff concludes that the licensee has verified qualification for the ADS accumulator systems at Cooper Nuclear Station.

Principal Contributor: J. Lombardo

Dated: August 9, 1985