REF 4

To:	D. W. MONTGOMERY - PROJECT MANAGER, NPSD
From	J. H. TAYLOR - FLUID SYSTEMS GROUP, NPSD
Cust.	DUKE POWER COMPANY
Subj.	PRESSURIZER SAFETY VALVE AND SPRAY VALVE REQUIREMENTS
	File No. 610-0003-[illegible] Vol. 2 or Ref. and 12209
	Date Dec. 13, 1968

This letter to cover one customer and one subject only.

Ref.: Letter from H. F. Dobal to D. W. Montgomery, dated September 14, 1967, Subject: Pressurizer Safety Valve Requirements.

During recent weeks additional investigative work has been completed to determine whether a pilot actuated safety valve could be eliminated. The pros and cons of a pilot actuated safety valve were discussed in some detail in the above referenced letter. The additional investigation of this matter has been completed in preliminary form and it is concluded that a pilot actuated safety valve in combination with a small spray valve should be used in our plants.

Mr. J. D. Carlton has performed these transient studies which have led us to the above conclusion. These studies were based on the following conditions:

a. A transient involving a 15% step down from 100% power.
b. Spray valve opening set point at 2250 psig.
c. Spray valve closing set point at 2165 psig.
d. Pilot actuated safety valve set point at 2300 psig.
e. Pilot actuated valve reseating point at 2250 psig.
f. No pressurizer heater action is considered.
g. The time constant for the pressurizer spray valve is 4 seconds.
h. The time constant for the pilot actuated valve is 1 second.

Several different combinations of spray valve and pilot actuated safety valve capacity were investigated. These ranged from 730 gpm spray and 36,000 lb/hr pilot actuated valve capacity to 95 gpm spray and 110,000 lb/hr pilot actuated valve capacity. In trying to determine what combination of spray valve and safety valve capacities should be selected, the following two criterin were set up.

a. The operator should have approximately one minute or more to take corrective action before a low pressure trip occurs if the spray valve opens or is opened inadvertently at 100% power.

b. The operator should have approximately one minute or more to take action before a low pressure trip occurs if the spray valve opens after a 15% step down from 100% power and jams in the open position. (The one-minute time period for this second criteria begins at the point where the valve should have begun to close.)

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Results and Recommendations

Following examination of the data that was collected from the above analysis, it is concluded that the above criteria can be met if the spray valve is limited in size to approximately 190 gpm and a pilot actuated safety valve having a capacity of 100,000 lb/hr is installed. Should this spray valve stick in the open position and the heaters work properly, it would probably take in excess of five minutes to reach the low pressure trip point. By comparison, the 750 gpm spray valve stuck open would cause the low pressure trip to be reached in about 20 seconds.

It is also recommended that a remotely operated shutoff valve be added to the spray line downstream of the spray valve. This would provide the operator the means of securing spray flow if the valve did jam in the open position. Without this valve he would have to shut the plant down in a somewhat uncontrolled fashion. It is believed that the failure of the spray valve in this manner is a realistic accident and should be protected against by the addition of this backup valve. *

At least on the Oconee project, to accommodate the additional flow into the quench tank from the pilot actuated valve during a pop of the code valves, the number of sparger nozzles in the quench tank will have to be increased from 48 to 56 to maintain the same back pressure on the existing code valves. The space for these nozzles will necessitate an increase in the straight shell length of the quench tank of one foot. The manway should also be able to accommodate a rupture disc of approximately 21" in diameter in lieu of the previously planned 20" diameter disc.

The respective project engineers are requested to obtain approval of the above changes in the area of the spray valve and the pilot actuated valve on all projects and to note the impact on areas outside our scope of supply, i.e., quench tank capacity, etc.

The above changes are summarized as follows:

1. Reduce the present spray valve capacity from 750 gpm to 190 gpm to enhance plant safety.

2. Add an isolation valve to the line presently containing the pressurizer spray valve to allow the operator to shutoff the flow under conditions of spray valve failure.

3. Set pilot actuated safety valve capacity at 100,000 lb/hr.

JHT:NF

J. H. Taylor

cc: JWMorchant
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