



South Carolina Electric & Gas Company  
P.O. Box 88  
Jenkinsville, SC 29065  
(803) 345-4040

Ollie S. Bradham  
Vice President  
Nuclear Operations

October 25, 1989

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

Attention: Mr. J. J. Hayes, Jr.

SUBJECT: Virgil C. Summer Nuclear Station  
Docket No. 50/395  
Operating License No. NPF-12  
Plant Shutdown Criteria for Potential  
Loss of Pressurizer Safety Valve Loop  
Seal

Gentlemen:

On October 20, 1989, Mr. Jack Hayes requested that South Carolina Electric & Gas Company provide to the NRC justification for the criteria being utilized for plant shutdown in regard to potential loss of the pressurizer safety valve loop seal.

Please find attached a description of the criteria being implemented and the basis for these established criteria.

Should you have any questions, please call at your convenience.

Very truly yours,

*Ollie S. Bradham*  
O. S. Bradham

ARK/OSB:lcd  
Attachment

c: D. A. Nauman/O. W. Dixon, Jr./T. C. Nichols, Jr.  
W. A. Williams, Jr.  
E. C. Roberts  
S. D. Ebnetter  
J. J. Hayes, Jr.  
General Managers  
C. A. Price  
K. E. Nodland  
R. B. Clary  
J. C. Snelson  
R. L. Prevatte  
J. B. Knotts, Jr.  
NSRC  
NPCF  
RTS (ONO 890082)  
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PDR ADOCK 05000395  
P PNU

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PRESSURIZER SAFETY VALVE  
LOOP SEAL TEMPERATURE MONITORING/SHUTDOWN CRITERIA

The purpose of the pressurizer safety valve loop seal temperature setpoint is to provide a conservative operating range for the pressurizer safety valves. This range covers points which ensure that the loop seal remains intact while allowing some minimal amount of leakage. The current operating range is approximately 280 degrees to 390 degrees with approximately 280 degrees being the normal operating temperature for the loop seals. The 390 degree point is the upper range point at which action will be taken to shut the plant down immediately. In addition, an intermediate requirement exists to establish a plan of action to shut the plant down if the loop seal reaches 350 degrees.

Placement of the loop seal temperature RTD was determined by a desire to ensure that water fully covered the valve seat at all times. As a result, the best point was determined to be on the riser at the inlet flange of the valve. Since this point is on a riser above the bottom of the loop seal, the temperature of this point will indicate the contents of the entire loop seal. If the temperature is close to the saturation temperature for the pressurizer pressure, then the content of the loop seal is steam. If the temperature is less than the saturation temperature, then the content is water. Consequently, if the temperature indicated water at this point, then the valve seat would have to be fully covered. This is because steam could not exist at that pressure with such a low temperature.

Initially, the upper point of the allowable operating range was set at 450 degrees. The saturation temperature for the operating pressure of 2250 psia is 653 degrees. Loss of loop seal would cause the loop seal temperature to approach this temperature since the contents of the loop seal would be steam. This is borne out by the fact that during the August 25, 1989, plant trip, loop seal temperature reached a maximum of 555 degrees. Previous in-plant and off-site tests had indicated that upon loss of loop seal, the pressurizer safety valve setpoint would drop by as much as 150 psi. No correlation has been established over the range of temperature changes to setpoint changes. However, the 450 degree setpoint was determined to be sufficiently below the saturation temperature to allow an orderly shut down prior to loss of loop seal.

Based on the August 25, 1989 event, the 450 degree setpoint was determined to be too high to allow the plant to shut down in an orderly fashion before loss of loop seal. In that event, loss of loop seal occurred approximately 15 minutes after reaching 450 degrees. It should be noted that this was coincident with a minor pressure excursion and a valve that was set at the low end of the tolerance band (the lower the setpoint, the more likely to leak). As a result, a review of the pre-trip temperature data was initiated.

The temperature data indicated that the loop seal temperature gradually increased from approximately 300 degrees at start up to approximately 450 degrees on the day of the event with minor temperature excursions during this period. Once 450 degrees was reached, the temperature rapidly increased until loss of loop seal occurred.

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Temperature remained just below 390 degrees for approximately three weeks prior to the event. It exceeded 390 degrees three days before the August 25, 1989 event. From this review, it was determined that a 390 degree setpoint would allow sufficient time to shut the plant down in an orderly manner prior to loss of loop seal. In addition, an intermediate point of 350 degrees was set to develop a plan of action based on rate of temperature rise and any other extenuating circumstances.

Since the valves have leaked in the past, it is planned to continue operating the plant as long as leakage remains minimal. Once a valve starts leaking, the leakage is made up by condensation from the pressurizer steam space. The loop seal temperature RTD provides a clear indication of loop seal status. The 390 degree setpoint will allow operation with some leakage while assuring continued maintenance of the loop seal.