Safety Related

EVALUATION OF THE EFFECT OF RELAXING THE LASALLE MAINSTEAM SAFETY RELIEF VALVE OVERPRESSURIZATION SETPOINT TOLERANCE

COMED
LASALLE UNIT 2
Project No. 9606-98
Issued 03-30-95

DESIGN CONTROL SUMMARY DESIGN VERIFICATION			PROJECT NAME: LASALLE UNIT NO.: 2 PROJECT NO.: 9606-098 CLIENT: ComEd CALC. NO.: LAS-NPD-95-0020 Rev. 00 PURPOSE: Evaluate Effects Relaxing MSRV Setpoint Tolerance ☒ SAFETY RELATED ☐ NON SAFETY RELATED	COMMENT NUMBER	QA SERIAL NUMBER
SIGNATURE & DATE FOR REV 00	PREPARER	C. E. O'Brien 3/29/95 C.E. O'Brien	IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD		
	REVIEWER	[signature] 3/29/95 P.R. Olson			
	APPROVER	[signature] 3-29-95 M. A. Pressburger	REVIEW METHOD This review was accomplished by a detailed review of the original calculation. Reviewer [signature] Date 3/29/95		
SIGNATURE & DATE FOR REV 01	PREPARER	[signature] 3-30-95 M.A. Pressburger	Revised pages as noted in text.		
	REVIEWER	[signature] 3/30/95 P. R. Olson			
	APPROVER	[signature] 3-30-95 M.A. Pressburger	REVIEW METHOD This review was accomplished by a detailed review of the original calculation. Reviewer [signature] 3/30/95		
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GES-320.10.4 07/30/92

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PURPOSE AND SCOPE

To evaluate the effects of relaxing the LaSalle Mainsteam Safety Relief Valve (MSRV) overpressurization setpoint tolerance to ±3%.

This evaluation is limited to the demonstration of design margins available in the four mainsteam drywell piping subsystems that contain the eighteen safety relief valves (SRVs) and the corresponding eighteen subsystems that are the discharge lines into the wetwell, to accommodate the ±3% tolerance change on the safety relief valve setpoints. This comprises all piping subsystems that make up the MSRV discharge system.

APPROACH

An increase in SRV setpoint tolerance will result in an increase in the SRV open discharge flow to the discharge piping. This flow increase will result in additional loads to the piping and additional pipe stress. The increase in pipe loads and stress will be proportional to the increase in expected flow rates. Pipe stresses are evaluated to the ASME Code (Reference)

The following applicable documentation forms the basis for the evaluation of the MSRV piping :

The SRV transient forcing function time histories for the twenty-two MSRV subsystems.

The user's manual for SRVA computer code.

The structural analyses for the twenty-two MSRV subsystems.

Key design parameters defining the existing setpoint for Mainsteam Safety Relief valves (MSRV), maximum flow rate in MSRV discharge lines, and the design pressure of MSRV lines.

Maximum ASME Code (Reference) Equation 9 stresses and quencher load interaction ratio for the affected piping within each subsystem.

Conservatism's inherent in the design input of the MSRV line piping.

The overall design margin available for the MSR lines. This overall design margin will be used to accommodate the ± 3% SRV setpoint tolerance change.

Acceptance of the ±3% setpoint change is based on demonstration of sufficient design margin to conservatively accommodate the change in the current design. Design margins greater than the percent increase in expected flow rate, for the ± 3% set point change, are judged acceptable without further demonstration since these margins will accommodate the stress and load increase.

Support load increases of less than 5% due to changes in the expected flow rate are deemed insignificant for supports.

EVALUATIONS

A review of the MSRV flow rate used in MSRV transient analysis indicates that the SRV setpoint used in the calculation of the transient force time history for the MSRV discharge lines varies per valve and are specifically defined for each subsystem.

Increased setpoint pressures were determined based on a 3% increase of the existing set point data for the eighteen valves. The new flow rates based on the 3% increased set pressures were computed and compared to the flow rates which represent the current design basis conditions.

The percent change between the analyzed flow rate and the increased flow rate were determined.

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Design pressures were reviewed and confirmed that the design pressure of 600 psig was used in ASME Equations 8 and 9 for the stress analyses of the MSRV discharge lines.

Pipe Stresses and Loads Summary

The twenty two MSRV stress analysis reports were reviewed for high stress locations including localized stresses such as those induced by welded attachments to the piping. The maximum stresses for each subsystem are taken from the appropriate mainsteam and discharge analysis of record previously performed utilizing the PIPSYS piping program as delineated in the LaSalle FSAR Appendix F, Section F.27. The maximum stress ratio between the design stresses for each subsystem and the respective allowable stress was determined. This ratio provides a stress margin for each subsystem. R

The quencher loads and their allowables were determined. The maximum quencher interaction was identified and this ratio provides a quencher load margin for each subsystem. R

In most cases, sufficient margin exists to accommodate the estimated increase in the SRV induced stresses and load due to the increase in flow rate. A comparison of the subsystem stress margins to the percent increase in flow rate identifies seven subsystems (2MS03, 2MS04, 2MS36, 2MS39, 2MS40, 2MS43 and 2MS45) which required further review. R

Conservatism In Design

Some of the conservatism for the MSRV discharge lines includes 5% for the variability of the loss coefficient and a 5% increase in the flow area.

If the 5% factor for the flow area is removed, as it may be considered addressed by test which establish the loss coefficient, the resulting flow rate is reduced by 5%. R

The design pressure of 600 psig is used for the pressure stress determination for both Code Equations 8 and 9. Based on the results of the SRVA code models, the peak calculated SRV pipe pressures concurrent with SRV activation are significantly less (~ 170 psi) than the 600 psig used in the Equation 9 evaluations. Use of the more realistic calculated peak pressure would reduce the contribution of the SRV pipe pressure term to the Equation 9 allowable by 4.4% and provides an additional margin to code allowables.

This margin, coupled with the 5% addressing flow area discussed above, yields more than 9% conservatism which is greater than the maximum expected percent increase due to the flow rate variations.

The SRV blowdown transients are also conservatively based on minimum valve opening time, maximum water column height, maximum pipe friction factor and maximum quencher loss coefficient. This results in the largest possible loading for the transient analysis reflected in the current design.

The operating range of the drywell and wetwell pressure was considered in the analysis. The design load spatial distribution for the various load cases were modified to assure conservatism in that the pressure magnitude was multiplied by a factor of 1.5 and the frequency range of the base time history was adjusted to address the effect on critical components of the LaSalle County structure.

Margins for the quencher are based on a review of allowables provided in the applicable stress calculations for the quencher device. The resulting allowables are based on a combination of conservative approaches to modeling of the quencher device and application of all the applicable suppression pool loading to that model. This is further defined in the applicable design basis documents. |R

There is conservatism in the existing seismic analyses, unaffected by the setpoint variance increase, which utilize the enveloped response spectra and conservative damping values per the NRC Reg. Guide 1.61.

The MSRV blowdown load is one of many load conditions for the subsystems and affect only a portion of Equation 9B and 9C. Weight and seismic are unaffected by the tolerance change, and combine for the remaining percentage of the total calculated stresses in the subsystems.

The MSRV blowdown load is one of a number of dynamic loads in the total support load which when combined with those loads, comprises a lesser percentage of the total design load for the supports than the percentage increase for the SRV transient load alone.

SUMMARY/CONCLUSIONS

Based on the review of the subject subsystems, there exists sufficient margin and/or conservatism to accommodate the ± 3% safety relief valve setpoint tolerance change for the existing setpoints.

REFERENCE

ASME B&PV Code, Section III, 1974 Edition.

ATTACHMENT H

NON-PROPRIETARY VERSION

OF

GENERAL ELECTRIC

SRV SETPOINT TOLERANCE RELAXATION ANALYSIS