

Maine Yankee

RELIABLE ELECTRICITY SINCE 1972

329 BATH ROAD • BRUNSWICK, MAINE 04011 • (207) 798-4100

June 18, 1997

MN-97-79

JRH-97-166

UNITED STATES NUCLEAR REGULATORY COMMISSION

Attention: Document Control Desk

Washington, D. C. 20555

Reference: (a) License No. DPR-36 (Docket No. 50-369)

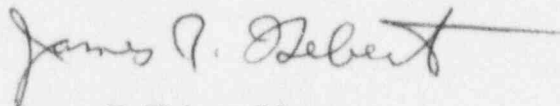
Subject: Maine Yankee Licensee Event Report 97-009-01, Design Basis Issues for High Energy Line Breaks

Gentlemen:

Please find enclosed Maine Yankee Licensee Event Report 97-009-01. This report is submitted in accordance with 10 CFR 50.73(a)(2)(ii).

Please contact us should you have any questions regarding this matter.

Very truly yours,



James R. Hebert, Manager
Licensing & Engineering Support Department

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Enclosure

c: Mr. Hubert Miller
Mr. J. T. Yerokun
Mr. D. H. Dorman
Mr. Patrick J. Dostie
Mr. Uldis Vanags

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PDR ADOCK 05000309
S PDR



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LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS
MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS.
REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE
LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD
COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION
AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR
REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND
TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF

FACILITY NAME (1)

Maine Yankee Atomic Power Company

DOCKET NUMBER (2)

50-309

PAGE (3)

1 of 5

TITLE (4)

Design Basis Issues for High Energy Line Breaks

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 NAME	DOCKET NUMBER
05	19	97	97	-- 009	-- 01	06	18	97	FACILITY NAME	DOCKET NUMBER
OPERATING MODE (9)		01	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)							
POWER LEVEL (10)		0	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)	
			20.2203(a)(1)		20.2203(a)(3)(i)		X 50.73(a)(2)(ii)		50.73(a)(2)(x)	
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71	
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER	
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A	
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)			

LICENSEE CONTACT FOR THIS LER (12)

NAME

George N. Stowers Senior Nuclear Safety Specialist

TELEPHONE NUMBER (Include Area Code)

(207) - 882-5749

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

SUPPLEMENTAL REPORT EXPECTED (14)

X	YES	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	(If yes, complete EXPECTED SUBMISSION DATE).					
				11	28	97

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

Revision 1 to LER 97-009 is a major rewrite with significant changes from the original LER. To improve readability change bars have not been included.

On May 1, through May 21, 1997, Maine Yankee was in the Refueling Shutdown Condition. During the review of Maine Yankee's Individual Plant Evaluation for External Event (IPEEE) a scenario that could be more limiting than the design basis High Energy Line Break (HELB) in the Turbine Building was identified. Analyses of a broader spectrum of line breaks were initiated. Initial assessment of the preliminary HELB profiles identified components in the Component Cooling Water and Feedwater Systems that were not qualified for the harsh environment predicted by the analyses. On May 19, 1997, following further review of Maine Yankee's High Energy Line Break licensing basis it was recognized that certain plant modifications installed after 1973, did not correctly account for licensing basis requirements for a postulated High Energy Line Break in the Main Steam Valve House (MSVH). Safe Shutdown Equipment potentially impacted by this oversight include the following: EFW System, Secondary Component Cooling Water System, Emergency Diesel Generator, DWST Level Alarms, and RG 1.97 Steam Generator Pressure instruments. On May 21, 1997, HELB related deficiencies associated with possible ruptures in Steam Generator Blowdown and Letdown System piping were identified in the Primary Auxiliary Building.

Additional analyses of postulated ruptures on high energy lines in the Turbine Building, MSVH and PAB continues. Potential corrective actions being considered include: replacement, modification, or relocation of components not qualified for a HELB, and continued evaluations for possible modifications to the Turbine Building, MSVH and PAB that would mitigate the consequences of a design basis HELB in these areas.

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INITIAL PLANT CONDITIONS:

On May 1, through May 21, 1997, Maine Yankee was in the Refueling Shutdown Condition.

EVENT DESCRIPTION:Turbine Hall HELB

Maine Yankee's original design basis for Turbine Building (NM) High Energy Line Break (HELB) concluded that a guillotine break of the 30 inch Main Steam (SB) piping near the Control Room and Protected Switchgear Room ventilation equipment produced the most limiting environment. Evaluations showed that this break would cause Turbine Building siding failure and allowed rapid venting of the Turbine Building.

The resulting environment was determined to be non-harsh. As a result, it was concluded that equipment located in the Turbine Building that was required for safe plant shutdown following a design basis HELB was not required to be qualified for a harsh environment.

Maine Yankee reviewed beyond design basis events for the Individual Plant Evaluation-External Event (IPEEE). During this examination a Turbine Building HELB scenario was identified that could have been more limiting than the design basis HELB. The scenario centered around the possibility that other breaks could occur that would not rupture the Turbine Building siding and the energy released would be retained within the Turbine Building and result in a potentially harsh environment.

Maine Yankee voluntarily submitted LER 96-04 on this issue. Additional evaluations and analyses on a broader spectrum of line breaks were initiated. Maine Yankee committed to determining all bounding design basis scenarios and would inform the NRC Staff of the outcome of evaluations performed as part of the corrective actions described in the LER. This was done through:

- 1) Letter to the NRC, MN-96-114, dated August 14, 1996
- 2) Letter to the NRC, MN-96-154, dated November 18, 1996

These letters concluded that a mild environment could be maintained in the Turbine Building based upon double ended breaks of Main Steam (30 inch) or Main Feed or critical cracks for smaller lines. Double ended breaks of smaller pipes were not considered part of the design basis at the time of the letters, however, evaluation of the effects of smaller doubled ended breaks continued.

On May 1, 1997, after further evaluating the potential affects of the smaller pipe double ended breaks, Maine Yankee concluded that double ended breaks of 10 inch and 14 inch diameter Main Steam lines should be included in the design basis since the post rupture environment was more severe than from the large Main Steam and Feedwater lines as well as the critical cracks. These ruptures result in significant mass and energy release rates to the Turbine Building but the pressure transient is not large enough to cause building siding failure. The energy released is retained within the building resulting in higher temperatures for longer durations of time, even when taking into account increased Turbine Building ventilation measures as described in MN-96-114 and 154.

The engineering analysis (still preliminary at this time) for the 14 inch Main Steam line break predicts temperatures as high as 280 degrees in the vicinity of the Primary Component Cooling Water (CC) and Secondary Component Cooling Water (KB) pumps. Previous analyses predicted temperatures of less than 200 degrees in the vicinity of

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these pumps when considering only the largest Main Steam and Feed lines, and critical cracks for smaller lines.

Initial assessment of the preliminary HELB profiles identified components in the Component Cooling Water Systems that are not environmentally qualified for the harsh environment predicted by the current analysis. PCC and SCC pump motors, SCCW Logic Panel subcomponents, pressure switches, solenoids, cabling, connections, and conduit arrangements are not qualified for the HELB environment.

Additionally, specific manufacturer's terminal block and splice products are not qualified for the HELB environment. These products affect the Feedwater System as well as the Component Cooling Water Systems.

The Component Cooling Water Systems service the Residual Heat Removal (BP) systems, the Emergency Diesel Generators (EK), and plant auxiliaries associated with the primary plant and the secondary plant.

Additional analyses of postulated ruptures of high energy lines continues. Mass and energy release calculations have been performed for postulated breaks in a spectrum of high energy main steam and feedwater lines ranging in size from 4 to 30 inches in diameter. Maine Yankee is currently finalizing calculations to determine the Turbine Building pressure and temperature profiles resulting from these postulated high energy line breaks. Qualification evaluations of affected components will be performed when the Turbine Building HELB environments are identified.

MSVH HELB

On May 19, 1997, following further review of Maine Yankee's High Energy Line Break licensing basis, it was recognized that certain plant modifications installed after 1973, did not correctly account for licensing basis requirements for a postulated High Energy Line Break in the Main Steam Valve House (MSVH). Safe Shutdown Equipment potentially impacted by this oversight include the following: EFW System (BA), Secondary Component Cooling Water System (CC), Emergency Diesel Generator, DWST Level Alarms, and RG 1.97 Steam Generator Pressure instruments.

The 1973 MSVH HELB design basis assumed that a HELB could damage the EFW Pump suction line to the DWST. The design basis required the operators to manually realign the suction to the PWST before starting the pumps. In order to prevent steam generator dry-out, the pumps now auto-start on low steam generator level (EDCRs 79-42 & 80-35). With the auto-start feature, if the suction line from the DWST is damaged by a HELB in the MSVH, the pumps may start before the operators can realign the suction to the PWST. This could cause the failure of both EFW Pumps due to a loss of suction flow.

With the installation of the auto-start feature, it was necessary to install an auto-isolation feature to keep the EFW Pumps from feeding a low pressure steam generator; potentially causing a return to power or pump runout (EDCRs 80-35 & 83-29). The pressure transmitters which actuate this feature are located in the MSVH. Failure of the auto-isolate feature caused by a HELB in the MSVH could isolate EFW flow to the generators, allow the pumps to be damaged by runout due to low back pressure in a faulted Steam Generator, or cause a return to power due to excessive RCS cooldown caused by feeding a faulted Steam Generator.

The minimum flow line for the EFW Pumps is routed through the MSVH to the DWST. This line also provides EFW pump oil cooling water return flow (EDCR-85-51). Damage to the return line caused by a HELB in the MSVH could cause the flow to be restricted so that the pump minimum flow and oil cooling requirements are not met.

EDCR 80-45 modified the Component Cooling Water System (CCW) so that the Primary Component Cooling Water System (PCCW) cooled one Emergency Diesel Generator (EDG) and the Secondary Component Cooling Water

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System (SCCW) cooled the other. Some SCCW lines are located in the MSVH. Therefore, loss of SCCW due to a MSVH HELB and a single failure in the PCCW System could cause a loss of both EDGs due to a loss of cooling water.

EDCR 91-29 installed RG 1.97 steam generator pressure indicators (PT-1012, 1022, & 1032) in the MSVH. The cables for these instruments are located close together as they leave the area. RG 1.97 pressure indication for steam generators being used for decay heat removal may be rendered inoperable if a main feedwater line break is assumed in the MSVH.

A HELB in the MSVH could affect cables associated with DWST level alarms located in the adjacent Containment Personnel Hatch Area. The NNS level alarms were used by Maine Yankee to meet NRC requirements for redundant DWST level alarms. The cables associated with the NNS level alarms are not environmentally qualified and may be affected by a MSVH HELB. Protection of these alarms is particularly important since the DWST may be emptied quickly due to damage to lines in the MSVH and the possibility that the AFW Pump could operate and pump water from the DWST to the floor of the MSVH.

PAB HELB

On May 21, 1997, following additional engineering review of Maine Yankee's HELB design/licensing basis, it was determined that a high energy line break in the S/G Blowdown (WI) piping or Letdown System (CB) piping exiting Containment into the PAB at elevation 11 foot could affect numerous class 1E cables located in the area possibly adversely affecting the ability to safely shutdown the plant. Preliminary evaluation of this condition has identified the following potential consequences.

A break in the S/G Blowdown piping during normal operations (particularly at low power levels) could cause a reactor trip due to excessive RCS cooldown before the blowdown trip valves isolate the break. In addition, pipe whip and fluid jet could cause control and power cables to Emergency Feedwater Pump (EFW) P-25A to be lost as well as the EFW Pump Room Exhaust Fans FN-35A & B which are needed to provide cooling for the EFW pump motors and EFW flow instrumentation. S/G level and HPSI flow instrument cables required by Regulatory Guide 1.97 could also be lost. Other cables associated with both the EFW control valves and the EFW trip valves could be potentially affected by different breaks in the same blowdown piping.

A break in Letdown System pipe 2-1/2"-CH-53, located in the same area of the PAB, could result in reactor trip due to loss of RCS inventory. Pipe whip and fluid jet stream associated with such a break could affect many of the same Class 1E cables described in the proceeding two paragraphs, and which are required to mitigate the HELB and safely shutdown the plant. Regulatory Guide 1.97 instrumentation for HPSI flow as well as S/G level could be lost. The EFW trip valves and flow indication may also be lost.

A comprehensive engineering review of Maine Yankee's susceptibility to High Energy Line Breaks continues.

SAFETY SIGNIFICANCE:

Had one of these unanalyzed events occurred, equipment important to safety may have been unable to perform its function. Evaluation of this condition is ongoing and any post HELB safety concerns identified will be reported in a supplement or revision to this LER.

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CAUSAL FACTORS:

The change in the licensing/design basis for HELB was a result of three causal factors:

- o Insufficient detail in the documentation justifying the original design basis (circa 1973/1974)
- o Inadequate accounting for Maine Yankee's HELB Licensing basis when making plant modifications.
- o New information developed during the IPEEE review.

CORRECTIVE ACTIONS:

- o Continue ongoing effort to reconstitute HELB design basis information.
- o Continue evaluations of high energy line breaks that could potentially cause more limiting environments in the Turbine Building than the original design basis break.
- o Replace, modify or remove, as applicable, identified components that are not qualified for a post HELB environment in the Turbine Building, MSVH, and PAB.
- o Continue evaluations for possible modifications to the Turbine Building that will mitigate the consequences of a design basis HELB in the Turbine Building, MSVH, and PAB.

PREVIOUS SIMILAR EVENTS:

97-009, Rev. 0	Design Basis Issue for High Energy Line Break in the Turbine Building
96-024	High Energy Line Break Potential in Unprotected Cable Tray Room
96-004	Turbine Building High Energy Line Break (Informational LER)
95-009	Inappropriate Technical Specification Ventilation Filter Test
93-023, Rev. 1	PCC/SCC Outside Design Basis due to Continuous Venting through NNS Piping
90-008	Failure of Environmentally Qualified Limit Switch
90-001	Failure of Environmentally Qualified Limit Switch
89-002	Environmental Qualification Discrepancies Identified in Containment Cable Connector
87-005	Reactor Coolant System Loop RTD Environmental Qualification Discrepancies
80-001	Steam Line Break Analysis Error