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October 28, 1982

Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Subject: Oconee Nuclear Station
Docket No. 50-269

Dear Mr. O'Reilly:

Please find attached Reportable Occurrence Report RO-269/82-18. This report is submitted pursuant to Oconee Nuclear Station Technical Specification 6.6.2.1.a(2) which concerns an operation subject to a limiting condition for operation which was less conservative than the least conservative aspect of the limiting condition for operation established in the Technical Specifications, and describes an incident which is considered to be of no significance with respect to its effect on the health and safety of the public.

Very truly yours,

Hal B Tucker - by WAH

Hal B. Tucker

JFN/php
Attachment

cc: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. W. T. Orders
NRC Resident Inspector
Oconee Nuclear Station

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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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Duke Power Company
Oconee Nuclear Station

Report Number: RO-269/82-18

Report Date: October 28, 1982

Occurrence Date: October 14, 1982

Facility: Oconee Nuclear Station, Seneca, South Carolina

Identification of Occurrence:

Three of the six Pressurizer Safety Valves on the Oconee Units were declared inoperable due to improper ring settings.

Conditions Prior to Occurrence: Oconee 1 - 100% FP
Oconee 2 - 100% FP
Oconee 3 - Cold Shutdown

Description of Occurrence:

NUREG-0737 Item II.D.1 required that a relief and safety valve test program be conducted to verify operability of these valves under postulated accident conditions. As a participant in this program, Duke Power was provided the results of the testing, including the testing of Dresser 31739A Safety Valves with short inlet piping as are used at Oconee Nuclear Station. The results of the testing showed that Dresser Safety Valve performance was affected by backpressure and ring settings (upper, middle, lower as seen on Figure 1). A preliminary assessment of preliminary test reports was provided to the NRC on July 1, 1982.

The results of the EPRI testing indicated that with ring settings of +11, -40, -48 (lower, middle, upper rings) the Dresser 31739A Safety Valve provided adequate relief under all expected conditions. However, this ring setting would result in an increase in blowdown (valve closing pressure versus opening pressure) in some cases.

Based on these findings, Duke Power began a three-phased approach to complete the analysis of Oconee Safety Valve performance. First, Duke initiated an analysis using RELAP 5, as benchmarked in the EPRI testing, to determine the backpressure which the valves would see under various conditions. Second, Duke contracted Babcock and Wilcox to analyze the significance of Safety Valve blowdown on plant performance. And third, Duke initiated a detailed analysis of Oconee valves, using the valve dynamic analysis code COUPLE, to determine the optimum ring settings to be used, which were expected to be fine tuned adjustments of the EPRI tested settings.

B&W's analysis indicated that up to 20 percent blowdown was acceptable under all expected conditions. This bounded all EPRI test results with the +11 -40 -48 ring settings.

On October 8, 1982, preliminary results from initial analysis at Duke showed that under full flow of the Safety Valves the backpressure could be high enough

to affect valve performance if the ring settings were less than optimum. Duke requested Dresser to provide what the ring settings were on the Oconee valves. On October 12, 1982 Dresser provided ring settings of five of the eight Oconee valves (two on each unit pressurizer plus two spares), taken from field data sheets when the valves were last refurbished at Wylie. Table 1 shows the ring settings obtained from Dresser. Discussions with Dresser revealed that they did not know now what ring settings were set into new valves when they were delivered, and that the ring settings were first recorded when valves were refurbished at Wylie. Valves BT-4975 and BT-4976 were new and, thus, no data were obtained for them. Upon receipt of these ring settings Duke became concerned with the difference between the Dresser recorded values and the recommended ring settings from the EPRI testing. However, the ring settings obtained from Dresser had neither been verified by actual inspection nor had a safety evaluation been completed using various assumed conditions of safety valve operability.

Duke immediately (October 12, 1982) shipped the two spare Oconee valves to Wylie for inspection to determine the actual ring settings. The "as found" ring settings were obtained from Wylie on the afternoon of October 13, 1982 and are indicated in Table 2. While the "as found" settings differed somewhat from the numbers provided by Dresser, the settings on the two most important rings (lower and middle) were significantly different from the EPRI recommended settings. This alone did not determine whether or not the safety valves were functionally operable and capable of performing their design bases function of relieving overpressure conditions during anticipated occurrences and design bases events. To answer these questions Duke had already initiated an around-the-clock analytical effort to attempt to derive valve performance from the EPRI test data and to determine actual safety valve relief requirements based on transient analysis.

Since no EPRI tests were performed with middle ring settings comparable to Oconee, no absolute values could be obtained regarding expected performance. However, the results of these analytical efforts completed on October 14, 1982 indicated that, for the valves with positive middle ring settings, performance would be substantially degraded from rated valve performance. When that determination was made, those valves were declared not to meet the requirements of Technical Specification 3.1.1.c.1.

For the two new valves (BT-4975 and BT-4976) ring settings and, thus, valve performance were unknown. BT-4975 was removed from Unit 3 and was shipped to Wylie to determine "as found" ring settings, which were -11, 0, -23 (lower, middle, upper). The expected valve performance with these ring settings would have been substantially better than the older Oconee valves.

Apparent Cause of Occurrence:

Prior to the EPRI Relief and Safety Valve Test program, actual valve performance for various conditions with backpressure from discharge piping had never been tested. Previously, valves were tested to determine lift set point and the rings were adjusted to control blowdown within desired tolerances. The relationship between ring settings and valve relief in the presence of various back-

pressures was not known.

Why the older Oconee valve ring settings were so different from the newer valves is unknown. Since Dresser did not record valve ring settings as they were set when supplied to the customer, there is no way to retrieve that information.

Analysis of Occurrence:

Since no tests have been conducted with Dresser 31739A Safety Valves with ring settings similar to the Oconee valves, actual valve performance under various conditions is unknown. In general, degraded valve performance from the tests can be characterized by chatter or by reduced lift in the presence of high backpressure. The EPRI tests indicated that valves with short inlet pipe configuration (as is the case at Oconee) were much less prone to chatter than long inlet piping. Also, even in the presence of chatter the valves tested provided substantial relief. (The short inlet configured Dresser 31739A did not experience any chatter even in the worst ring setting tested.)

During the EPRI tests the Dresser 31739A valve was shown to achieve less than rated lift in the presence of high backpressure when the "huddle chamber" shown in Figure 1 was opened up with ring settings of -13, 0, -48 (lower, middle, upper). In the tests the percent of rated flow achieved was significantly higher than the percent rated lift achieved (which is reasonable since valves are conservatively derated from actual expected flow). In actual plant conditions high backpressure is caused by high relief flows, so if relief flow is reduced, then the backpressure is also reduced.

A number of plant transients and accidents involve a pressure transient in the reactor coolant system (RCS). The safety systems provided for overpressure protection are the Reactor Protection System (RPS), through the high RCS pressure trip function, and the pressurizer safety valves. Most of the events involving an RCS overpressure condition are adequately mitigated by the RPS. Accident conditions requiring pressurizer safety valve pressure relief are generally characterized by low frequency of occurrence as evidenced by the operating experience. Also, the FSAR analyses involving overpressure protection include significant conservatisms over actual conditions. (A preliminary assessment of FSAR analyses of moderate frequency events for all B&W plants indicates only a small percent of the capacity of safety valve relief is needed for safe operation.) Thus, a reduction in relief capacity would not necessarily result in an unsafe condition.

Despite the unknown quantity of valve relief and the low probability of needing safety valve relief, Duke decided to immediately initiate steps to reset the valve ring settings to proven EPRI values and thus ensure that the health and safety of the public would not be jeopardized.

Corrective Action:

Steps were immediately taken to reset the safety valve ring settings to the

EPRI proven values. Unit 2 was shut down to remove the safety valves and to replace them with valves with proper ring settings. Unit 3 valves were replaced with reset valves prior to restart. Permission was received from the NRC to delay Unit 1 shutdown for up to two weeks to allow a phased work process at Oconee. All units now have valves with reset ring settings installed. All valve refurbishment and ring measurement and setting were accomplished at Wylie Laboratory.

Duke is participating in a program to fine tune these EPRI test ring settings using the valve dynamic code COUPLE. The results of all safety valve related analyses should be complete in time to allow any fine tune adjustments to be made to the ring settings on the valves now installed during the next refueling outage for each unit. However, the EPRI recommended values used in resetting the Oconee valves have been shown to provide satisfactory valve performance under all expected conditions.

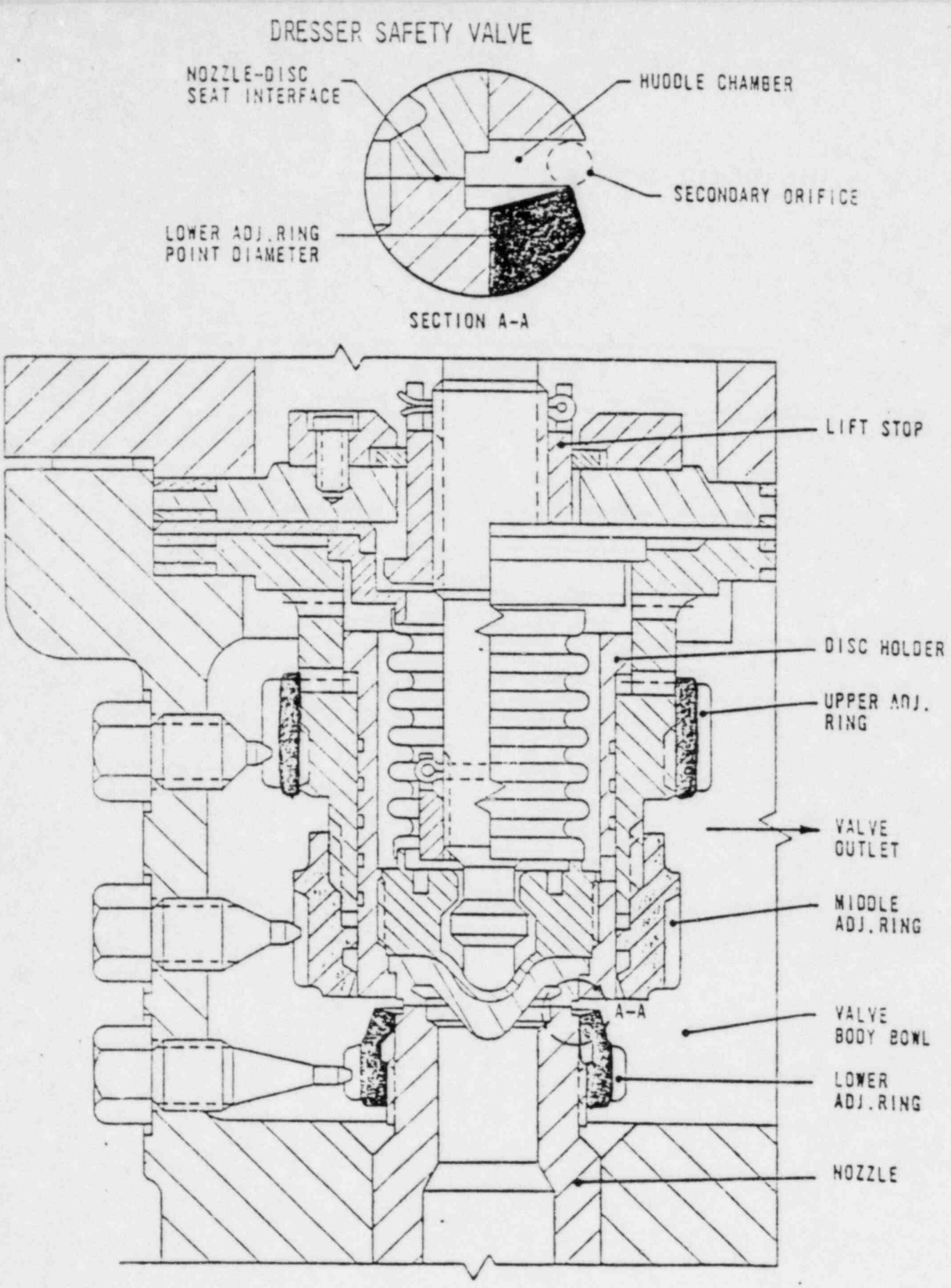
DRESSER SAFETY VALVE
NOZZLE-DISC SEAT INTERFACE
HUDDLE CHAMBER
SECONDARY ORIFICE
LOWER ADJ. RING POINT DIAMETER
SECTION A-A
LIFT STOP
DISC HOLDER
UPPER ADJ. RING
VALVE OUTLET
MIDDLE ADJ. RING
A-A
VALVE BODY BOWL
LOWER ADJ. RING
NOZZLE

FIGURE 1

TABLE 1

Oconee Safety Valve Ring Settings

	Valve Serial Number	Ring Settings Upper	Middle	Lower
Unit 1	BL-8894 BT-4976	-48	+40	-8
Unit 2	BL-8889	-48	+41	-8
	BL-8895	-48	+41	-9
Unit 3	BL-8890 BT-4975			-7
SPARE	BL-8891	-48	+70	-7
	BL-8896	-48	+35	-8

TABLE 2

AS FOUND RING SETTINGS AT WYLIE

SPARE	BL-8891	-71	+39	-9
VALVES	BL-8896	-74	+40	-4