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TWO PUMP OPERATION OF TWO LOOP-4 PUMP REACTORS

As part of OL Review for Calvert Cliffs the operation of the reactor coolant loop with 4, 3, and 2 reactor coolant pumps was evaluated. One step of the review was to compare to other plants, and the second step was to perform in-house simplified calculations. The results of these steps are as follows:

PLANT	Reactor Flow Rate (%) of 4 pump				
	4 pumps	3 pumps	1-each loop	2-one loop	1 pump
Calvert Cliffs (BG&E)	100	73	50	47	--
Calvert Cliffs (DRL)	100	72.5	45.6	27.6	18.5
Palisades (CPC)	100	71	46	46	--
Oconee (DPC)	100	74	49	42.8	21

Note that a significant difference was found between the manufacturers and DRL calculated flow with operation of 2 pumps in one loop. Our judgement supports the in-house calculated results.

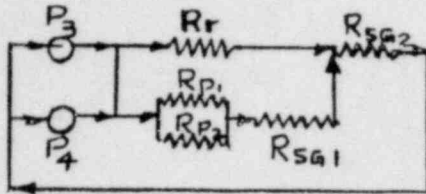
The in-house calculations used the basic flow resistance as symbolized in Fig. 1.

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FIG. 1

Calvert Cliffs Plant

2 pumps Operating In One Loop



Rr - Reactor

Rsg - Steam Generator

Rp - Pump

P - Operating Pump

Using Combustion engineering Flow vs Head curve for back-flow through the dead pumps, and pressure drop approximations through the reactor and steam generators based on FSAR data, the flow through the reactor was determined as 27.6% of 4 pump flow rate.

In an effort to determine the cause of the difference in calculations, FIG. 1 was revised to FIG. 2 configuration. This represents one possible error in the manufacturers codes.

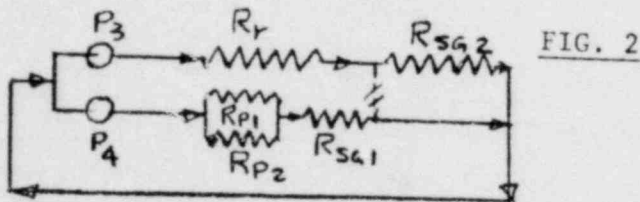


FIG. 2

Solving this configuration we find the reactor flow at 47.8 compared to the manufacturers value of 47%. This configuration is physically impossible to achieve. Since manufacturers find flows almost equal for either two pump operation, their Tech Specs do not differentiate between the two.

Since our calculations show the one condition flow much greater than the other, it is suggested that the Project Leaders be aware of this apparent anomaly. They may want to clarify their particular situation to their satisfaction. Careful flow testing in the field will provide conclusive answers required for reactor safety.

G. W. Knighton, Project Leader
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Division of Reactor Licensing