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

LICENSEE EVENT REPORT (LER)

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

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Cook Nuclear Plant Unit 1	05000-315	1 OF 4

TITLE (4)

Reactor Coolant System Leak Detection System Sensitivity Not in Accordance with Design Requirements

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
04	01	1999	1999	010	00	05	03	1999	Cook Nuclear Plant Unit 2	05000-316
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5
POWER LEVEL (10)	0%

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

	20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)

	50.73(a)(2)(viii)
	50.73(a)(2)(x)
	73.71
	OTHER
	Specify in Abstract below or in NRC Form 366A

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Lyle R. Berry, Regulatory Compliance Engineer	(616) 465-5901 X1623

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	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)

On April 1, 1999, with both Units in Mode 5, it was concluded, subsequent to the completion of an engineering evaluation of conditions identified during an Expanded System Readiness Review (ESRR), that the containment sump level and flow monitoring subsystem of the Reactor Coolant System (RCS) Leakage Detection System is not consistent with the design recommendations of Regulatory Guide (R.G.) 1.45. Contrary to the description in Technical Specification Bases 3/4.4.6.1, the containment sump level and flow monitoring subsystem is not consistent with R.G. 1.45, since that subsystem's sensitivity and response time is not capable of detecting a change in leakage rate of one gpm in one hour or less. Since the containment sump level and flow monitoring subsystem is not consistent with the guidance of R. G. 1.45, it is considered historically inoperable, for the purposes of complying with TS 3.4.6.1, for the life of the plant. This event is reportable as a condition prohibited by Technical Specifications pursuant to the requirements of 10CFR50.73(a)(2)(i)(B). On April 23, 1999, the lower containment sump level detection and flow monitoring subsystem was declared inoperable. The apparent cause of the event was inadequate original design of the containment sump level and flow monitoring subsystem and the historical failure to identify this design discrepancy. The recommendations of Regulatory Guide 1.45 were not considered in the design, configuration, and operational use of the containment sumps and containment sump instrumentation. An evaluation will be performed to clearly define the design and licensing bases for the containment sump level and flow leak detection subsystem and appropriate actions taken to resolve identified deficiencies and restore system operability prior to Mode 4. Although the containment sump level and flow monitoring subsystem sensitivity is not consistent with the recommendations of R.G. 1.45, the plant has maintained the ability to detect and respond to a leak, as verified by periodic TS surveillance testing of the other leak detection subsystems. Based upon this information, this event has no implications to the health and safety of the public.

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cook Nuclear Plant Unit 1	05000-315	1999	010	00	2 OF 4

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

Conditions Prior To Event

Unit 1 Mode 5 at 0% power
Unit 2 Mode 5 at 0% power

Description Of The Event

On April 1, 1999, with both Units in Mode 5, it was concluded, subsequent to the completion of an engineering evaluation of conditions identified during an Expanded System Readiness Review (ESRR), that the containment sump level and flow monitoring subsystem of the Reactor Coolant System (RCS) Leakage Detection System is not consistent with the design recommendations of Regulatory Guide (R.G.) 1.45. Contrary to the description in Technical Specification Bases 3/4.4.6.1, the design of the containment sump level and flow monitoring subsystem is not consistent with R.G. 1.45, since the sensitivity and response time of that subsystem is not capable of detecting a change in leakage rate of one gpm in one hour or less. Since the containment sump level and flow monitoring subsystem is not consistent with the guidance of R.G. 1.45, it is considered historically inoperable, for the purposes of complying with TS 3.4.6.1, for the life of the plant. With one RCS leak detection subsystem inoperable, the action statement of Technical Specification 3.4.6.1 would have applied in Modes 1-4. However, since historically it was not recognized that the sump level and flow monitoring subsystem design was inadequate, rendering the system inoperable, the appropriate action statement may not have been invoked when required to satisfy TS. This is a condition prohibited by TS. This event is applicable to both units.

Cause Of The Event

The apparent cause of the event was the inadequate original design of the containment sump level and flow monitoring subsystem and the historical failure to identify that a design discrepancy existed which rendered the containment sump level and flow monitoring subsystem inoperable. The recommendations of Regulatory Guide 1.45 were not considered in the design, configuration, and operational use of the containment sumps and containment sump instrumentation. The Final Safety Analysis Report (FSAR) describes the containment sump level and flow monitoring system as only for gross leak detection.

Analysis Of The Event

This event is reportable pursuant to the requirements of 10CFR50.73(a)(2)(i)(B) as a condition prohibited by TS.

General Design Criterion (GDC) 30, "Quality of Reactor Coolant Pressure Boundary," of Appendix A to 10CFR Part 50 requires that means be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage. R.G. 1.45 describes acceptable methods for implementing GDC 30 with regard to the selection of leakage detection systems for the reactor coolant pressure boundary. R.G. 1.45 details a number of recommendations and states a clear position on sensitivity and response time. In accordance with R.G. 1.45, each of the leakage detection systems should be capable of detecting a one gpm leakage rate in less than one hour.

D.C. Cook TS 3/4.4.6.1, Leakage Detection Systems, specifies the requirements for instrumentation required to detect Reactor Coolant System Leakage. The TS Bases 3/4.4.6.1 state "The RCS leakage detection systems required by this specification are provided to monitor and detect leakage from the Reactor Coolant Pressure Boundary. These detection systems are consistent with the recommendations of Regulatory Guide 1.45, 'Reactor Coolant Pressure Boundary Leakage Detection Systems,' May 1973."

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cook Nuclear Plant Unit 1	O5000-315	1999	010	00	3 OF 4

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

Final Safety Analysis Report (FSAR) Section 4.2.7, "Leak Detection Methods," describes the leak detection systems at D.C. Cook.

a) Containment Air Particulate and Containment Radiogas Monitors

The containment air particulate monitor is the most sensitive instrument of those available for detection of reactor coolant leakage into the containment. This instrument is capable of detecting particulate radioactivity in concentrations as low as 1E-9 microcurie/cc of containment air. Assuming a low background of containment air particulate radioactivity, a reactor coolant corrosion product radioactivity (Fe, Mn, Co, Cr) of 0.2 microcurie/cc (a value consistent with little or no fuel cladding leakage), and complete dispersion of the leaking radioactive solids into the containment air, the air particulate monitor is capable of detecting leaks as small as approximately 0.0013 gal/min (5 cc/minute) within thirty minutes after they occur. If only ten percent of the particulate activity is actually dispersed in the air, the threshold of detectable leakage is raised to approximately 0.013 gpm (50 cc/minute)...

b) Humidity Detector

The humidity detection instrumentation offers another means of detection of leakage into the containment. This instrumentation is not nearly as sensitive as the air particulate monitor, but has the advantage of being sensitive to vapor originating from all sources, the reactor coolant, the steam, and the feedwater systems. Plots of containment air dew point variations above a base-line maximum should be sensitive to incremental leakage equivalent to 0.2 to 1.0 gpm.

c) Liquid Inventory in the Process Systems and in the Containment Sump

An increase in the amount of coolant make-up water, which is required to maintain normal level in the pressurizer, will be indicated by an increase in charging flow or change in volume control tank level. Gross leakage will be indicated by a rise in normal containment sump level and periodic operation of containment sump pumps. A run time meter is provided to monitor the frequency of operation and running time of each containment sump pump.

Plant procedures are used by Operations to record and track containment sump discharge flow data and RCS unidentified leakage. On a shiftly basis (every eight hours), run time meter readings are recorded for sump pumps in the lower containment sump, the reactor cavity sump, and the pipe tunnel sump. Discharge volume from each sump is calculated by multiplying run time by the known pump flow (pump flow values are measured on a refueling basis). Once every 24 hours, the total discharge from all of the sumps is summed and plotted; total unidentified leakage rate is also calculated and plotted.

Operations maintains the sump pumps in a manual start alignment, and relies on the pump abnormal, or sump high level, alarms to alert them to a high sump water level. An Equipment Operator will then be dispatched to the pump controls to place the pump control switch to AUTO control. The pump(s) will then run until the low level cutoff switch is activated.

An engineering evaluation completed on March 24, 1999, concluded that the lower containment sump level monitor had the requisite R.G. 1.45 sensitivity, i.e., the lower sump level indicators, considering the worst case combination of indication uncertainty and indicator resolution, have the sensitivity to show a level increase in response to a one gpm leak within one hour. However, a follow-up evaluation, completed April 1, 1999, identified that this sensitivity assumed that the lower containment sump is isolated from the containment recirculation sump. The two sumps are normally connected via an 8 inch diameter line. The connection line is blocked off during calibration of the lower containment sump level switches, resulting in a 7.030 gallons per inch of level rise relationship. In this configuration, a leak rate of one gpm, existing for 60 minutes, would add 60 gallons to the sump and result in an 8.4 inch level rise.

	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cook Nuclear Plant Unit 1	05000-315	1999	010	00	4 OF 4

This corresponds to 6.8% of the indicated range of the level detector, more than sufficient sensitivity to detect the one gpm leak rate, since the level detector has a resolution accuracy of 1% of the 123 inch span, or 1.23 inches. However, since the lower containment and recirculation sumps are connected in the normal configuration, it would require about 125 gallons to raise level one inch. Therefore, a 60 gallon addition to the sumps would result in a level increase of only 0.48 inches, which is below the resolution accuracy of 1.23 inches. The April 1, 1999, evaluation concluded that the lower containment sump level and flow monitoring subsystem does not meet the sensitivity recommended by R.G. 1.45. Subsequent to further evaluation by engineering, it was concluded that the subsystem should be considered inoperable, since it does not meet design requirements. The lower containment sump level and flow monitoring subsystems were declared inoperable on April 23, 1999.

Although the containment sump level and flow monitoring subsystem sensitivity is not consistent with the recommendations of R.G. 1.45, the plant has maintained the ability to detect and respond to a leak. As discussed above, the RCS leak detection system includes not only the containment sump flow and level monitoring subsystems, but also includes containment air particulate and radiogas monitors and humidity detection instrumentation. In accordance with TS (Modes 1-4) and plant procedures, the air particulate and gaseous activity monitors are verified operable each shift by a source and a channel check. Operability of the humidity monitor is procedurally required to be verified by a channel check each shift. Channel calibrations are performed at least once per 18 months. RCS leakage in Modes 1-4 is also monitored by the periodic performance of inventory balances at least once per 72 hours during steady state operation.

Coolant leakage within the reactor containment may be an indication of a small through-wall flaw in the reactor coolant boundary. As demonstrated by the Westinghouse mechanistic fracture investigation as discussed in Generic Letter (GL) 84-04, any postulated flaw can be detected prior to propagation around the circumference of the pipe, provided that sufficient leak detection capability is provided. Sufficient leak detection capability, as defined by GL 84-04, is at least one leakage detection system with a sensitivity capable of detecting one gpm in four hours. As noted above, in the FSAR descriptions of leakage detection systems, both the containment air particulate monitors and the containment humidity monitor have the appropriate sensitivity. Since the requisite leak detection capability has been maintained, there is no adverse impact on safety. Based upon the above information, this event has no implications to the health and safety of the public.

CORRECTIVE ACTIONS

The containment sump level and flow leak detection subsystem was declared inoperable for both units on April 23, 1999. An evaluation will be performed to clearly define the design and licensing bases for the containment sump level and flow leak detection subsystem. A supplement to this LER will be provided if the results of the evaluation provide substantial changes to the significance, implications, consequences or corrective actions. Action to restore operability to the sump level and flow leak detection subsystem will be taken prior to entry into operational Mode 4.

The adequacy of the design of safety significant systems and conformance to licensing and design basis requirements is being reviewed during the discovery process at D. C. Cook under a number of system assessments and programmatic assessments to support the Restart Plan. These include the Expanded System Readiness Review (ESRR), Licensing Basis Review, and the Emergency Operating Procedures Project. Identified deficiencies are being addressed under the Corrective Action Program.

SIMILAR EVENTS

315/98-034-00 315/98-058-00 315/98-002-01
315/98-029-00 315/98-001-01