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Docket Nos. 50-315

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

LER 315/1999-026-01: "High Energy Line Break Programmatic Inadequacies Result In Unanalyzed Conditions"

No commitments are identified in this submittal.

Should you have any questions regarding this correspondence, please contact Mr. Ronald W. Gaston, Manager, Regulatory Affairs, at 616/465-5901, extension 1366.

Sincerely,

Joseph E. Pollock

Joseph E. Pollock
Plant Manager

/pae

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NRC Form 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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 MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Donald C. Cook Nuclear Plant Unit 1	05000-315	1 of 10

TITLE (4)

High Energy Line Break Programmatic Inadequacies Result In Unanalyzed Conditions

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
									Cook Unit 2	05000-316
10	22	1999	1999	-- 026 --	01	08	24	2001	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9): N/A

POWER LEVEL (10): 00

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	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	TELEPHONE NUMBER (Include Area Code)
Richard Meister, Compliance Specialist	(616) 465-5901, x1707

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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 15 single-spaced typewritten lines) **(16)**

This LER is revised in its entirety to include information from the completed root cause evaluation.

On October 22, 1999, it was determined that a number of locations in the plant should be considered unprotected from the dynamic and environmental effects of a postulated nearby high-energy line break (HELB) event. An evaluation of the HELB program identified important equipment that was either not qualified for the harsh environment that would result from a HELB in its area, or would have been damaged by jet impingement from a break or crack in high-energy piping near the equipment. Equipment potentially affected includes the auxiliary feedwater (AFW) pumps, safety and non-safety-related 600 VAC and lower voltage switchgear, emergency diesel generators (EDGs) and associated ventilation systems, component cooling water (CCW) pumps, battery trains for the turbine-driven auxiliary feedwater pumps (TDAFP), equipment located near the pressurizer surge line, auxiliary building ventilation equipment located near the chemical volume control system (CVCS) letdown and steam generator (SG) blowdown piping, equipment located near HELB doors, and cables and conduits inside containment. Six of the above conditions were reported in an Emergency Notification System (ENS) phone call made on October 22, 1999, at 1500 hours in accordance with 10CFR50.72(b)(2)(i), of a condition which could have resulted in the nuclear plant being in an unanalyzed condition that significantly compromises plant safety. This LER is submitted in accordance with the corresponding 10CFR50.73(a)(2)(ii)(A) reporting requirement.

The root cause of the condition was linked to a programmatic failure, one of inadequate design and licensing basis control. The entire HELB program was evaluated and re-constituted, HELB procedures were revised, and plant modifications were performed.

The condition is safety significant because the affected systems are vital for controlling core reactivity, removing core decay heat, controlling reactor coolant inventory, or providing indication of plant parameters. Loss of all auxiliary feedwater pumps or loss of power to vital equipment would significantly challenge the plant.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR	SEQUENTIAL NUMBER			REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	--	026	--	01	2 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

Conditions Prior to Event

Unit 1 was de-fueled.
Unit 2 was de-fueled.

Description of Event

On October 22, 1999, it was determined that a number of locations in the plant should be considered unprotected from the dynamic and environmental effects of a postulated nearby high-energy line break (HELB) event. These areas were previously considered to be protected from, or not susceptible to, the effects of a HELB event. However, an evaluation of the HELB program identified areas where important equipment was either not qualified for the harsh environment that would result from a HELB, or would have been damaged by the jet impingement from a break or crack in high-energy piping near the equipment. Equipment potentially affected includes the auxiliary feedwater (AFW) pumps, safety and non-safety-related 600 VAC and lower voltage switchgear, emergency diesel generators (EDGs) and associated ventilation systems, component cooling water (CCW) pumps, battery trains for the turbine-driven auxiliary feedwater pumps (TDAFP), equipment located near the pressurizer surge line, auxiliary building ventilation equipment located near the chemical volume control system (CVCS) letdown and steam generator (SG) blowdown piping, equipment located near HELB doors, and cables and conduits inside containment.

Three HELB conditions affecting the equipment identified above have been previously reported in LERs 50-315/1998-058, "Postulated High Energy Line Break Could Result in Condition Outside Design Bases for Auxiliary Feedwater," 50-316/1998-005, "Potential for High Energy Line Break to Degrade Component Cooling Water System," and 50-316/1998-007, " High Energy Line Break Effects On Auxiliary Feedwater System." This LER combines all the HELB environmental and jet impingement issues into a single report to better characterize the aggregate impact of the programmatic inadequacies that led to these individual conditions. A discussion of each issue is provided in the Analysis section of this LER.

The HELB programmatic inadequacies were reported in an emergency notification system (ENS) phone call made on October 22, 1999, at 1500 hours in accordance with 10CFR50.72(b)(2)(i), for a condition which could have resulted in the nuclear plant being in an unanalyzed condition that significantly compromises plant safety. This LER is submitted in accordance with the corresponding 10CFR50.73(a)(2)(ii)(A) reporting requirement.

Cause of Event

The root cause of the condition was linked to a programmatic failure, one of inadequate design and licensing basis control. A 1999 root cause evaluation of design control deficiencies addressed historical causes of loss of design control at the Donald C. Cook Nuclear Plant (CNP). The cause of the programmatic failure was a failure to recognize that maintaining the design basis and providing strong configuration management are vital functions in nuclear power operations. Specific causes identified in the root cause for the design control process applicable to this condition were uncontrolled calculations, uncontrolled design basis supporting documentation, and an incomplete understanding of the plant design basis. As such, strategic errors, low expectations, and a low commitment to implementing and controlling the CNP design basis caused this programmatic issue.

Analysis of Event

The HELB discrepancies, discovered during the HELB program reconstitution, were evaluated for their safety significance. These discrepancies were reviewed and prioritized based on their impact to the following generic categories of plant protection to establish their relative safety significance:

1. Reactivity (Post Trip Shutdown Margin)

2. Core cooling

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	--	026	--	01	3 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

3. Reactor Coolant System (RCS) pressure control/thermal shock

4. Containment integrity

5. Inventory control

6. Indication

A discussion of each HELB discrepancy follows, and applies to both units except as noted. These events are not postulated to occur simultaneously as the result of a single HELB, but are postulated to occur individually due to a specific precursor.

AFW Pumps

Each unit has two motor-driven auxiliary feedwater pumps (MDAFPs), designated as east and west, and one TDAFP. Each pump is located in a separate room in the turbine building. The AFW pump rooms for both units are adjacent to each other. The east MDAFP and the TDAFP for both units have doors that open into a common hallway with doors at each end that were normally left open to the turbine building to allow for cooling air flow. The west MDAFP rooms do not share this common hallway, but instead have normally closed doors that open into the general area of the turbine building. The east MDAFP and the TDAFP rooms drew cooling air from the hallway and discharged the warm room air to the general area of the turbine building. The west MDAFP room drew cooling air from the general area of the turbine building and discharged warm air back to the turbine building.

Two HELB issues related to the arrangement of the AFW pump rooms and the AFW system were identified. First, a postulated HELB in the four-inch steam supply line to the TDAFP could have resulted in the loss of the TDAFP and one MDAFP for each unit. The steam used to drive the TDAFP turbine is provided by a four-inch supply line, which is postulated to rupture at its terminal end in the TDAFP room. The strategy for mitigating the consequences of this postulated break was to control door positions, with the TDAFP room door maintained open and the east MDAFP room door maintained closed. However, the steam from this HELB would have been exhausted into the common hallway and could have impacted equipment located in the hallway or other AFW pump rooms. No analysis could be located that evaluated these effects.

Subsequent evaluation determined that a harsh environment in the common hallway following a HELB in the TDAFP room of one unit could affect four AFW system valves required for safe shutdown of the plant because their cables are located in the hallway but are not qualified for the environmental conditions. Failure of these valves could result in loss of the unaffected unit's TDAFP and each unit's east MDAFP. One AFW pump in each unit would remain available. The safety significance of this first AFW HELB issue is bounded by the safety significance discussion for the second AFW HELB issue, below. The condition of this four-inch TDAFP steam line break was previously reported in LER 50-315/1998-058, which was closed to LER 50-315/1999-026.

The second AFW HELB issue was the discovery that all of the AFW pumps could have been adversely impacted by a postulated line break in the turbine building of any of the large main steam, feedwater, or condensate lines. The impact would have been due to the following reasons:

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR	SEQUENTIAL NUMBER			REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	--	026	--	01	4 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

1. The doors to the turbine building at both ends of the AFW pump room hallway were maintained open. The fusible links installed on these doors were set to actuate at a value that is above the expected temperature in the area following a postulated HELB event in the turbine building. Therefore, the doors between the turbine building and the AFW pump room would not have closed following a postulated turbine building HELB event.

2. The TDAFP doors were maintained open with fusible links that would not have actuated due to the turbine building HELB event. The harsh environment created by the postulated HELB could have adversely impacted the TDAFPs.

3. The ventilation systems supplying cooling to the MDAFP rooms drew air from the turbine building. A postulated main steam line break in the turbine building could have resulted in steam being drawn into the MDAFP rooms, making the rooms a harsh environment. The dampers installed in the ventilation ductwork for the MDAFPs were curtain-style fire dampers with thermal fusible links, but were not designed to close with flow in the ventilation ducts. Therefore, since the MDAFPs are not qualified for a harsh environment, and the fire dampers may not have closed with airflow in the ducting to the MDAFPs, the pumps may not have been protected from a postulated HELB event in the turbine building. Even if the dampers did close, the resultant pump room temperature without ventilation had not been previously analyzed and may have been unacceptable.

A HELB in the large main steam, feedwater, or condensate piping in the turbine building, coupled with the postulated failure of some AFW pump area doors and ventilation dampers to reposition in response to the steam environment, could have resulted in all of the AFW pumps being subjected to a harsh environment. As none of the AFW pumps are qualified for a harsh environment, this postulated event could have resulted in a loss of all AFW.

With respect to the safety significance criteria described above, the criterion impacted by loss of AFW is ability to maintain a heat sink to ensure core cooling. Both postulated AFW-related HELB scenarios are safety significant because AFW is a vital system for removing core decay heat to prevent fuel damage in the event of a large HELB outside containment.

To mitigate the effects of a potential loss of AFW following a HELB, other methods to remove core decay heat would likely have been available to the operators, such as use of condensate pumps and steam dumps or feed-and-bleed operation. In the case of a full feedwater or main steam line break, with the main steam isolation valves and the feedwater isolation valves closed, SG inventory would allow approximately 30 minutes of time for operator action to restore core cooling via alternate means.

Additionally, evaluation indicates that the TDAFP may have been available, even in the worst case scenario. The most critical piece of equipment in the room subject to a harsh environment is the electronic trip device for the turbine. This device has two potential failure modes in a harsh environment. The first and far most likely scenario is for portions of the device and its circuitry too simply fail as a result of environmental exposure, thus preventing completion of a trip. Under these conditions, the electronic trip device would not protect the turbine from overspeeding, but this would be acceptable since there is a redundant mechanical overspeed device. The second failure mode is for portions of the device and its circuitry to fail in a specific manner that would result in a spurious overspeed trip, thereby preventing the TDAFP from performing its safety function. A specific failure of this type is considered unlikely due to the complexity of the trip circuitry and its propensity to fail "as-is." Based on engineering judgment, there is reasonable assurance that the TDAFP would have started and performed its function in the postulated harsh environment.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	--	026	--	01	5 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

Safety- and Non-Safety-Related Switchgear

The switchgear rooms are served by a supply-only ventilation system designed to exhaust through the switchgear room roll-up doors; therefore, the doors were maintained open to provide a ventilation exhaust path. The doors closed automatically on a carbon dioxide actuation or on actuation of a fusible link, and were closed as needed to support testing or maintenance. A calculation previously verified that the rooms would remain a mild environment post-HELB with the doors open.

A walkdown of the switchgear rooms performed in September 1999 revealed that the analytical assumptions used in the original calculation failed to consider a high-energy source near the rooms. A high-pressure feedwater heater is located outside the room near the open door. If the heater or associated piping failed, the resultant steam/water mixture could produce a harsh environment inside the switchgear room. Electrical structures, systems, and components located inside the switchgear rooms were not designed for a harsh environment. Therefore, safety-related, safe shutdown, and vital instrument equipment powered from the 600 VAC and lower voltage buses located in the switchgear rooms may not have functioned as designed. The equipment directly exposed would be the 600 VAC switchgear, control room instrument distribution (CRID) inverters, the control rod drive equipment room, and the AB battery train. The 4160 VAC switchgear and the CD battery train would not have been affected, as they are located in separate areas.

A review of this postulated event with respect to the criteria described previously indicates that most plant protection categories may have been impacted due to loss of the 600 VAC transformers. However, many of the components lost, such as motor-operated valves, can be manually operated. The largest challenge to safe shutdown would have been the potential loss of instrumentation or indication.

Further evaluation indicated that, if instrumentation or indication were lost, adequate vital instrumentation would have been available at the remote shutdown panel, which is powered from the opposite unit. Once instrumentation was restored to service, the issue would have been enveloped within the existing station black out and 10 CFR 50, Appendix R, plant analyses and procedures, and the plant would be capable of being safely shutdown. Control of the plant from the remote shutdown panel lessens the severity of the issue since the operators would have indication available to properly diagnose plant conditions and react appropriately. While the postulated HELB condition represents a significant challenge to the plant and operating crew, the condition is bounded by the station black out and Appendix R analyses, and does not adversely impact plant safety.

EDGs and Associated Ventilation Systems

At the time of the Emergency Notification System report to the NRC, preliminary information regarding HELB impact on the EDGs indicated that the EDG rooms are not protected from the effects of a postulated HELB originating in the turbine building. The EDG ventilation system exhaust air path to the turbine building is provided with fire dampers in the wall penetration, but these dampers will not close due to a HELB in the turbine building because the expected temperatures are not high enough to actuate the damper fusible link. Steam could flow into the EDG rooms through the EDG ventilation exhaust ducts when the fans are not operating, potentially rendering the rooms a harsh environment. The EDG equipment is not rated for a harsh environment.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	-- 026 --	01	6 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

Subsequent evaluation of this issue determined that the environmental conditions in the area of the EDG rooms due to a HELB in the turbine building would not adversely impact the ability of the EDG room ventilation fans to start and run. Automatic operation of these ventilation fans will prevent the EDG rooms from becoming a harsh environment. Therefore, a HELB in the turbine building has a negligible effect on the EDGs and their associated ventilation systems.

Component Cooling Water Pumps

This condition was previously reported as LER 50-316/1998-005, which was closed, to LER 50-315/1999-026. At the time LER 50-316/1998-005 was written, a preliminary determination had been made that a postulated non-mechanistic critical crack of a Unit 2 main steam line could degrade the ability of adjacent CCW pumps to perform their design function. The CCW pumps for both units are located in close proximity to one another in a semi-enclosed area in the auxiliary building. Adjacent to the pumps on the Unit 2 side is a pipe chase enclosing two main steam lines and a main feedwater line, which can be accessed through any of three doors. The corresponding area in Unit 1 does not have any doors or safety-related equipment adjacent to the high-energy line pipe chase.

Although the pipe chase walls provide a qualified HELB barrier, no calculation could be found which showed that the doors would withstand the energy released from a postulated non-mechanistic critical crack directly opposite the Unit 2 doors. The existing calculation considered a HELB location roughly 37 feet from the doors. The pipes pass within about three feet of the doors. As the adjacent CCW pump motors and other equipment are not qualified for the high temperature and/or high humidity environment that might occur following a postulated crack in the steam or feedwater piping near the doors, this concern was initially determined to constitute an unanalyzed condition. That determination was later rescinded.

The methodology of NUREG/CR--2913, "Two-Phase Jet Loads," was used to determine the zone of influence of a pipe crack. The NUREG states that the dynamic effects of high-energy line break jet impingement are minimal beyond ten times the piping diameter from the break. This methodology has also been applied to critical cracks using the critical crack area as a piping diameter equivalent. The doors and the pumps are located beyond the ten-diameter equivalent zone of influence of a pipe crack, and, therefore, would not have been exposed to the effects of direct jet impingement.

It was also noted that thresholds were not installed in the doors. This lack of a threshold could have led to some steam migration into the room as a result of a break somewhere in the pipe chase. The potential effect on the pumps is determined to have been negligible based on the following:

1. The CCW pump area is open to the rest of the auxiliary building, thus allowing the steam to disperse into the general environment and not concentrate in the area.

2. The pump motors have blower hoods over them that direct cooling air onto the motors. Cooling air is provided from the auxiliary building ventilation system that draws air from the outdoors. These hoods would have prevented steam from directly impacting the motors.

Based on the results of analysis this condition has minimal safety significance.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	-- 026 --	01	7 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

TDAFP Battery Trains

The 250 VDC N-train battery and associated support equipment supplies power for the operation of the turbine-driven auxiliary feedwater system. The N-train batteries for both units are located in closed rooms protected from the effects of a postulated HELB. The Unit 1 N-train battery system supporting components are also located in an area protected from the effects of a HELB event. However, the Unit 2 N-train battery system supporting components, such as the battery charger and power distribution cabinet, are located in the steam generator blowdown flash tank room, which is outside of the battery room. In the event of a failure of the steam generator blowdown line as it enters the flash tank, the Unit 2 N-train battery support components would be exposed to a harsh environment. These components are not qualified for a harsh environment.

A break in the SG blowdown line inside the normal blowdown flash tank room could have rendered the Unit 2 N-train battery system inoperable. This postulated condition would have resulted in the unavailability of the TDAFP. However, there would have been no impact to the motor-driven AFW pumps. Since, as determined by the Appendix R analyses, a single MDAFP can provide adequate cooling to safely shut down a unit, there is no safety significance to this condition.

Pressurizer Surge Line

The surge line is connected to the bottom of the pressurizer at one end and the RCS hot leg at the other. The line is part of the RCS, and is classified as a high-energy line due to its high pressure and elevated temperature. Thirteen pipe whip restraints are provided to limit uncontrolled movement of the pipe should a pipe rupture occur. A postulated break of the high-energy pressurizer surge line would cause the pipe to move, and the whip restraints would absorb the energy of the moving pipe. Should the whip restraints fail, the surge line would impact nearby safety-related structures. These structures have not been previously qualified to withstand a large impact load, such as from a whipping surge line.

The original whip restraint calculations had deficiencies and did not address the adequacy of some connections. Also, these calculations did not address the effect of large gaps between the pipe and the restraint. The large gaps that existed between the surge line and the whip restraints introduce added energy to be considered in the design of these restraints. Physically, the members were very rigid such that they would not have yielded to absorb the energy of a moving pipe. The connections were weak compared to the yield capacity of the members framed into the connection. Some of the embedded anchor plates had lesser capacities than the members connected to the plates. These restraints would not have absorbed the kinetic energy of the broken pipe.

The thermodynamic effects of a broken pressurizer surge line (14-in. diameter) on containment integrity are bounded by the design basis loss-of-coolant accident, which is a double-ended rupture of the largest pipe (31 in. diameter) in the RCS. The other potential safety concern is that an unrestrained broken surge line could impact nearby safety-related structures. Although an analysis was not conducted, the mass of the surge line is small compared to nearby containment structural components, primarily the reactor cavity wall, and by engineering judgement, the kinetic energy of a broken surge line should not cause these reinforced concrete structures to fail. Therefore, failure of the pressurizer surge line pipe whip restraints to meet their design basis requirements is of minimal safety significance.

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CVCS Letdown and SG Blowdown Piping

CVCS letdown removes water from the RCS so that filtration, cleanup, and chemical control of the RCS fluid can take place. The SG blowdown system helps maintain proper secondary side water chemistry by removing water from a point in the cycle where chemical contaminants tend to concentrate; blowdown flow can be routed to either a startup blowdown flash tank or a normal blowdown flash tank. An analysis of these piping systems showed that stress levels were high enough to require consideration of arbitrary intermediate pipe breaks.

A postulated intermediate break in either the CVCS letdown piping or the SG blowdown piping in the vestibule area outside containment could potentially result in a locally harsh environment and could adversely affect the auxiliary building ventilation system charcoal filtration units. Steam could also be drawn into the ventilation ductwork and be distributed throughout the auxiliary building.

The CVCS letdown line and the SG blowdown line in the auxiliary building ventilation vestibule area from the containment penetration to the downstream side of the outboard containment isolation valve are two-inch diameter piping. A failure of either the CVCS letdown line or the SG blowdown line is bounded by the UFSAR analysis of the peak environmental qualification conditions for a HELB outside containment. The analysis was performed considering a break of the feedwater system in the access between the east enclosure and the auxiliary building ventilation vestibule area, and resulted in a peak temperature of 225 degrees F and pressure of 16 pounds per square inch. Based on the bounding UFSAR analysis, a break near containment in either the CVCS letdown line or the SG blowdown line did not adversely impact plant safety.

HELB Doors

Doors that provide protection to equipment and personnel against the effects of a HELB need to be controlled to ensure they remain closed, with the exception of passage. However, the HELB door control program allowed HELB doors to be blocked open for up to 31 hours, and, in one instance in July 1995, an evaluation was performed that allowed a Unit 2 HELB door to be blocked open for 39 hours.

In July 1995, the fire/HELB door for the Unit 2 startup blowdown flash tank room was blocked open for approximately 39 hours to allow draining of the essential service water (ESW) header. Had a break occurred in the steam supply line to the TDAFP or the SG blowdown line, the open door would have allowed steam to exit the room and create a harsh environment in the hallway outside the room. Located in the hallway are motor control centers (MCCs) that provide power to ESW valves supplying ESW flow to the AFW pumps. Blocking open the HELB door to the startup blowdown flash tank room created the potential for a loss of ESW flow to the AFW system, which under certain scenarios could have impacted the ability of the AFW system to perform its function. This condition was previously reported in LER 50-316/1998-007, which was closed to LER 50-315/1999-026.

The basis for allowing HELB doors to be blocked open for 31 hours or more was established on invalid assumptions that the break would be isolated within ten minutes. Should the door to the startup blowdown flash tank room be open, a HELB in the three-inch SG blowdown line would potentially expose the MCC outside the room to higher temperatures and humidity than that to which the bus and breakers are qualified. The valves that supply ESW to the AFW pumps are on these MCCs, and may not have operated in the event of a HELB.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	--	026	--	01	9 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* (17)

The condition is of no safety significance for three reasons:

1. The steam supply line that passes through the startup blowdown flash tank room was re-evaluated using the Generic Letter 87-11 methodology. All postulated breaks of this steam line in the startup blowdown flash tank room have been eliminated by stress analysis.

2. The startup blowdown flash tank is typically used during plant startup and shutdown, but is used infrequently during normal power operation. Since the startup blowdown flash tank is in service a limited amount of time, there is only a short time in which a HELB in the blowdown line could occur concurrent with the doors being open. The potential for impact to the components in the MCC is judged to be small.

3. The ESW supply to AFW is an emergency supply; the normal water supply to the AFW system is from the condensate storage tank. Makeup to the SGs due to a HELB in the blowdown line would easily be accomplished by the main feedwater system. The AFW system, therefore, would not have necessarily received a start signal. Should the system have been needed, the condensate storage tank would have provided the initial source of water to the AFW system.

Cables and Conduits Inside Containment

Forty-two potential jet impingement targets existed that could have been adversely affected due to a postulated crack in high-energy lines inside containment. These targets consisted of cables and conduits in containment that were originally thought to not have been adequately protected from the effects of jet impingement, and may have failed.

During the evaluation of the unprotected targets inside containment, it was determined that the targets did not require protection based on one or more of the following considerations:

1. The postulated rupture was eliminated by stress analysis and the application of Generic Letter (GL) 87-11, "Relaxation in Arbitrary Intermediate Pipe Rupture Requirements."

2. The target was outside the range of the postulated jet based on a more thorough review.

3. The target was determined not to be required for safe shutdown.

Corrective Actions

No immediate corrective actions were necessary as a result of the identified problems because both units were shutdown and de-fueled, and there were no high-energy conditions in either unit.

The corrective actions to prevent recurrence for the root cause of the generic inadequacies of the design control process were addressed through the CNP corrective action program. The root cause evaluation identified numerous corrective actions to address management, organizational, and programmatic issues in the Engineering organization.

Due to the large number of actions to prevent recurrence specific to the HELB program, only a summary list of the actions is provided below. Most of the actions listed have been completed, although some actions remain to be completed post-restart for both units. Post-restart HELB actions have been entered into the CNP corrective action program.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1999	--	026	--	01	10 of 10

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

Completed HELB Actions:
- Consolidate plant-specific design and licensing criteria
- Perform an interim 50.59 review of design and licensing criteria
- Identify fluid systems and boundaries
- Identify protection requirements for essential safety-related systems
- Identify postulated rupture locations
- Perform calculation revisions
- Perform calculation methodology verification
- Review calculation methodologies for compartment pressurization evaluation
- Identify inappropriate calculation methodologies used
- Implement required modifications:
  AFW pump room sealing / AFW pump room cooler installation
  HELB dampers and doors to switchgear rooms
  Unit 2 CCW pump room door restraints
  SG blowdown piping and pipe supports in normal blowdown flash tank room
  Unit 2 Pressurizer surge line pipe whip restraints (Unit 1 surge line was re-evaluated using leak-before-break methodology)
  CVCS and SG blowdown piping supports
- Implement walkdown of piping
- Document the HELB program:
  Create a HELB phase 2 report
  Update plant drawings
  Categorize and close the HELB condition reports
  Revise the HELB related procedures
- Updated the UFSAR

Post-Restart HELB Actions:
- Revise the design basis document
- Develop a long-term HELB program management plan
- Develop position requirements for the long-term HELB program owner
- Monitor and manage the program
- Develop and implement a HELB configuration change training program
- Perform a post-restart assessment

Additionally, License Amendments 244 (Unit 1), and 225 (Unit 2), were submitted and subsequently approved by the NRC for unreviewed safety questions (USQs) related to 1) changes in the HELB methodology, and 2) the new design of the AFW pump room coolers.

Previous Similar Events
There have been numerous other LERs from 1999 and 2000 that have been linked to the design control inadequacies root cause. Since the condition described here is historical, the corrective actions from these LERs would not have identified or prevented this condition.