U-0763
L30-84(11-19)L
1A.120

ILLINOIS POWER COMPANY

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

November 19, 1984

Docket No. 50-461

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Clinton Power Station (CPS) Unit 1
Request for Additional Information
TMI Action Item II.K.3.28 (Confirmatory Issue #47)

Dear Mr. Schwencer:

In your letter dated September 11, 1984, you requested Illinois Power to provide additional information relative to TMI Action Item II.K.3.28, "Verify Qualification of Accumulators on Automatic Depressurization System Valves" (CPS Safety Evaluation Report Confirmatory Issue #47). The requested information is provided in the attachment.

Please contact us should you have any questions concerning this response.

Sincerely yours,

T. L. Gubel for

F. A. Spangenberg
Director - Nuclear Licensing
and Configuration
Nuclear Station Engineering

LRR/lm

Attachment

cc: B. L. Siegel, NRC Clinton Licensing Project Manager
NRC Resident Office
Regional Administrator, Region III USNRC
Illinois Department of Nuclear Safety

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Aperture Card Dist
7 sets
Drawings
To: B. Siegel

Drawings TO:
Reg Files-1
EAB-2
RSB-1
ASB-1
I&E Files-1

Attachment to
U-0763
L30-84(11-19)L
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Dated 11/19/84

ILLINOIS POWER COMPANY - CLINTON POWER STATION (CPS) UNIT 1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
TMI ACTION PLAN ITEM II.K.3.28
VERIFY QUALIFICATION OF AUTOMATIC DEPRESSURIZATION SYSTEM (ADS) ACCUMULATORS

Question #1

Define the basis for the allowable leakage criteria for the ADS accumulator system (e.g. boundary conditions, environmental, and seismic parameters, operator interface, margin, etc.).

Response #1

The allowable leakage criteria was established based on providing short-term ADS Safety Relief Valve (SRV) operations because provisions are made for an essentially infinite long-term supply through the use of external air supply connections.

The ADS accumulator system allowable leakage criteria is 1 SCFH per SRV as stated in General Electric (GE) Specification 22A4622AV. Specification 22A4622AV establishes that this allowable leakage criteria applies both under normal operating and post-accident conditions. The 1 SCFH leakage rate was originally established by multiplying the 0.1 SCFH GE acceptance criteria (specified to the SRV vendor for new valves) by a factor of 10 to allow for inservice deterioration between SRV overhauls.

Two CPS specific calculations were performed (conservatively assuming frictionless adiabatic actuation) that demonstrated the adequacy of the designed accumulator capacity with the leakage rate at the maximum allowed by the leakage criteria. Adequate accumulator capacity is demonstrated by showing one SRV actuation is possible following an intermediate or small break accident without recharging the accumulator for a specified time period. The required time period is determined based upon ADS SRV needs following such accidents. The CPS Final Safety Analysis Report (FSAR) Chapter 15 Loss of Coolant Accident (LOCA) analyses assume that six ADS SRVs are available to perform the ADS function. Such LOCA analyses assume only six ADS SRVs to account for a single failure resulting in a loss of one ADS SRV. Based upon these conservative analyses, the six ADS SRVs are required for a period of one to two hours after scram. Following this initial time period, sufficient dissipation of core sensible and decay heat will have occurred such that only three ADS SRVs would be required to provide a rapid enough reactor depressurization to permit low pressure Emergency Core Cooling System makeup and thus limit peak clad temperatures to acceptable values.

The first calculation indicated that, under worst case initial conditions, assuming the actual leakage rate is at the maximum allowable value, one SRV actuation can be achieved for up to 3.4 hours into the

LOCA event without relying on the backup ADS air supply. Thus the ADS accumulators are adequately sized to allow for the necessary one SRV actuation for approximately twice the needed time period of one to two hours.

The second calculation indicated that, under normal (expected) initial operating conditions, assuming the actual leakage rate is at the maximum allowable value, one SRV actuation can be achieved for up to nearly eight hours into the LOCA event without relying on the backup ADS air supply.

Specification 22A4622AV requires that each ADS accumulator provide two SRV actuations with the drywell at 70% of drywell design pressure. Since only one actuation is needed for the ADS function, the second actuation is provided for margin. The 70% of drywell design pressure corresponds to 21 psig. Drywell pressures greater than 21 psig are experienced only during the short duration blowdown in the drywell that follows a large pipe break. During such large break events, sufficient reactor depressurization occurs through the break to preclude the need for ADS.

A third calculation was performed to demonstrate the capability of the accumulator for each ADS SRV to provide these two actuations. Under LOCA conditions, the first SRV actuation is assumed to be isothermal. This is based on the assumption that by the time the second SRV actuation is required, the air remaining in the accumulator will have been heated back up to at least its original (pre-LOCA) temperature by the LOCA environment in the drywell. The second SRV actuation is then conservatively assumed to be frictionless adiabatic. The third calculation shows that under normal (expected) initial operating conditions accumulator to drywell differential pressure following the second actuation is above the required 95 psid for a period of at least two hours if the maximum allowable leakage is assumed. Thus, two SRV actuations can be achieved under worst-case drywell pressure conditions following a small-break or intermediate-break LOCA.

In the short-term, ADS SRV operations do not require any operator interface. Also, the margin associated with the allowable leakage criteria to account for increases in the leakage resulting from the effects of harsh environmental and/or seismic conditions is discussed in the response to Question #2.

To demonstrate the ability of the long term air supply to provide sufficient air to meet the leakage criteria, a fourth calculation was performed. This calculation demonstrated the capability of the backup air supply to meet the ADS system needs for a period of one week without replenishment. The calculation takes into account 100 actuations of the low setpoint SRV (also connected to this supply) and a leakage of 1 SCFH for each of the five SRVs connected (per Specification 22A4622AV). At the end of this seven day period the pressure remaining on the air bottle is still sufficient for ADS operation. During the seven day period, provisions can be made to bring in additional air supply to meet system demands indefinitely.

Question #2

What margin is in the allowable leakage criteria to account for possible increase in leakage resulting from the effects of a harsh environment and/or a seismic event?

Response #2

Experience from previous GE environmental qualification tests and from the recent NUREG-0588 tests shows that, for well beyond the required time period for ADS SRV short-term operation, SRV pneumatic system leakage will not exceed about 0.5 SCFH. These tests included seismic and environmental (temperature, radiation, etc.) qualification of the SRVs. The CPS SRV pneumatic system solenoid valves have been completely qualified to seismic and environmental conditions specific to CPS, with the exception of the electrical portion of the solenoid which is currently undergoing environmental qualification (already seismically qualified).

Leakage from the remaining portion of the ADS accumulator system could occur through the ADS accumulator inlet check valve (spring-loaded piston type). These check valves provide positive shutoff to prevent leakage from the ADS accumulators. The manufacturer has hydrotested these valves at 3600 psig with the resultant leakage less than or equal to 10 cc/hr. An extrapolation was performed to convert to an equivalent air leakage at 150 psig accumulator pressure. The methodology included conservative assumptions that the valve leakage was through an area of circular cross-section and that air flow was sonic. The results indicate a leakage of about 0.01 SCFH under normal (expected) conditions. A materials and design review was performed to ensure that these check valves would not experience a significant increase in leakage due to post-LOCA environmental and/or seismic conditions. The check valve seat and disc materials are made of stellite. CPS post-LOCA environmental and/or seismic conditions would not be expected to significantly increase the leakage around such materials.

Based upon the tested leakage rate from the ADS SRV pneumatic operators and the expected low leakage past the ADS accumulator inlet check valves, under post-LOCA environmental and/or seismic conditions, there is about 0.5 SCFH margin in the 1 SCFH allowable leakage criteria.

Question #3

A statement that test and/or analysis performed verified that a harsh environment and/or seismic event would not increase the leakage rate.

Response #3

The information provided above in Response #2 indicates that the margin associated with the allowable leakage criteria is adequate in that tests and analyses indicate that the harsh environment and/or seismic conditions would not increase the leak rate of the ADS pneumatic supply system beyond the maximum allowable criteria.

Question #4

A statement that verifies that no credit was taken for non-safety related equipment and instrumentation when establishing the allowable leakage criteria.

Response #4

In establishing the allowable leakage criteria, actual leakage was from safety related equipment or components. Therefore, no credit was taken for non-safety related equipment and instrumentation when establishing the allowable leakage criteria.

Question #5

Define the periodic leak testing of the ADS accumulator system (i.e., the time interval between these leak tests, along with a concise description of the test procedure employed).

Response #5

A surveillance test will be conducted every refueling cycle under the normal Plant Preventative Maintenance Program (PPMP). Two tests will be performed at an ADS accumulator initial pressure of 150 psig. For each test, Instrument Air valves 1IA013B and 1IA012B will be closed (isolating the normal Instrument Air supply to the ADS accumulators), valves 1IA013A and 1IA012A will be checked closed (ensuring the backup pneumatic supply is isolated from the ADS accumulators), and vent valves 1IA097A and 1IA097B will be opened to relieve air pressure upstream of the ADS accumulator inlet check valve. For the first test, the isolation boundaries are the ADS accumulator inlet check valve and the de-energized SRV actuation solenoid. For the second test, the SRV actuation solenoid will be energized so that the SRV pneumatic operator and the solenoid valve vent port become part of the boundaries. By performing the two tests proposed, leakage from the SRV pneumatic operator can be specifically quantified. In both tests, the leakage acceptance criteria is 0.425 SCFH, 85% of the expected leakage, which is obtained by subtracting the 0.5 SCFH margin (see Response #2) from the 1.0 SCFH allowable leakage (see Response #1).

Question #6

A concise description of the alarms and instrumentation associated with the ADS accumulator system and backup system, if applicable.

Response #6

In the event of a problem in the normal instrument air supply to the ADS accumulators, the Main Control Room Operator would be alerted by one or more of the following alarms at CPS:

Alarm Parameters	Setpoints
Compressor Trouble:	
High Oil Temperature	125°F
Low Oil Temperature	65°F
Low Oil Pressure	7 psig
High Discharge Temperature	130°F
Low Cooling Water Pressure	29.1 psig
High Interstage Air Temperature	125°F
High Vibration	.8 mils
Air Dryer Trouble:	
Auto Bypass Activation	@70 psig
High Humidity	@3-5%
High Prefilter ΔP	@10 psig
High Afterfilter ΔP	@10 psig
Loss of Power	Alarm
Auto Start Backup Compressor	70 psig
Low System Header Pressure	70 psig
Air System Not Available:	
Division I or II in Test	Alarm
Division I or II Inoperable	Alarm
Accumulator Low Pressure (Annunciated on P601 in Main Control Room and is common for all accumulators. The specific accumulator that is alarming can be identified via the plant computer.)	140 psig

Local pressure gauges monitor the backup air supply header pressure. In addition, this header pressure is indicated on panel P601 in the Main Control Room. The normal instrument air supply inboard containment isolation valves (1IA012B and 1IA013B) automatically isolate on high drywell pressure (2 psig) or low RPV water level (Level 2) signals. The backup compressed air supply outboard containment isolation valves (1IA012A and 1IA013A) automatically open upon closure of the normal instrument air supply valves. Valve position indication and associated control switches are provided in the Main Control Room for each of these valves.

Plant operating and off-normal procedures are provided for operator use in verifying (or manually placing) the backup compressed air bottles are in service when needed as well as procedures for restoring the normal instrument air supply to the ADS accumulators.

Question #7

A statement that confirms that the ADS accumulator system, associated equipment and control circuitry, and backup system, if applicable, are seismically qualified.

Response #7

The ADS air accumulators, interconnected piping, and associated valves are designed to the requirements of ASME Section III, Safety Class 3, Seismic Category I, Quality Group C, and electrical classification 1E as defined in the CPS FSAR Chapter 3. Piping and valves forming part of the containment boundary are designed to the requirements of ASME Section III, safety class 2, Seismic Category I, Quality Group B, and electrical classification 1E. All pressure transmitters and pressure switches for the ADS air supply header and accumulators are seismically qualified. The instrument air supply line from the outboard containment isolation valve to the air receiver bottles of the backup air supply system is designed to ASME Section III, safety class 2 and safety class Other, and is Seismic Category I. The ADS backup air tanks are non-safety grade and non-seismic qualified but are manufactured to United States Department of Transportation Specification 3AA and are equipped with Seismic Category I restraints.

Question #8

Excerpts from the plant's technical specifications, verifying that they specify the following:

- ADS leak test frequency
- Allowable leakage rate
- Actions to be taken, in a specified time frame, should the allowable leakage rate be exceeded

Response #8

Currently, there are no plans to include the leak testing of the ADS accumulators in the CPS Technical Specifications. The response to Question #5 describes the test frequency and allowable leak rate for the proposed tests that will be performed as part of the PPMP. Should the allowable leakage rate test criteria be exceeded, actions will be taken to determine the source of leakage and correct the problem. The system will then be retested prior to plant startup.

Question #9

Provide P&ID drawings for ADS accumulator system, including backup air supply.

Response #9

The requested P&IDs are attached, as follows:

M05-1040 Sheet 5, Revision G
M05-1040 Sheet 7, Revision L
M05-1040 Sheet 15, Revision G
M10-1002 Sheet 1, Revision K

A brief description of the normal and backup air supply is provided below.

The normal air supply to the accumulators for the ADS valves and non-ADS safety relief valves is from the station instrument air (IA) system. Compressed air for this system is supplied at 120 psig from one of the three 100% capacity service air (SA) system compressors and processed through one of the three 100% capacity IA system filter/dryer packages. Instrument air to the ADS and non-ADS valves is processed through twelve 20% capacity air amplifiers which double the regulated supply pressure of 80 psig to 160 psig and deliver it to the valve accumulators.

The backup air supply system will preserve ADS valve accumulator pressure should the normal air supply not be available. This backup system has two independent air storage facilities located in separate corners of the basement of the auxiliary building. Each facility consists of eight 1.75 ft^3 bottles, pressurized to 2400 psig, and equipped with appropriate pressure regulating valves and interconnecting piping to supply one division of ADS valves with a seven day supply of air. Both facilities have remote makeup capability to assure a 100 day post-accident ADS air supply.

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