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CRYSTAL RIVER 3 ECCS MODIFICATION

The enclosed material submitted by Florida Power Corporation (FPC) in response to an inquiry on LOCA operating procedure indicates that automatic flow controllers are being added to their Decay Heat and Building Spray systems. FPC's stated intent of the design change is to preclude the need for operator action or operating procedures to control pump runout (which could result in insufficient pump suction head).

Your review of this design is invited and could be considered a followup to your letter to me on CR-3 dated May 5, 1976. (Also, item 4.0 in the May 5th letter awaits resolution). Your conclusions by August 1, 1976 would be appreciated.

Original Signed by
Thomas M. Novak

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Enclosure:
As Stated

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Informal ECCS Questions - Runout

During the injection phase of ECCS following E. S. actuation the runout flow for the Decay Heat and Reactor Building Spray pumps is ultimately high and the limiting condition is that of insufficient discharge system head. During the recirculation phase the runout flow for the Decay Heat and Reactor Building Spray pump is significantly less than for the injection phase and the limiting condition is that of NPSH.

In order to prevent runout or exceedance of NPSH margin available for both of these systems during either phase of operation, safety-related automatic flow controllers will be added to the Decay Heat and R.B. Spray Systems.

Runout or exceedance of the NPSH margin available by the Decay Heat pumps during the injection and recirculation phases will be prevented by discharge valve limit switch adjustment and by automatic flow controllers operating the throttle valves. The limit switches on throttle valves DHV-110 and DHV-111 are adjusted such that the system is preset to deliver 3000 gpm at 100 psig Reactor Coolant pressure. As the Reactor Coolant pressure decays, the automatic flow controllers monitor the discharge flow of DHP-1A and DHP-1B and automatically throttle DHV-110 and DHV-111 as required to maintain the flow between 3000 and 3300 gpm during both phases of operation. For the Decay Heat System the automatic flow controller remains in operation following E.S. by-pass and change over to the recirculation mode.

Similar safety related automatic flow controllers are provided for the Reactor Building Spray pumps to prevent runout or exceedance of NPSH margin available by throttling discharge valves BSV-3 and BSV-4 as necessary to accomadate the following two modes of operation:

(1) With an E.S. signal present (injection phase), safety related flow switches activate the automatic flow controller which throttles BSV-3 & 4 as required to maintain the flow between 1500 and 1600 gpm.

(2) When the E.S. signal is by-passed following a LOCA (recirculation phase), a separate set of safety related flow switches activate the automatic flow controller which throttles BSV-3 & 4 as required to maintain the flow between 1150 and 1250 gpm.

A key switch in a locked cabinet is also provided to give the operator the flexibility of manually bypassing the automatic flow controller to allow operator control from the control room of DHV-110 and DHV-111. In addition, BSV-3 and BSV-4 can be manually controlled from the control room.

The flow set points for the automatic flow controllers and their respective alarm limits are included in Table 1 (attached).

The use of automatic flow controllers during the injection phase and the recirculation phase precludes the need for operator action or operating procedures to control pump runout or the exceedance of NPSH margin available for the Decay Heat & R.B. Spray Systems. However, Annunciator Alarm procedures (AP-102) are available to aid the operator in his response to alarms indicating high or low flow conditions in the Decay Heat or R.B. Spray Systems. These procedures list specific inputs and/or set points to each annunicator window, probable cause for the alarm, symptoms indicated by the cause, automatic action associated with the alarm, and follow-up action to correct the problem.

Information concerning the accuracies of the outlet flow instrumentation and alarms for the R.B. Spray Pumps BSP-1A and BSP-1B and the Decay Heat Pumps DHP-1A and DHP-1B is included in Table 2 (attached).

It is our intent to test these systems to the most complete and actual postulated E.S. condition possible to insure that the automatic flow controllers maintain the flow to within the limits identified with Table 1.

Table 1

Flow and Alarm Setpoints

		Decay Heat System (GPM)	R.B. Spray System (GPM)
Runout Flow D. H. Pump:		4100	2000
Maximum Flow based on NPSH margin during recirculation phase:		~3700	~1300
Alarm Setpoints:			
Injection Phase			
	High	3400	1700
	Low	2800	1400
Recirculation Phase			
	High	3400	1300
	Low	2800	1100
Automatic Flow Controller Setpoints:			
Injection Phase			
	High	3300	1600
	Low	3000	1500
Recirculation Phase			
	High	3300	1250
	Low	3000	1150

Table 2

Pump: BSP-1A	Outlet Flow Instrumentation and Alarms
Primary Element:	BS-1-FE1 (Local) Bailey Meter Company 8" 304 SS Eccentric Orifice S/N 159315
Transmitter:	BS-1-DPT1 (Local) Bailey Meter Company BY-8240-A S/N 721866 Flow Range: 0-1800 GPM From - 0-300" H_2O Differential Accuracy: $\pm$ 1/2% of Range Output: -10 to +10 VDC
Remote Indication:	BS-1-FI1 ESF(A) Item JQ Bailey Meter Company RY 120 X S/N 690102 Flow Range: 0-1800 GPM Scale Accuracy: $\pm$ 1% of Span Input: -10 to +10 VDC
Alarm Switch:	BS-1-FS1 (NNI CAB) Bailey Meter Company Alarm Monitor 6683819-1 Range: 0-1800 GPM Injection Phase: High Flow Alarm - 1700 GPM Low Flow Alarm - 1400 GPM Recirculation Phase: High Flow Alarm - 1300 GPM Low Flow Alarm - 1100 GPM Accuracy: $\pm$ 0.25% of Span
Overall Accuracy:	$\pm$ 1.14%

Table 2 (continued)

Pump: BSP-1B	Outlet Flow Instrumentation and Alarms
Primary Element:	BS-1-FE2 (Local) Bailey Meter Company 8" 304 SS Eccentric Orifice S/N 159316
Transmitter:	BS-1-DPT2 (Local) Bailey Meter Company BY-8420-A S/N 721867 Flow Range: 0-1800 GPM From - 0-300" H_2O Differential Accuracy: ± 1/2% of Span Output: -10 to +10 VDC
Remote Indication:	BS-1-FI2 ESF(B) Item JQ) Bailey Meter Company RY 120 X S/N 690103 Flow Range: 0-1800 GPM Scale Accuracy: ± 1% of Span Input: -10 to +10 VDC
Alarm Switch:	BS-1-FS2 (NNI CAB) Bailey Meter Company Alarm Monitor 6623819-1 Range: 0-1800 GPM Injection Phase: High Flow Alarm - 1700 GPM Low Flow Alarm - 1400 GPM Recirculation Phase: High Flow Alarm - 1300 GPM Low Flow Alarm - 1100 GPM Accuracy: ± 0.25% of Span
Overall Accuracy:	± 1.14%

Table 2 (continued)

Pump: DHP-1A	Outlet Flow Instrumentation and Alarms
Primary Element:	DH-1-FE1 (Local) Bailey Meter Company 10" 304 SS Eccentric Orifice S/N 159331
Transmitter:	DH-1-DPT1 (Local) Bailey Meter Company BY-8240X-A S/N 721859 Flow Range: 0-5000 GPM From - 0-573.9" H_2O Differential Accuracy: $\pm$ 1/2% of Span Output: -10 to +10 VDC
Remote Indication:	DH-1-FI1 ESF(A) Item KB Bailey Meter Company RY 120 X S/N 690093 Flow Range: 0-5000 GPM Linear Scale Accuracy: $\pm$ 1% of Span Input: -10 to +10 VDC
Alarm Switch:	DH-1-FS1 (NNI CAB) Bailey Meter Company Alarm Monitor 6623819-1 Range: 0-5000 GPM Injection and Recirculation Phases: High Flow Alarm - 3400 GPM Low Flow Alarm - 2800 GPM Accuracy: $\pm$ 0.25% of Span
Overall Accuracy:	$\pm$ 1.14%

Table 2 (continued)

Pump: DHP-1B	Outlet Flow Instrumentation and Alarms
Primary Element:	DH-1-FE2 (Local) Bailey Meter Company 10" 304 SS Eccentric Orifice S/N 159332
Transmitter:	DH-1-DPT2 (Local) Bailey Meter Company BY-8240X-A Flow Range: 0-5000 GPM From - 0-573.9" H_2O Differential Accuracy: $\pm$ 1/2% of Span Output: -10 to +10 VDC
Remote Indication:	DH-1-FI2 ESF(B) Item KB Bailey Meter Company RY 120 X S/N 690094 Flow Range: 0-5000 GPM Linear Scale Accuracy: $\pm$ 1% of Span Input: -10 to +10 VDC
Alarm Switch:	DH-1-FS2 (NNI CAB) Bailey Meter Company Alarm Montior 6623819-1 Range: 0-5000 GPM Injection and Recirculation Phases: High Flow Alarm - 3400 GPM Low Flow Alarm - 2800 GPM Accuracy: $\pm$ 0.25% of Span
Overall Accuracy:	$\pm$ 1.14%