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Nuclear Regulatory Commission
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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
LICENSEE EVENT REPORT 90-007 - RE-ANALYSIS OF MAIN STEAM LINE BREAK IDENTIFIES THAT CONTAINMENT PRESSURE COULD EXCEED FSAR VALUES DUE TO INADEQUATE DESIGN

Licensee Event Report (LER) 90-007 is attached. This event is reportable to the NRC per 10CFR50.73(a)(2)(ii).

Brian D Johnson
Staff Licensing Engineer

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachment

OC0590-0020-NL02

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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
PALISADES NUCLEAR PLANT	0 5 0 0 0 2 4 1	1 OF 0 4

TITLE (4) REANALYSIS OF MAIN STEAM LINE BREAK IDENTIFIES THAT CONTAINMENT PRESSURE COULD EXCEED FSAR VALUES DUE TO INADEQUATE DESIGN

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 4	1 8	9 0	9 0	— 0 0 7	— 0 0	0 5	1 8	9 0	N/A	0 5 0 0 0
									N/A	0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
C S KOZUP, TECHNICAL ENGINEER, PALISADES	AREA CODE 6 1 6 — 7 6 4 - 8 9 1 3

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
				NO							

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)

ABSTRACT

At 1500 hours on April 18, 1990 the Plant was in cold shutdown, with the Primary Coolant System at approximately 135 degrees F and 265 psia. During review of the main steam line break (MLSB) analysis being performed as part of the replacement steam generator (RSG) effort, it was determined that the current steam generator installation could result in containment pressures that exceed values referenced in the Final Safety Analysis Report (FSAR) during MSLB scenarios where the break size is less than 100% of the steam line cross sectional area.

The condition described in this report was caused by inadequate design, and involved personnel error. As corrective action, a modification was installed to close the feedwater regulator valves on high containment pressure. An analysis which reflects this modification indicates that peak containment pressure for the identified scenarios is now within the design basis, and that the MSLB analysis in the FSAR now reflects the limiting case for containment pressure. We will continue to work with designers throughout the RSG effort to ensure that MSLB analysis requirements are met and that Plant specific analysis inputs are identified. Also, additional technical review requirements are now in procedures used for accident and transient analysis. The condition described in this report did not involve failure of a component or system.

EVENT DESCRIPTION

At 1500 hours on April 18, 1990 the Plant was in cold shutdown, with the Primary Coolant System (AB) at approximately 135 degrees F and 265 psia. During review of the main steam (SB) line break (MS[illegible] analysis being performed as part of the replacement steam generator (RSG [illegible]BLP) effort it was determined that the current steam generator installation could result in peak containment (NH) pressures in excess of the design pressure (55 psig) referenced in the Final Safety Analysis Report (FSAR). This potential overpressure condition exists for certain MSLB scenarios where the break size is less than 100% of the equivalent main steam line cross sectional area.

The MSLB transient described in the FSAR assumes that a steam line break equivalent to 100% of the cross section area of the main steam line piping is the most limiting MSLB with respect to containment pressure. Mitigation of this MSLB transient was provided in the original Palisades design, in part, by an engineered safety feature that initiates closure of the main feedwater regulator valves (90) and regulator bypass valves on low steam generator pressure. The feedwater regulator valve and regulatory bypass valve closure feature is part of the steam generator isolation function provided by the main steam isolation signal (MSIS) (JE) and is initiated when steam generator pressure is reduced below 500 psia.

During the course of analyses performed to support the RSG effort it was identified that the duration of an MSLB accident was considerably lengthened by a steam line break that was less than 100% of the main steam line cross sectional area. When compared to the large break MSLB analysis for the currently installed steam generators, the reduced break flow that results during smaller steam line breaks increases the time needed to reduce steam generator pressure below the MSIS initiation setpoint by up to approximately 20-30 seconds. During this additional time, a significant amount of feedwater is introduced to the faulted steam generator. This additional feedwater increases the amount of steam generator inventory available for blowdown to the containment, and results in a calculated containment pressure that is greater than design.

CAUSE OF EVENT

The condition described in this report was caused by inadequate design, and resulted because the methodology that was used by the Nuclear Steam Supply System supplier to assess the effects of MSLB transients on containment pressure incorrectly assumed that the largest break area that would result in blowdown of pure steam also constituted the most limiting design case for containment pressure, and that the Palisades design is atypical of other Combustion Engineering plants in this regard, they did not realize the impact of this difference on containment pressure during previous analyses. The condition described in this report did not involve an action that was not in accordance with an approved procedure, an unusual condition of the workplace, failure of a component or system, or inoperability of a component, system, or structure.

CORRECTIVE ACTION

As corrective action, a modification (FC-906) was installed prior to restarting the Plant that provides a closure signal to the main feedwater regulator valves and main feedwater regulator bypass valves on high containment pressure (setpoint approximately 3.7 psig). Closure of the feedwater regulator and regulator bypass valves on high containment pressure provides faster response than the low steam generator pressure initiated main steam isolation signal (MSIS) that was previously used to limit steam generator blowdown during an MSLB transient, and will act in parallel with the MSIS steam generator isolation feature.

An analysis of the effects of variously sized MSLBs on containment pressure has been performed in the post-modification configuration and indicates that maximum containment pressure for the most limiting case is now within the containment pressure design basis referenced in the FSAR. This analysis also indicates that the main steam line break analysis currently described in the FSAR, which considers a steam line break area that is equivalent to 100% of the main steam line cross sectional area, is now the most limiting case for containment pressure.

Accident and Transient Analysis engineers will continue to work with Combustion Engineering designers throughout the RSG project to ensure that the requirements for MSLB analyses are met. This effort will include attention to Palisades specific design details which may conflict with methodology assumptions that are typical at other plants. Also, additional technical review requirements are now included in procedures used for accident and transient analysis such that a condition similar to the one described in this report, where previous MSLB analyses did not meet design requirements due to Plant specific design features, would now be identified during the technical review.

ANALYSIS OF EVENT

An actual MSLB event has not occurred at Palisades. As a result, the condition described in this report did not adversely impact the operational safety of the plant, or the safety of plant personnel or the general public. Analyses indicate that the initial Plant design was adequate to ensure that maximum containment pressure would be within the FSAR design value for containment pressure, through the use of existing engineered safety features, following an MSLB which involved a steam line break sized greater than approximately 30% of the main steam line cross sectional area. For steam line breaks sized smaller than 30% of the cross sectional area of the main steam lines, the ability of the containment structure to maintain structural integrity at a pressure equal to 1.5 times the FSAR design value has been analyzed. Also the containment air coolers, which are not credited in the MSLB analysis, could be used to reduce peak containment pressure during a MSLB.

ADDITIONAL INFORMATION

A previous condition involving the MSLB analysis described in the FSAR was reported in LER 87-039. The condition described in this previous LER involved the charging pump (BQ;P) auto-start feature, and was not directly related to the condition described in this report.