VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

October 23, 1989 9 : 27 89: 01

Mr. Stewart Ebneter
Regional Administrator
U S Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323

Serial No. 89-750
NO/ETS
Docket No. 50-280
Licenses No. DPR-32

Dear Mr. Ebneter:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNIT 1
DISCRETIONARY ENFORCEMENT
PRESSURIZER SAFETY VALVE SETPOINTS

Surry Unit 2 was shutdown on October 13, 1989 to repair a leaking pressurizer code safety valve. Concurrently, Westinghouse notified us of a potential generic issue regarding safety valve testing methodology and the allowable setpoint tolerance. Specifically, the lift setpoint may change by more than the 1 percent from the original set pressure when the valves are installed at temperature conditions different from those used during the setpoint pressure test.

Because of this potential safety issue, we chose to have the Surry Unit 2 pressurizer code safety valves tested to establish the lift setpoint change due to the temperature difference from the condition with steam to the condition with a water loop seal. The valves were tested at both conditions. The setpoint change from steam to a water loop seal condition ranged from +3.5 to +5.0 percent for the three valves tested. The test results are denoted in Table 1.

Since the Unit 1 safety valves were originally tested and their setpoints established using the same test conditions as the Unit 2 safety valves, the potential exists that the Unit 1 valves would also exceed the 1 % Technical Specification tolerance, if tested. Therefore, to continue operation of Unit 1, discretionary enforcement is requested based on the potential to exceed the tolerence requirement of Technical Specification 3.1.A.3.c. that requires [safety] valves lift settings shall be maintained at 2485 psig ±1%. We are requesting discretionary enforcement until December 1, 1989, in order to allow time to work toward a resolution of this issue.

Engineering evaluations were performed on the accident scenarios that cause significant pressure transients (i.e., Locked RCP Rotor, Loss of Feedwater, Feedwater Line Break, Rod Ejection, and Loss of Load.) The analyses showed that the conclusions of the existing licensed safety analysis remain valid,(i.e., peak RCS

pressure remains below the 110% design overpressure limit) for safety valve lift setpoints as high as 5.4% above the nominal setpoint of 2485 psig.

We will also be working with the Westinghouse Owners Group and the NRC staff to resolve this potential generic issue during the requested discretionary enforcement period.

As discussed in telephone conference calls with the NRC staff, we are providing our Justification for Continued Operation of Unit 1. The Justification for Continued Operation includes a summary of the analysis work and the compensatory measures that will be taken to avoid conditions which could be impacted by relaxed safety valve lift setpoint tolerances. The compensatory measures that will be implemented include taking credit for the reactor trip on turbine trip and the required operability of a power operated relief valve (PORV).

Should you have any further questions or require additional information concerning this action please call.

Very truly yours,

W. L. Stewart
Senior Vice President - Power

Attachments:
1. Table 1 Safety Valve setpoints
2. Justification for Continued Operation
3 Westinghouse Letter - VRA-89-718

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

Mr. W. E. Holland
NRC Senior Resident Inspector
Surry Power Station

TABLE 1
PRESSURIZER SAFETY VALVE
TEST RESULTS

PRELIMINARY

PRESSURIZER SAFETY VALVE TEST RESULTS

VALVE NO.	AS-FOUND		DIFFERENCE
	Steam	Water	
2-RS-SV-2155A	-2.1	+2.9	5.0
2-RV-SV-2155B	-0.9	+2.7	3.6
2-RV-SV-2155C	+0.5	+4.0	3.5

The results are in percent change relative to 2485 psig

ATTACHMENT 1
JUSTIFICATION FOR CONTINUED OPERATION

ATTACHMENT 1

JUSTIFICATION FOR CONTINUED OPERATION

Pressurizer Safety Valve Set Pressure Deviation
Surry Units 1 and 2

A potential 10CFR50.59 unreviewed safety question is identified in Westinghouse internal memo NS-PL-RCLCL-89-396 (Generic Pressurizer Safety Valve Set Pressure Deviation, dated October 5, 1989.) Recent test data indicate that the pressure at which a pressurizer safety valve (PSV) will lift may change by more than the allowable setpoint tolerance defined in the Technical Specifications when the valve is tested and reset at conditions different than the as-installed conditions. This report provides a safety evaluation to justify continued operation of Surry Unit 1, and to indicate the measures planned to resolve the issue for Surry Unit 2 in light of identified and potential deviations in the pressurizer safety valve (PSV) lift setpoint beyond the allowable tolerance.

Testing of several Crosby 6M6 forged body and cast body pressurizer safety valves was performed by Westinghouse using a loop seal configuration with 300°F water in the loop. The loop seal was then drained and the set pressure was checked with steam. The valve set pressure was observed to drop approximately 4% to 8%. It was concluded that plants which set their safety valves on steam and install them on hot or cold water loop seals may have set pressures higher than the desired 2485 psig +1% (T.S. 3.1.A.3.c).

Surry Unit 2 was recently shut down so that leakage from the "B" pressurizer safety valve could be corrected. While the unit was shutdown, the potential unreviewed safety question described above was identified. It was determined that the most prudent course of corrective action was to ship all three valves to the Westinghouse Western Service Center so that they might be (a) tested at as-found conditions with steam, (b) tested at as-found conditions in a loop seal configuration, and (c) adjusted to the proper setpoint and tolerance for a loop seal configuration. This issue for Surry Unit 2 will be resolved through this action. The data from these tests will provide information on the expected condition of the Unit 1 valves.

For the currently operating Surry Unit 1, a Justification for Continued Operation (JCO) must be provided which will provide adequate assurance of the safety of the operating unit under postulated accident conditions. Toward this end, an evaluation of the impact of potentially deviated PSV lift setpoints on the UFSAR transients has been performed. The transients which are most severely affected by the inoperability of the pressurizer safety valves were reanalyzed. The results of the transient analysis evaluations and reanalyses provide indication of what compensatory measures, if any, are necessary to assure safe operation of Surry Unit 1 for the remainder of Cycle 10.

Westinghouse provided the results of a sensitivity study applicable to the V. C. Summer (SCE&G) and Diablo Canyon (PG&E) plants which

indicates the impact of increased PSV set pressures on each of the following transients: Loss of Load/Turbine Trip, Main Feedline Break, Locked Rotor, and Rod Ejection. Their results indicate that the transient pressure in each of these transients remains below 120% of design pressure (the faulted condition stress limit).

In a similar study performed by Virginia Power for Surry, the Loss of Load/Turbine Trip, Locked Rotor, Main Feedline Break, RCCA Ejection, and Loss of Normal Feedwater transients were evaluated. The results of this study are summarized in the following.

EVALUATION OF UFSAR TRANSIENTS

Virginia Power has evaluated the UFSAR transients and determined that the Loss of Load/Turbine Trip, Locked Rotor, Main Feedline Break, and RCCA Ejection, and the Loss of Normal Feedwater transients are potentially affected by a deviation in the PSV lift setpoint. The Loss of Load/Turbine Trip and the Locked Rotor were reanalyzed and the remaining transients reevaluated to determine the impact on safety analysis of a PSV lift setpoint deviation as high as +10%. In the Loss of Load/Turbine Trip and Locked Rotor analyses, it was presumed that the PSV's did not function at all. The conditions assumed in the reanalyses are equivalent to, or are conservative with respect to, the conditions of the current licensing analysis unless otherwise noted. An overpressure safety limit of 2750 psia (110% of design pressure) was assumed for the analyses and evaluations performed in support of this JCO.

LOSS OF LOAD/TURBINE TRIP

For the case of the Loss of Load/Turbine trip in which the PSV's are assumed to be inoperable, the maximum reactor coolant system (RCS) pressure exceeds 110% of design pressure. However, the maximum pressure remains below 120% of design pressure. If either a Reactor Trip on Turbine Trip or the operation of a single pressurizer PORV is assumed, peak RCS pressure remains below 110% of design pressure. It may be concluded that with no action to compensate for potentially inoperable PSV's, the maximum RCS pressure remains below 120% of design pressure in a Loss of Load transient. If a Reactor Trip on Turbine Trip or operation of a single PORV can be assured, peak RCS pressures will remain below 110% of design pressure in the Loss of Load transient.

LOCKED ROTOR

For the case of the Locked Rotor transient in which the PSV's were assumed to be inoperable, peak RCS pressure remained below 110% of design pressure. The inoperability of the PSV's negligibly impacts the RCS overpressure results of the current licensing analysis.

MAIN FEEDLINE BREAK

The Main Feedline Break (MFLB) transient is not a part of the formal licensing basis for Surry. However, the MFLB transient was analyzed to permit comparison of the thermal/hydraulic conditions at the PSV inlets to conditions employed in valve tests conducted by EPRI. It was concluded

that the pressurizer safety valves can be expected to perform adequately under MFLB conditions, even with a deviation in PSV lift setpoint pressure as high as +10%, since the thermal hydraulic conditions that would be experienced in the applicable MFLB scenario with these PSV lift setpoints are within the EPRI test conditions.

LOSS OF NORMAL FEEDWATER

The evaluation of the Loss of Normal Feedwater (LONF) transient concluded that a +10% deviation in the PSV lift setpoint would result in a peak RCS pressure during a LONF of less than or equal to 2750 psia. If either a single PORV or the high pressurizer pressure reactor trip is actuated, the maximum pressure attained in this transient is not high enough to challenge the nominal PSV lift setpoints. Because the high pressurizer pressure reactor trip is a safety-grade reactor trip, it may be concluded that the peak pressure in a LONF transient will remain below the nominal PSV lift setpoint of 2500 psia.

ROD EJECTION

The evaluation of the Rod Ejection transient concluded that the peak pressure attained in a Rod Ejection transient will remain well below the nominal PSV setpoint of 2500 psia. A high PSV setpoint, or even inoperable PSV's, does not impact the results of the Rod Ejection transient analysis.

CONCLUSIONS

It may be concluded from the results of the UFSAR transient evaluations and reanalyses that the maximum overpressure attained in any UFSAR transient will remain below 2750 psia (110% of design pressure) with PSV setpoint deviations up to +10%. This conclusion is based on the assumption that operation of either the Reactor Trip on Turbine Trip or a single pressurizer PORV can be assured. Peak RCS pressures in all UFSAR transients will remain below 120% of design pressure under current UFSAR assumptions for setpoint deviations up to +20%

RECOMMENDATIONS

Should the test results of the Unit 2 PSV lift setpoints indicate that the Unit 1 PSV setpoints may be deviated beyond the tolerance allowed by T.S. 3.1.A.3.C, discretionary enforcement of the Technical Specification requirement will be required. It is recommended that administrative procedures be implemented for the remainder of Surry Unit 1 Cycle 10 which insure the availability and operability of the Reactor Trip on Turbine Trip and a single pressurizer PORV. Both systems should be maintained available and operable since the pressurizer PORV's are not required to be available at power, and since the Reactor Trip on Turbine Trip is not a safety-grade trip. These compensatory measures will insure that transient pressures under postulated accident conditions will remain below 110% of design pressure for PSV setpoint deviations up to +10%. The pressure integrity of the primary system components is thereby assured.

ATTACHMENT 2
WESTINGHOUSE LETTER
PRESSURIZER SAFETY VALVE
SET PRESSURE DEVIATION

Westinghouse Electric Corporation Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

October 16, 1989
VRA-89-718

Mr. W. R. Cartwright, Vice President
Nuclear Operations
Virginia Power
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, Virginia 23060

Dear Mr. Cartwright:

Virginia Power
Surry Units 1 and 2, North Anna Units 1 and 2
Pressurizer Safety Valve Set Pressure Deviation

This letter is to provide you with information related to a potential deviation of the pressurizer safety valve set pressure from the ASME Code and the plant technical specification requirements. This information is being provided for your evaluation following review by the Westinghouse Safety Review Committee (SRC). Based on an evaluation of the available information, the SRC concluded that this issue does not constitute a substantial safety hazard and, as such is not reportable by Westinghouse to the NRC under 10CFR Part 21. The SRC then evaluated the significance of this issue utilizing the criteria of 10CFR50.59. From this evaluation, the SRC concluded that the information should be communicated to various utilities for their evaluation.

SYNOPSIS

ASME Section III defines set pressure and provides an opening pressure tolerance that is specified in percent of the set pressure for pressures above 1000 psi. Typically, the set pressure for the pressurizer safety valves is 2485 psig $\pm$1% in plant Technical Specifications. Recent plant operating experience and test data indicate that the opening pressure changes by more than one percent from the original set pressure when the valve is installed at temperature conditions different from those used during the set pressure test. It has been observed that a shift of 4 to 8 percent can occur. This potentially places the plant in violation of Technical Specifications, ASME Code Sections III/XI requirements, and thus, outside the bounds of the plant licensing basis criteria.

IDENTIFICATION OF ISSUE

In 1989 two utilities, South Carolina Electric and Gas (SCE&G) and Pacific Gas and Electric (PG&E), conducted Crosby pressurizer safety valve testing at the Westinghouse Western Service Center (WSC). The valve testing included Crosby 6M6 forged body (V.C. Summer) and cast body (Diablo Canyon) valve designs.

The set pressure tests were performed using a loop seal configuration. Test conditions included the control of ambient air temperature to simulate as-installed plant conditions and setting the valves to 2485 psig ±1% using approximately 300°F hot water in the loop. The loop seal was subsequently drained and the set pressure checked with steam. The valve set pressure dropped approximately 4% to 8%.

Based on the testing performed at the WSC, it has been determined that set pressure changes as a function of temperature. Plants setting their valves on steam and installing them on hot or cold water loop seals have a resultant set pressure higher than 2485 psig +1%. Since the trend is for the set pressure difference to increase as the temperature difference increases, setting valves on steam and installing them on a cold loop seal will result in the largest set pressure increase.

The FSAR licensing basis analyses were evaluated since pressurizer safety valve set points above the nominal 2500 psia +1% value could have a potential adverse impact on the FSAR licensing basis criteria, where credit is taken for safety valve relief, specifically the Loss of Load/Turbine Trip, Feedline Break, Locked Rotor and RCCA Ejection analyses were examined.

Typically, in each of these analyses, the pressurizer safety valves (PSVs) are actuated and provide sufficient relief capacity which limits the peak pressure in the RCS to an acceptable value. Should the PSV set pressure be increased, the margin to the maximum allowed pressure for each of these events would be potentially reduced to a point where the licensing basis criteria would no longer be satisfied.

Westinghouse has performed sensitivity studies on the impact of increased PSV set pressures for each of the four potentially affected transients. The results of these analyses are contained in the Justification for Continued Operation section of this letter.

Similarly, the effect of a lost loop seal during normal plant operation and Pressurizer Safety relief transient conditions have been reviewed for the case in which a Pressurizer Safety Valve has been set and is installed in a loop seal configuration.

If the loop seal is lost as a result of a transient lifting the PSV, the PSV is exposed to steam at the valve seat and a reduction in set pressure due to the increase in temperature is experienced. The reduction of the valve's set pressure from the nominal value of 2500 psia to the PORV set pressure and actuating at that point, does not affect the licensing basis criteria since no credit is taken for the PORVs in the licensing basis analysis. A further set pressure reduction to the maximum 8% below 2500 psia is not expected to violate the licensing criteria, however, confirmation would require plant specific analysis or evaluation.

If the loop seal is lost during normal plant operation, the PSV is exposed to steam at the valve seat and a reduction in set pressure due to the increase in temperature is experienced. The reduction of the valve's set pressure from the nominal value of 2500 psia to a level which opens during normal plant operation is bounded for one PSV as defined by the current analysis of an inadvertent opening of a PSV.

SAFETY ISSUE

The pressurizer safety valve is classified as a Safety Class 1 component and is required to prevent the pressure in the reactor coolant system from exceeding its design condition, typically 110 percent of 2485 psig (2500 psia). The deviation of the set pressure varies from 4 to 8 percent as seen under various loop seal conditions. This set pressure deviation is outside the bounds of ASME Code Section III and XI requirements and should be reviewed by each utility in conjunction with their Technical Specification. ASME Code Section III is not met since the set pressure of the pressurizer safety valves is outside the opening tolerance specified. Likewise, ASME Code Section XI for inservice testing requires valves not exceed the stamped set pressure criteria by more than 3%.

CONCLUSION

As a result of the tests conducted at the Westinghouse Western Service Center, it has been determined that the pressurizer safety valve set pressure will vary based on the methodology used in setting the valves. The variance occurs when the valve is set at conditions other than "as-installed". That is, when either the test media or ambient temperatures differ from the operating media and ambient temperatures a set pressure shift is possible. Crosby 6M6 design valves set with hot water and ambient air temperatures of approximately 300°F and 130°F, respectively, experienced a set pressure shift of 4% to 8% when the test media was changed to saturated steam. Thus, setting a valve at plant ambient air with steam as a media and installing it on a loop seal filled with 300°F water can result in a set pressure 4% to 8% higher than anticipated.

Note that similar data does not exist for other safety valve sizes, designs, or other plant specific temperatures.

Crosby Valve and Gage Co. agrees that the valve set pressure should be established at temperatures representing as-installed media and ambient temperatures.

RECOMMENDATIONS

Utilities should review the existing methodologies that are currently in practice at their plants relative to setting and testing of pressurizer safety

valves, their current FSAR analyses and the licensing bases for the plant to determine their compliance with safety valve set pressure tolerances as specified in their Technical Specification.

The FSAR licensing basis analyses were evaluated since pressurizer safety valve set points above the nominal 2500 psia ±1% value could have a potential adverse impact on the FSAR licensing basis criteria, where credit is taken for safety valve relief, specifically the Loss of Load/Turbine Trip, Feedline Break, Locked Rotor and RCCA Ejection analyses were examined.

Typically, in each of these analyses, the pressurizer safety valves (PSVs) are actuated and provide sufficient relief capacity which limits the peak pressure in the RCS to an acceptable value. Should the PSV set pressure be increased, the margin to the maximum allowed pressure for each of these events would be potentially reduced to a point where the licensing basis criteria would no longer be satisfied.

Westinghouse has performed sensitivity studies on the impact of increased PSV set pressures for each of the four potentially affected transients. The following sensitivity studies were performed on the impact of increased PSV set pressures for each of the four potentially affected transients:

Loss of Load/Turbine Trip

For the loss of load/turbine trip analysis, sensitivity studies show that with no credit taken for any relief capacity from either the PSVs or the PORVs, the peak RCS pressure exceeds 110% of design (the licensing basis limit for this Condition II event). However, the pressure remains below 120% of design and thus, the peak RCS pressure does not cause stresses to exceed the faulted condition stress limits. This analysis is based upon the analysis documented in the FSAR, and all of the conservative bounding assumptions are applied.

Feedline Break

For the feedline break event, Westinghouse has performed analyses which demonstrate that with a 10% increase in the PSV set pressure, from 2500 psia to 2750 psia, the maximum RCS pressure remains below 120% of design. In addition, the core remains covered throughout the transient and no overpressurization of the secondary side occurs. This analysis does not take credit for best estimate operation or PORVs, and retains the conservative assumptions which are presented in the FSAR. Thus, the peak RCS pressure does not cause stresses to exceed the faulted condition stress limits.

Locked Rotor

Westinghouse has performed locked rotor analyses for a typical 2 loop plant, which bounds 3 and 4 loop plants. This analysis makes similar conservative assumptions to those found in the FSAR analysis. No credit was taken for any relief capacity from the PSVs or PORVs. The maximum RCS pressure remains below 120% of design. Thus, the peak RCS pressure does not cause stresses to exceed the faulted condition stress limits. There is no adverse impact upon the rods-in-DNB or the peak clad temperature analyses documented in the FSAR.

RCCA Ejection

Westinghouse has performed a bounding overpressurization analysis for the RCCA ejection event which is documented in WCAP-7588. This analysis is performed under BOL HFP conditions and makes extremely conservative assumptions regarding ejected rod worth. The PSVs are assumed operable with a set pressure of 2500 psia. The peak pressure is calculated to be less than 2800 psia. A 10% increase (250 psi) in the PSV set pressure would increase the peak pressure by no more than 250 psi, resulting in a peak RCS pressure of 3050 psia. This is greater than 120% of design pressure. However, as discussed in WCAP-7588, a more detailed, but still conservative analysis, using 3D methodology calculated a peak RCS pressure less than 2600 psia. Thus, even with the additional 250 psi bias due to the 10% setpoint shift, the pressure will remain less than 2850 psia which is below 120% of design. In addition, this analysis used an extremely conservative ejected rod worth estimated at 2 to 3 times greater than the conservative values typically presented in the FSAR. Lower, but still conservative, ejected rod worths would yield lower RCS pressures. Thus, even under conservative assumptions, the peak RCS pressure will not exceed that which would cause stresses to exceed the faulted condition stress limits.

Based on the results of these sensitivity studies, the calculated pressure spikes for these transients do not challenge the pressure integrity of the primary system components.

Similarly, the effect of a lost loop seal during normal plant operation and Pressurizer Safety relief transient conditions have been reviewed for the case in which a Pressurizer Safety Valve has been set and is installed in a loop seal configuration.

If the loop seal is lost as a result of a transient lifting the PSV, the PSV is exposed to steam at the valve seat and a reduction in set pressure due to the increase in temperature is experienced. The reduction of the valve's set pressure from the nominal value of 2500 psia to the PORV set pressure and actuating at that point, does not affect the licensing basis criteria since no

credit is taken for the PORVs in the licensing basis analysis. A further set pressure reduction to the maximum 8% below 2500 psia is not expected to violate the licensing criteria, however, confirmation would require plant specific analysis or evaluation.

If the loop seal is lost during normal plant operation, the PSV is exposed to steam at the valve seat and a reduction in set pressure due to the increase in temperature is experienced. The reduction of the valve's set pressure from the nominal value of 2500 psia to a level which opens during normal plant operation is bounded for one PSV as defined by the current analysis of an inadvertent opening of a PSV.

Should you have any questions or require further information on this matter, please contact me.

Very truly yours,

Donald R Beynon Jr

D. R. Beynon, Jr., Manager
Customer Projects Department
Virginia Area

HT/5303G

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