

DUKE POWER COMPANY

POWER BUILDING

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WILLIAM O. PARKER, JR.  
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November 24, 1980

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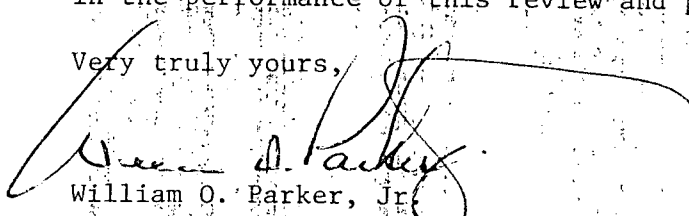
Mr. James P. O'Reilly, Director  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, Suite 3100  
Atlanta, Georgia 30303

Re: RII:JPO  
50-269, -270, -287

Dear Sir:

With regard to your letter of November 14, 1980 which transmitted IE Bulletin 80-23, attached please find Duke Power Company's responses to Action Items 1 and 2 for the Oconee Nuclear Station. Approximately 60 manhours were required in the performance of this review and preparation of the attached responses.

Very truly yours,

  
William O. Parker, Jr.

FTP:scs  
Attachment

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

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ATTACHMENT

DUKE POWER COMPANY  
OCONEE NUCLEAR STATION

IE Bulletin 80-23  
Responses to Action Items 1 and 2

1. Determine whether Valcor solenoid valves having P/N's V70900-21-1 or -3 are used to perform any safety-related function at your facility. If so, identify the safety-related systems using these solenoid valves, the total number of such solenoid valves used, and evaluate acceptability of continued operation with potentially defective solenoid valves. A report of the results of the evaluation of continued operation shall be submitted within ten (10) days of the date of this bulletin and should include factors such as (a) operator's ability to promptly identify a failing or failed solenoid valve, (b) effect of solenoid valve failures on safety-related systems and subsequent operator actions required, and (c) possible degradation of the power supply serving a failed solenoid valve and the effects on other components served by said power supply. If no such solenoid valves are used, you need only submit a negative declaration to this effect within thirty (30) days of the date of this bulletin and you need not respond to the remaining items.

DUKE RESPONSE

Presently, Oconee has eighteen (18) (six per unit) Valcor solenoid valves installed in the Auxiliary Feedwater system. As shown on the attached sketch, there are three (3) Valcor solenoid valves used with each train of Auxiliary Feedwater.

<u>Valve</u>	<u>Use</u>
SV202	Cooling Water to Motor Driven Emergency Feedwater Pump A (MDEFWP).
SV203	Cooling Water to Motor Driven Emergency Feedwater Pump B (MDEFWP).
SV200	Selects Manual or Automatic Control of FDW-315.
SV201	Selects Manual or Automatic Control of FDW-316.
SV204	Selects Train A or B Level Transmitter For Automatic Control of FDW-315.
SV205	Selects Train A or B Level Transmitter For Automatic Control of FDW-316.

Tables 1 and 2 give the effects of failure, indication of failure, and subsequent operator action of each solenoid failure for Oconee Unit 2. Units 1 and 3 are similar. As can be seen from a review of the tables and the sketch with a failure of any single solenoid feedwater will be supplied to both steam generators. Also the worse failure of a single solenoid (a short of one of the cooling water solenoids which prevents its respective MDEFWP for starting) will not stop feedwater flow from being supplied to both steam generators and can be detected from the control room.

The solenoid coils can fail either open or short circuited. We have had three Valcor solenoid failures at Oconee. All three have failed open circuited without tripping their power supply circuit breakers. If all the Valcor solenoids in both trains of Auxiliary Feedwater fail open circuited, all three emergency feedwater pumps will supply feedwater to both steam generators. If all the Valcor solenoids in both trains of auxiliary feedwater fail short circuited and trip their respective power supply breakers, the turbine driven feedwater pump will supply feedwater to both steam generators.

In summary, the Oconee Auxiliary Feedwater System can withstand single and/or multiple failures of the Valcor solenoids and still perform its safety function.

2. Licensees of operating plants using the aforementioned solenoid valves in safety-related applications shall periodically test the coils for potential turn-to-turn shorts in a manner that will not violate any LCO or cause any undesirable transient. The tests should account for coil resistance changes due to temperature effects attributed to the environment to  $I^2R$  losses in the coil to provide accurate indications of changes in resistance due to turn-to-turn shorts.

These tests are to be initiated within ten (10) days of the date of this bulletin. The following schedule is recommended until the units are replaced with qualified units:

- (a) Daily for solenoid valves operated in a normally energized mode;
- (b) Weekly for solenoid valves operated in a normally de-energized mode.

Whenever the tests indicate that ten percent or more of the coil turns have been shorted, said solenoid valve, or its coil, shall be replaced with a new unit.




#### DUKE RESPONSE

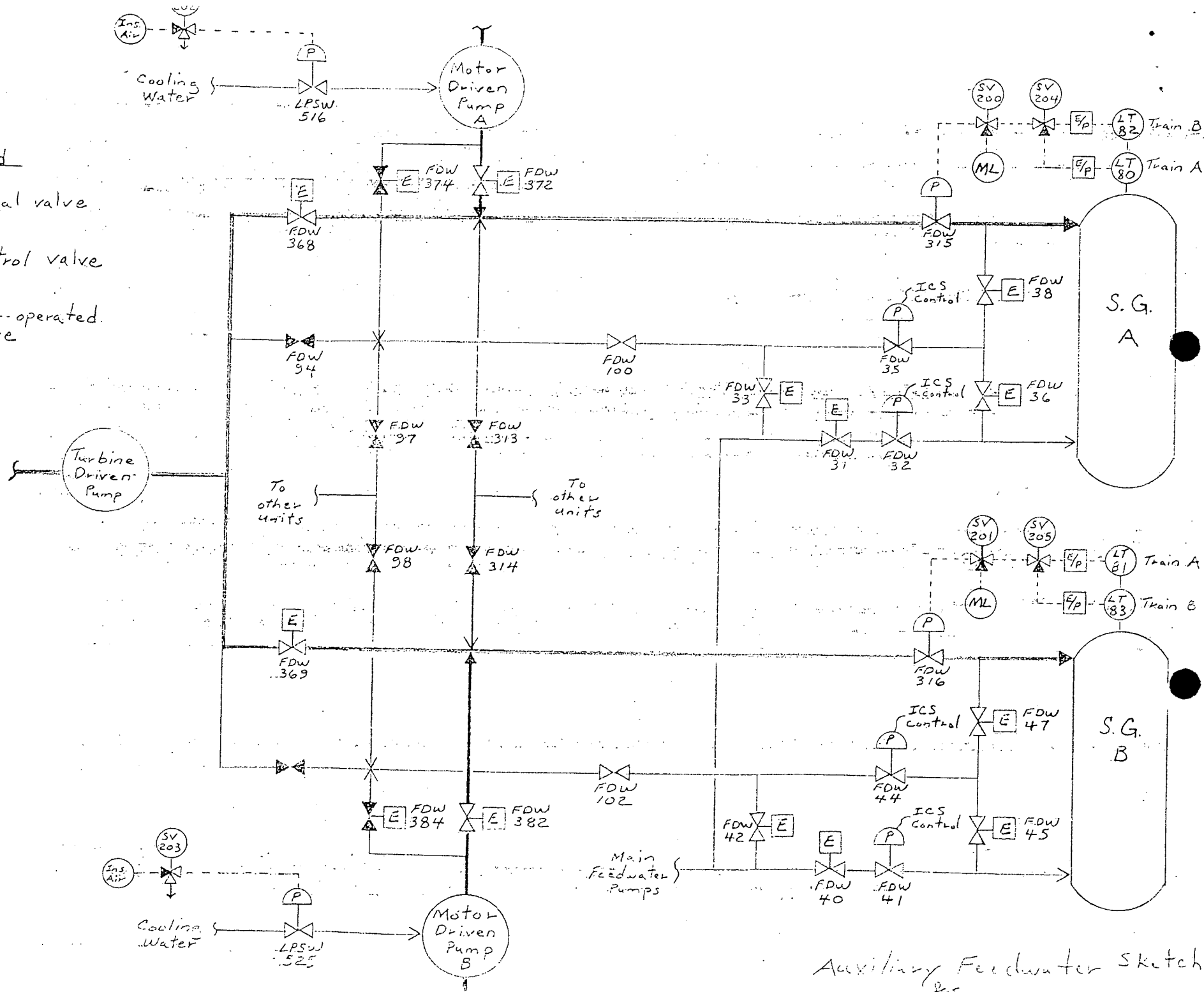
Oconee has had three (3) failures of the Valcor solenoids. As mentioned in Item #1, all three have failed open circuited without tripping their respective power supply circuit breakers. As a result of an August 29, 1980 failure, a surveillance procedure was written to allow on-line verification of all Valcor solenoids weekly until the problem was resolved. In addition, we will verify each shift from the control room that control power is available to both MDEFWP's. In view of our failure analysis, we feel that the above surveillances are adequate to assure satisfactory operation of Oconee's Auxiliary Feedwater System.

Furthermore, we do not believe that the required resistance test would yield meaningful results. We have performed tests in our lab on a limited number of Valcor solenoids and agree that a ten percent change in resistance indicates that the solenoid will probably fail. Additional tests have shown that when power is removed from the solenoid, it changes resistance approximately 50 ohms in the first 4 minutes. There are several uncontrollable variables which would influence the results of any test performed in the field:

1. Ambient Temperature.
2. Battery (supply ) Voltage - Oconee's DC supply voltage is  $130 \text{ VDC} \pm 4 \text{ VDC}$ .
3. Number of windings actually shorted, i.e., we have no baseline data to measure from.
4. Length of time the coil has been energized.
5. Relative humidity in the area that the solenoid is located in.

Legend

-  Manual valve
-  Control valve
-  motor-operated valve



Auxiliary Feedwater Sketch  
etc.

TABLE 1

SOLENOID #	FUNCTION	NORMALLY	POWER SUPPLY	EFFECTS OF FAILURE	
				OPEN CIRCUIT	SHORT CIRCUIT
2SV202	De-energizes to open 2LPSW-516 which supplies cooling water to MDEFWP-2A.	Energized	125VDC Panelboard 2DIB Breaker 32	Solenoid causes 2LPSW-516 to open supplying cooling water to MDEFWP-2A	Same as open circuit. Also if 2DIB Breaker 32 trips, it will prevent MDEFWP-2A from starting.
2SV200	Selects automatic or manual level control for steam generator 2A	Energized	125VDC Panelboard 2DIB Breaker 10	Selects automatic mode of level control. Lose manual control of FDW-315.	Same as open circuit. Also if 2DIB Breaker 10 trips, 2SV204 de-energizes selecting the Train B level transmitter.
2SV204	Selects which level transmitter will control steam generator 2A level when the system is in the automatic mode.	Energized	Same as 2SV200	Selects the Train B level transmitter for control.	Same as open circuit. Also, if 2DIB Breaker 10 trips, 2SV200 de-energizes selecting automatic control using the Train B level transmitter. Lose manual control of FDW-315.
2SV203	De-energizes to open 2LPSW-525 which supplies cooling water to MDEFWP-2B	Energized	125VDC Panelboard 2DIC Breaker 28	Solenoid causes 2LPSW-525 to open supplying cooling water to MDEFWP-2B	Same as open circuit. Also if 2DIC Breaker 28 trips, it will prevent MDEFWP-2B from starting.
2SV201	Selects automatic or manual level control for steam generator 2B	Energized	125VDC Panelboard 2DIC Breaker 10	Selects automatic mode of level control. Lose manual control of FDW-316.	Same as open circuit. Also if 2DIC Breaker 10 trips, 2SV205 de-energizes selecting the Train A level transmitter
2SV205	Selects which level transmitter will Control Steam Generator 2B level when the system is in the automatic mode.	Energized	Same as 2SV201	Selects the Train A level transmitter for control.	Same as open circuit. Also if 2DIC Breaker 10 trips, 2SV201 de-energizes selecting automatic control using the Train A level transmitter. Lose manual control of FDW-316.

TABLE 2

SOLENOID	INDICATION OF FAILURE		OPERATOR ACTIONS ON FAILURE DURING EMERGENCY FEEDWATER OPERATION
	SHORT	OPEN	
2SV202	If 2DIB Breaker 32 trips, MDEFWP 2A control board indicating lights go out. If coil shorts to case, it will initiate a control room alarm on DC ground fault.	None	None TDEFWP and MDEFWP 2B will supply cooling water to the steam generators.
2SV200	If coil shorts to case, it will initiate a control room alarm on DC ground fault.	None	FDW-315 will be controlled automatically. The operator will lose manual control of FDW-315. FDW-372 and FDW-368 will be used to isolate feedwater to steam generator 2A if necessary.
2SV204	If coil shorts to case, it will initiate a control room alarm on DC ground fault.	None	FDW-315 will be controlled automatically. Manual control of FDW-315 will still be available unless 2DIB Breaker 10 trips. If 2DIB Breaker 10 trips, FDW-372 and FDW-368 will be used to isolate feedwater to steam generator 2A if necessary.
2SV203	If 2DIC Breaker 28 trips, MDEFWP-2B control board indicating lights go out. If coil shorts to case, it will initiate a control room alarm on DC ground fault.	None	None TDEFWP and MDEFWP 2A will supply cooling water to the steam generators.
2SV201	If coil shorts to case, it will initiate a control room alarm on DC ground fault.	None	FDW-316 will be controlled automatically. The operator will lose manual control of FDW-316. FDW-382 and FDW-369 will be used to isolate feedwater to steam generator 2B if necessary.
2SV205	If coil shorts to case, it will initiate a control room alarm on DC ground fault.	None	FDW-316 will be controlled automatically. Manual control of FDW-316 will still be available unless 2DIC Breaker 10 trips. If 2DIC Breaker 10 trips, FDW-382 and FDW-369 will be used to isolate feedwater to steam generator 2B if necessary.