MAIN STEAM SAFETY VALVE RING SETTING MODIFICATION

FOR THE SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 and 3

January 25, 1990

TABLE OF CONTENTS

BACKGROUND

In 1984, Public Service of New Hampshire sent the Crosby model 6R10 main steam safety valves (MSSV's) for its Seabrook plant to Wyle Laboratories for testing to determine proper vent stack size. The tests indicated that the valves were not able to achieve their design lift and therefore might not pass stamped (or design) flow at 3% accumulation. On January 31, 1986 the NRC issued Information Notice No. 86-05, "Main Steam Safety Valve Test Failures and Ring Setting Adjustment" followed by Supplement 1 on November 16, 1986. The notice alerted licensees of a potentially significant problem regarding the main steam safety valve (MSSV) ring settings.

Subsequently, Georgia Power Company tested five MSSV's of the Alvin W. Vogtle Unit 1 plant. The tests indicated that, with as shipped ring settings, the valves did not achieve design lift. The Seabrook and Vogtle tests have demonstrated that Crosby MSSV's with factory ring settings may not achieve full lift, and therefore might not develop the required steam flow to meet stamped capacity at 3% accumulation as required by ASME III, Section NC-7000.

In order to develop generic valve ring settings for Crosby safety valves, the Westinghouse Owners Group (WOG) contracted the Crosby Valve and Gage Co. to perform a series of high flow tests. Based on their test results, Crosby has recommended a change from factory to generic ring settings for the San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 MSSV's.

UNITS 2 AND 3 MSSV STATUS

The two main steam lines (one per steam generator) are each provided with nine (9) Crosby Model 6R10 HA75FN safety valves to protect the main steam system from over-pressurization. These valves were designed in accordance with ASME Section III, Article NC-7000 defined in the 1974 Code Addition and Summer 1974 Addenda. This code states, in part, that safety valves shall operate without chattering and achieve full lift at a pressure less than 3% above the setpoint pressure. After blowing down, all valves shall close at a pressure not lower than 95% of the set pressure.

The as-shipped ring settings for the SONGS MSSV's range from minus (-) 55 notches to minus (-) 30 notches for the nozzle ring, and plus (+) 150 notches to plus (+) 180 notches for the guide ring. According to Crosby, these ring settings are similar to the original Seabrook MSSV ring settings. Based on the currently available information, these factory ring settings are the principal cause of the sluggish MSSV operation witnessed during the Seabrook and Vogtle limited tests. Following a detailed and comprehensive engineering evaluation in accordance with the provisions

of 10 CFR 50.59, the SONGS Unit 2 MSSV ring settings were changed to the generic settings during the Cycle 5 refueling outage. The generic ring settings recommended by Crosby for the valves supplied to SONGS Units 2 and 3 are minus (-) 100 notches for the nozzle ring and minus (-) 50 notches for the guide ring. The SONGS Unit 3 MSSV ring settings will also be changed to the generic settings during its upcoming Cycle 5 refueling outage scheduled to begin in April 1990.

UNIT 3 MSSV's WITH FACTORY RING SETTINGS

The Unit 3 MSSV's will retain the as-shipped (factory) ring settings until the next refueling outage presently scheduled for April 1990. For analytical purposes, SCE postulates the performance of the as-shipped MSSV's to be approximately 75% of rated capacity. This approximation of reduced MSSV capacity is derived from information applicable to Crosby valves with factory ring settings. Using this value, the total relieving capacity indicated in the technical specification bases, section B3/4.7.1.1, is reduced to approximately 11,605,221 lbs/hr which is 76.7% of the total secondary steam flow of 15,130,000 lbs/hr at 100% Rated Thermal Power (RTP).

The impact of this reduced capacity was evaluated through the re-analysis of the Loss of Condenser Vacuum (LOCV) event. The re-analysis was performed in the same manner as the Chapter 15 analysis with the exception that: (1) it made use of the reduced capacity MSSV model, (2) it used a moderator temperature coefficient (MTC) representative of the actual time in cycle (343 effective full power days), and (3) the initial conditions used maximized peak secondary pressure.

The analysis, like Chapter 15 of the UFSAR, utilized a 2% uncertainty factor for an initial power level of 102% RTP. A peak secondary pressure of 1209 psia was obtained for the LOCV event with all 18 MSSV's operable. This peak pressure is less than the secondary pressure limit of 1210 psia (110% of design pressure). The analysis is valid for the remainder of the current operating cycle and indicates that the SONGS Unit 3 Cycle 4 operation has adequate overpressure protection, with all MSSV's operable, for the balance of the cycle.

The Action statement of Technical Specification 3/4.7.1.1, "Safety Valves", requires that with one or more MSSV's inoperable, operation in Modes 1, 2 and 3 may continue provided that within 4 hours either the MSSV's are restored to operable status, or the Linear Power Level-High Trip (LPLHT) setpoint is reduced per Table 3.7-2 of the Technical Specification. Otherwise, the plant is to be placed in COLD SHUTDOWN within 36 hours. Therefore, an additional LOCV analysis was performed assuming operation under technical specification limitations, i.e. with one MSSV inoperable. A peak secondary pressure of 1205 psia was obtained assuming an

initial power level of 92% RTP with one inoperable MSSV. The 92% RTP initial power level value chosen for the LOCV analysis corresponds to operation above a pre-trip setpoint of approximately 91.9%, which would be considered the upper limit for plant operation in this configuration.

Based on Table 3.7-2, continued operation with one inoperable MSSV requires a reduction of LPLHT from 111.3% to a maximum value of 98.9%. This 12.4% decrease in setpoint is intended to be coincident with a reduction in operating power level. As stated in the basis of Technical Specification 3/4.7.1.1, "... Operation is allowable with safety valves inoperable within the limitations of the ACTION requirements on the basis of the reduction in secondary system steam flow and THERMAL POWER required by the reduced reactor trip settings of the Power Level-High channels." Therefore, the unit would be operated at a corresponding condition below the LPLHT setpoint. Operation at a power level approaching LPLHT setpoint of 98.9% with one inoperable MSSV would clearly represent the greatest challenge to the remaining MSSV's but this would require operation of the unit at the trip setpoint with no operating margin.

No additional LOCV analysis were performed for initial power levels above the pre-trip setpoint, in excess of 92% RTP. However, an assessment of the safety analyses performed to date of the LOCV event indicates that the peak steam generator pressure would reach 110% of the allowable value as initial core power is allowed to approach 98% RTP. This assessment is based on very conservative analysis. Based on engineering judgement, more realistic less conservative assumptions would yield acceptable results. Nonetheless, the Unit 3 operating procedures have been revised to include administrative limits on the operating power level whenever the plant operated under the provisions of the ACTION statement of Technical Specification 3/4.7.1.1. These administrative controls limit reactor power, preserving an operating margin of 8.9% below the LPLHT setpoint.

Data recorded during a Unit 2 decrease of heat removal event, due to MSIV closure, corroborates the adequacy of MSSV performance. On August 12, 1986, with Unit 2 operating at approximately 100% power, a spurious Main Steam Isolation Signal resulted in the simultaneous closure of both main steam isolation valves (LER 86-022). The performance of the overpressure protection system was adequate, although it was subsequently discovered that three MSSV's were set outside the allowed 1% band as required by technical specifications (LER 85-061). This event resulted in peak primary and secondary pressures measured at approximately 2485 psia and 1175 psia, respectively. The event demonstrated that, although equipped with factory ring settings and with high pressure lift setpoint settings, the Unit 2 MSSV's were adequate to meet system overpressure requirements. Therefore,

the Unit 3 MSSV's in their current condition are adequate to meet system overpressure requirements for the remainder of Cycle 4.

OVERPRESSURE PROTECTION RE-EVALUATION

Combustion Engineering re-analyzed the LOCV event in order to update the values in the overpressure protection report and the SONGS Units 2 and 3 Updated Final Safety Analysis Report (UFSAR). The re-analysis assumed that the MSSV ring settings had been set to the recommended generic values, and that they would achieve rated capacity at 3% accumulation as originally specified. The re-analysis included two cases: Case One maximized the primary pressure, and Case Two maximized the secondary pressure.

The re-analysis results indicate that for Case One, the peak primary pressure could rise to a maximum of 2729 psia which is less than the limit of 2750 psia (110% of the design value). For Case Two, the maximum secondary pressure predicted is 1186 psia which is within the limit of 1210 psia (110% of the design value). These results are in the process of being incorporated into the UFSAR overpressure protection report.

INCREASED BLOWDOWN WITH GENERIC RING SETTINGS

A comprehensive engineering and safety evaluation was performed prior to resetting the SONGS Unit 2 MSSV ring settings to generic values. The evaluation encompassed the impact on the design basis of the plant as a result of the change from factory to generic MSSV ring settings. While the generic MSSV ring settings will improve the valve performance, they do result in increased blowdown. The evaluation and results are also pertinent to SONGS Unit 3, once its MSSV ring settings are reset to the generic values.

Based on a conservative application of Crosby test results for MSSV's with generic ring settings, the maximum extended blowdown for SONGS 2/3 MSSV's is 15%. The current SONGS Units 2 and 3 safety analysis assumes a blowdown of 4% for valves with factory ring settings.

The safety evaluation addressed all Chapter 15 events which result in opening the MSSV's and was performed with the assistance of Combustion Engineering. The primary affect of the increased blowdown is the radiological consequences associated with the release of additional mass from the steam generators, particularly for the Steam Generator Tube Rupture (SGTR) event.

All of the dose consequences were found to remain bounded by the results reported in the UFSAR with the exception of the SGTR event. This event was re-analyzed to obtain a new primary to secondary reactor coolant leakage value and the off-site and control room doses reassessed. The resulting doses were found to remain within the criteria established in the Safety Evaluation Report. Namely, the doses remain within a small fraction (10%) of the 10CFR100 limits. The values reported in the UFSAR for this event are in the process of being updated.