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Iowa Electric Light and Power Company

August 5, 1980

LDR-80-224

LARRY D. ROOT
ASSISTANT VICE PRESIDENT
NUCLEAR GENERATION

Mr. James G. Keppler
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Re: Duane Arnold Energy Center

Subject: Supplement No. 1 to IE Bulletin 80-17
Failure of Control Rods to Fully Insert
During a Scram at a BWR

File: A-101a, NRC-2, Bulletin 80-17

Dear Mr. Keppler:

In partial response to your letter transmitting Supplement No.1 to the subject bulletin concerning the manual scram failure event at TVA's Browns Ferry Unit No. 3 and additional information identified subsequently, we have completed the Licensee Action Items A.1) through A.5) activities at DAEC. The following discussion is provided to briefly describe the actions taken at DAEC to address these additional NRC IE Bulletin concerns.

Supplement 1, Item A.1). An analysis of the adequacy of the as-built DAEC SDV system and associated vent and drain system is provided in Attachment 1. As-built isometric drawings of the SDV and detailed descriptions of the remainder of the system are also included in Attachment 1.

Supplement 1, Item A.2). A statement has been added to the DAEC Integrated Plant Operating Instructions (IPOI) Section II.D.2, Loss of Shutdown Margin to advise the reactor operator that prior management or supervisory approval is not required for initiation of the Standby Liquid Control System in the event that:

a. The control rod system is unable to maintain the reactor subcritical and Rx water level cannot be maintained.

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or, b. The control rod system is unable to maintain the Rx subcritical and torus water temperature cannot be maintained below 110°F (DAEC Tech. Spec. 3.7.A.1.c limit).

Supplement 1, Item A.3). The DAEC Surveillance Test Procedure (STP) used to verify daily that no significant amount of water exists in the SDV and associated piping (STP BS-6, Scram Discharge Volume and Piping Water Test, Rev. 4) was revised as necessary to clearly specify remedial action to be taken if water is found in the SDV system. The STP specifies that the following actions be taken in the event that more than one quart of water is found (BS-6, Step 4.6.a):

a. Visually inspect the SDV drain valve (CV-1867) to verify and record its position.
b. If CV-1867 is found to be in the open position a drain path blockage has occurred. If the cause for blockage cannot be corrected within 24 hours, an orderly shutdown shall be initiated and the Rx shall be in cold shutdown within 24 hours.

Supplement 1, Item A.4). A note was added to the DAEC IPOI Section II.D.2, Loss of Shutdown Margin (Step 3.1) to advise the reactor operator that the key for operation of the SLCS control switch is available in the control room at panel 1C05 (Rx. mode switch key). The DAEC Operating Instructions (OI) were reviewed concerning this matter also. SLCS OI No. 53, Step C.1.4 states that the SLCS switch is available at panel 1C05.

Supplement 1, Item A.5). DAEC Surveillance Test Procedure (STP) BS-6 is presently being performed on a daily basis to verify that no significant amount of water exists in the SDV and associated piping. This daily surveillance of the SDV will continue until such time as a continuous SDV level monitoring system (such as discussed in Supplement 1, Item B.1) is installed and fully functional at DAEC.

The details of a SDV continuous water level monitoring system and improved SDV venting system design review (Licensee Action Items B.1) and B.2)) will be discussed in subsequent correspondence. If you have any questions or desire further information regarding this matter, please contact this office.

This response is true and accurate to the best of my knowledge and belief.

IOWA ELECTRIC LIGHT AND POWER COMPANY

BY: Larry D. Root

Larry D. Root
Assistant Vice President
Nuclear Generation

Subscribed and sworn to before me on this 7th day of August, 1980.

Jean R. Smith

Notary Public in and for the State of Iowa

NOTARIAL SEAL IOWA
JEAN R. SMITH
My Commission Expires
September 30, 1981

LDR/DWT/pl

Attach.

cc: U.S. Nuclear Regulatory Commission w/dwgs.
Office of Inspection and Enforcement
Division of Reactor Operations Inspection
Washington, D.C. 20555

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ATTACHMENT 1

SYSTEM DESCRIPTION AND ANALYSIS

A system description of the as-built DAEC Scram Discharge Volume (SDV) System is attached which describes the system, its components and their functions.

Also attached are a set of (10) drawings which reflect the as-built condition of the system. These are:

Dwg. No.	Rev.	Title
NRC-80-17(1)	1	Scram Discharge Headers and Instrument Volumes - Isometric Drawing
NRC-80-17(2)	1	SDV Drain Piping - Isometric Drawing
NRC-80-17(3)	1	SDV Vent Piping - Isometric Drawing
NRC-80-17(4)	1	Instrument Volume "A" Level Instrumentation Piping - Isometric Drawing
NRC-80-18(5)	1	Instrument Volume "B" Level Instrumentation Piping - Isometric Drawing
NRC-80-19(6)	1	Vent & Drain Valve Air Supply Piping - Isometric Drawing
NRC-80-17(7)	1	Drain Valve Air Supply Piping (Continuation of 6) - Isometric Drawing
NRC-80-17(8)	1	SDV System P & ID - Schematic Drawing
FSK-4247	A	SDV Drain Piping (Continuation of 2) - Isometric Drawing
HBC-122-1	A	SDV Drain Piping (Continuation of FSK-4247) - Isometric Drawing

Copies of a number of documents (including many of these described above) were left with representatives of NRR and Region III for informational purposes on July 30 in the Region III offices. This present submittal supersedes those documents presented at the meeting.

Review of drawing numbers (1) & (8) reveals that the 8" diameter headers are in immediate and direct communication with the 10" diameter instrument volumes via the 10" x 8" reducing elbows. Consistent with providing a vertical instrument volume for more accurate and simplified water volume measurement techniques and allowing concessions for plant layout requirements, this arrangement assures a minimum delay time between having water, from whatever source, enter the headers and having it available for cummulative volume measurement. Equally important, it reduces the transient inventory of water present in the headers (which may be leaking from the HCU's) at the instant of a limit-switch-induced scram.

The required pre-scram, free volume in the SDV system for the DAEC is (3.34 gal/CRD x 89 CRD's) 300 gallons. The available volume above the instrument volumes is in excess of 400 gallons.

Approximately 30 representative line slope checks were performed throughout the SDV system including the headers, drain piping and vent piping. In all cases slopes were in the proper direction (i.e., slope up toward the vent valve and down toward the drain valve). This provided assurance that (essentially) no water is held in the 8" diameter headers or anywhere else in the system when the system is gravity drained.

An investigation was performed to determine if water could enter the scram discharge volume headers or instrument volumes via either the vent or drain lines for the system. The vent piping outside of the vent valve is a dedicated line open to the reactor building atmosphere. No mechanism for drawing or forcing water into this line could be identified, given this piping configuration. The 2" drain line for the system enlarges to a 4" drain header downstream of the drain valve. The 4" drain header, prior to terminating above water level in the equipment drain sump, can accept drainage via two other connections: 1) a 3" drain line from the condensate storage tank system (tank drain, overflow tank overflow and sample pit drain) and 2) a 2" instrument condensate drain line from an off gas system panel, 1C-177. If the 4" drain header to the sump is open (not plugged), neither of these two water sources has sufficient pressure and water volume to cause water to back up the 4" drain header, through the SDV drain valve and up into the instrument volumes. Concerning the possible plugging of the 4" line between these connection points and the end of the line at the sump (thereby causing water from either source to back up toward the SDV), no mechanism for such pluggage could be identified since only lines smaller than 4" (i.e., 2", 2" & 3") discharge into this 4" header and the header terminates above sump water level. Therefore, it is concluded that water will not enter the SDV, thereby reducing the available free volume required to perform its safety (scram) function, by either the vent line or drain line.

The seismic integrity of the SDV headers, instrument volumes, drain piping and level instrument piping has previously been verified as part of Iowa Electric responses to NRC Bulletins 79-02 and 79-14. In preparation of this present response, no seismic stress report could be located for the vent piping of the system up to the vent valve. It was apparently not a part of the SDV documentation package. We have immediately initiated corrective action in the form of appropriate pipe support system walkdowns and analyses to assure the seismic integrity of the entire SDV system. This is the only apparent deficiency which we have identified as a part of our response to Supplement 1 of the Bulletin.

Scram Discharge Volume System Description

The scram discharge volume (SDV) system is provided to receive and contain the water exhausted from all CRD's during a reactor scram, thereby limiting the loss of water from the reactor vessel. During normal reactor operation, the discharge volume is empty and its vent valve, CV 1859, and drain valve, CV 1867, remain open. During a scram, venting of the scram valve pilot header via the backup scram valves (SV-1840A & B) or venting of the air line to the vent and drain valves via solenoid valves SV 1868 & 1869 causes these two valves to close. The vent and drain valves may also be manually controlled from the control room via hand switch HS 1870 and SV 1870.

The SDV consists of 8" diameter header piping which connects to each HCU (3/4" drive water discharge line) and drains into 10" diameter instrument volumes. The header piping is sized to contain the water volume discharged from all CRD's during a reactor scram (3.34 gallons/CRD) independent of the instrument volumes. One half (44) of the 89 HCU's are connected to header piping which drains into instrument volume "B" on the north side of the DAEC reactor building. The other half (45) are connected to SDV header piping which drains into instrument volume "A" on the south side of the building. The two instrument volumes communicate with each other via a 2" diameter line connected to the bottom of each instrument volume.

Float-type, liquid level switches are connected to the piping system to continuously monitor the instrument volumes for abnormal water accumulation. An instrument volume high level switch (LS1861F) actuates a control room alarm to indicate that the volume is not completely empty during post-scram draining or to indicate that the volume starts to fill through water accumulation at other times during reactor operation. A rod-withdraw-block level switch (LS1861E) actuates a control room alarm and prevents further control rod withdrawal when water accumulates to half the capacity of the instrument volumes.

Four additional switches are interconnected with the trip channels (A-1, A-2, B-1, B-2) of the RPS and will initiate a reactor scram should water fill the instrument volumes. Two switches are mounted on each instrument volume: The A-1 & B-1 trip channel switches on the "A" instrument volume and the A-2 and B-2 trip channel switches on the "B" instrument volume. The switch logic is arranged such that a reactor scram will occur when either "A" trip channel and either "B" trip channel is activated ("1 our of 2, twice" logic). Therefore a scram will be initiated if both switches on either instrument volume are tripped or if an "A" trip channel switch on one instrument volume and a "B" trip channel switch on the other instrument volume are tripped.

TABLE - 1

INSTRUMENT LIST FOR SCRAM DISCHARGE VOLUME SYSTEM

Instrument or Control Device	Location	Description	Function
CV 1859	SDV Vent Piping	Globe Valve (Pressure in SDV acts to close valve)	Normally open - closes during scram to contain discharge - failure position is closed.
ZS 1859	SDV Vent Valve	Stem-mounted position switch	Monitors stem position of CV 1859 and controls position indicator lights on Panel 1C05.
LS 1861A	(1) Instrument Volume A	(1) Float-type level switch	Provide scram trip when water level corresponds to filled instrument volumes. Also provides input to computer. (Set points = 60 gallons)
LS 1861B	(2) Instrument Volume A	(2) Float-type level switch	
LS 1861C	(3) Instrument Volume B	(3) Float- type level switch	
LS 1861D	(4) Instrument Volume B	(4) Float-type level switch	
LS 1861E	Instrument Volume A	Float-type level switch	Blocks rod withdrawal if level rises to fill half the instrument volumes - activates annunciator in control room (Set point = 29 gallons)
LS 1861F	Instrument Volume A	Float-type level switch	High level - activates annunciator in control room (Set point = 3 gallons)
CV 1867	SDV Drain Piping	Globe valve (Pressure in SDV acts to close valve)	Normally open - closes during scram to contain discharge - failure position is closed.
ZS 1867	SDV Drain Valve	Stem-mounted position switch	Monitors stem position of CV 1867 and controls positon indicator lights on Panel 1C05
SV 1868 SV 1869	Scram Valve Pilot Air Header	(1) Solenoid valve (2) Solenoid valve	On signal from Reactor Protection System, vents air to close vent and drain valves - both valves must function to accomplish above function
SV 1870	Scram Valve Pilot Air Header	Solenoid valve	On signal from HS 1870 closes vent and drain valves.
HS 1870	Panel 1C05	Hand switch	Provides manual switch in Control Room to close vent and drain valves for test purposes.
PSV 1871	Bottom of Instrument Volume A	Pressure relief valve	To relieve pressures over 1250 psig in the SDV system.

TABLE - 2

COMPUTER INPUTS

Point ID	Function Monitored	Activated By	Limits
(1) C-D500 (2) C-D501 (3) C-D502 (4) C-D503	Water level in instrument volumes	(1) LS 1861A (2) LS 1861B (3) LS 1861C (4) LS 1861D	60 gallons accumulated in instrument volumes

TABLE - 3

ANNUNCIATORS

Description	Location	Activated By	Limits
Scram Discharge Volume Not Drained	1C05	LS 1861F	Activated when water level corresponds to 3 gallons (nominal) in instrument volumes.
Instr Volume Hi Water Level CRD trip (red)	1C05	LS 1861A, B,C,D	Instrument volumes are filled (60 gallons)
Instr Volume Water Hi Level Trip Bypass	1C05	Relays in K18A-D in 1C15 & 1C17 with Mode and Bypass Switches	Mode Switch in SHUTDOWN or REFUEL and INSTR Vol Wtr High Level Trip Bypass Switch in BYPASS