NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs Unit 1	0 5 0 0 0 3 1 7	1 OF 0 4

TITLE (4)
Loss of Circulating Water Caused by Fish Impingement

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)
											N/A	0 5 0 0 0
1 1	2 0	8 4	8 4	–	0 1 5	–	0 0	1 2	1 0	8 4		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	X 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)	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
S. R. Cowne, Operational Safety Analyst	AREA CODE 3 0 1 1 2 1 6 1 0 1 – 1 4 1 3 1 6

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)		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)

At 1716, on November 20, 1984, Unit 1 was manually tripped while operating in MODE 1 at 100% power. This trip was caused by an imminent loss of circulating water due to the clogging of eight of twelve Unit 1 traveling water screens with fish.

An unusual seasonal change in water temperature in the Chesapeake Bay, the ultimate heat sink, caused by seasonal weather conditions, resulted in fish impingement that clogged Traveling Water Screen Nos. 11A, 11B, 12A, 12B, 13A, 13B, 14A, and 14B. Circulating Water Pump Nos. 11, 12, 13, and 14 were stopped alternately, in accordance with established procedure, to prevent damage to their associated traveling water screens. The Unit was manually tripped, by procedure, when it was known that more than one circulating pump would be stopped at the same time.

An evaluation of alternative traveling water screens and methods for minimizing fish impingement are actively being pursued.

8412140465 841210
PDR ADOCK 05000317
S PDR

IE 22
1/1

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Calvert Cliffs Unit 1	0 5 0 0 0 3 1 7	8 4	— 0 1 5	— 0 0	0 2 OF 0 4

TEXT (If more space is required, use additional NRC Form 366A's) (17)

At 1711, on November 20, 1984, during normal MODE 1 operation at 100% power, an alarm indicated to the Unit 1 Control Room Operator that the differential pressures across Traveling Water Screen (KE-SCN) Nos. 11A, 11B, 12A, 12B, 13A, 13B, 14A, and 14B were greater than 10" water and rising rapidly. The Operator noted that all of the above-mentioned traveling water screens were rotating.

At 1712, the differential pressure across Traveling Water Screen Nos. 11A and 11B had reached 40" water and Circulating Water Pump (KE-P) No. 11 was stopped in accordance with Operating Instruction (OI)-38A in order to prevent damage to the associated screens due to excessive differential pressure. With continued evidence of rising differential pressure for all other traveling water screens, a power reduction for the Unit was commenced at this time.

At 1713, the differential pressure across Traveling Water Screen Nos. 14A and 14B reached 40" water. Circulating water Pump (CWP) No. 11 was started and CWP No. 14 was stopped in accordance with OI-38A. Differential pressure across Traveling Water Screen Nos. 13A and 13B reached 40" water at 1714. Circulating Water Pump No. 14 was started and CWP No. 13 was stopped in accordance with OI-38A. Traveling Water Screen Nos. 12A and 12B then reached 40" water. At this time, CWP No. 13 was started and CWP No. 12 was stopped in accordance with OI-38A at 1715.

By 1715, a technician arrived at the intake and noticed a large number of fish, some of them dead, in the intake. He saw that Traveling Water Screen No. 11A had a drive shear pin that sheared off and the motor for Traveling Water Screen No. 11B was heavily loaded. He then notified the Control Room of these facts. Circulating water Pump No. 12 was then started. No. 11 was stopped in accordance with OI-38A. When CWP No. 12 was started, the shear pin on No. 12B Traveling Water Screen sheared off and No. 12A Traveling Water Screen motor tripped on overload. Circulating Water Pump No. 12 was stopped.

At 1716, CWP No. 12 was started. A technician at the scene noticed that No. 13A Traveling Water Screen had sheared off and that No. 13B Traveling Water Screen motor tripped. Differential pressures across Traveling Water Screens 11A, 11B, 12A, 12B, 13A, 14A, and 14B had again reached 40" water. The Shift Supervisor declared an Unusual Event loss of circulating water to Main Condenser Shell (SG-COND) Nos. 11 and 12 and with reactor power at 99%, ordered Unit 1 tripped in accordance with OI-38A.

The actions in Emergency Operating Procedure Number 1 (EOP-1), were properly carried out following the trip. All safety systems functioned as expected. No personnel errors occurred during the event. All traveling water screens were checked and cleaned as necessary. The shear pins for Traveling Water Screen Nos. 11A, 12B, and 13A were replaced prior to restart of the Unit. In addition, a screen panel for No. 11A Traveling Water Screen was replaced due to denting incurred during fish impingement. Unit 2 traveling water screens were not affected.

The root cause of this event was fish impingement of the traveling water screens. An extremely large number of fish that were unable to avoid the traveling water screens impinged upon the screens and exceeded the fish removal capability of the screens. As a result, the differential pressure across four sets of traveling water screens rose rapidly, forcing Operator action to protect the condensers and turbine. The pins for the traveling water screens are designed to shear in order to protect the major components of the screens and had done so for Traveling Water Screen Nos. 11A, 12B, and 13A during this fish overload condition.

The massive influx of fish into the traveling water screens was an abnormal occurrence. An abrupt change from relatively mild to cold weather this fall discouraged schools of fish from migrating south before water temperatures cooled significantly. Spot was identified as the type of fish involved in this event. They are very susceptible to rapid water temperature changes. Consequently, the large population of spot became sluggish in the cold water and the fish were unable to avoid the traveling water screens. This phenomenon is called "cold shock" and, as mentioned above, many species are vulnerable to this effect in the Chesapeake Bay. However, this is the first time since beginning operation of the Plant that "cold shock" phenomenon has caused significant fish impingement of the traveling water screens.

There have been five similar events at Calvert Cliffs Nuclear Plant. Four of the previous events were caused by fish impingement as a result of low dissolved oxygen conditions in the months of August and September. One previous event was caused by sea nettle impingement in October of this year.

Since this event occurred during MODE 1 operation at 100% power, the heat load on both the Circulating Water (KE) and Saltwater (BI) Systems, whose suctions are protected by the traveling water screens, was at a maximum for non-accident conditions. Therefore, the safety consequences of this event would not have been more severe under reasonable and credible alternative circumstances.

During the first fish impingement in August 1975, it was noted that if the circulating water pumps were allowed to operate continuously with their associated traveling water screens clogged with fish, it is possible to lower the suction head of the Saltwater Pump (BI-P) enough to degrade pump operation. Since then, procedural changes have been implemented that require stopping a circulating water pump at excessive differential pressures to prevent damage to the traveling water screens. Operating experience since the 1975 event has substantiated the fact that timely stoppage of the circulating water pumps prevents any degrading effect on the Saltwater System. It is important to note that when circulating water pumps are secured, the traveling water screen differential pressures rapidly drop to 0", due to the reduction in flow from 215,000 to 15,500 gpm.

Attachment 1 is provided as a description of the Unit 1 Intake Structure (NN). Each saltwater pump takes a suction on either of two adjacent circulating water pump wells. There are three saltwater pumps, six circulating water pumps, and twelve traveling water screens for each Unit.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Calvert Cliffs Unit 1	0 5 0 0 0 3 1 7	8 4	— 0 1 5	— 0 0	0 4 OF 0 4

TEXT (If more space is required, use additional NRC Form 366A's) (17)

Only one saltwater pump is necessary to meet the system design function of providing cooling water for the Servicewater (BI) and Component Cooling Water (CC) Heat Exchangers, and the Emergency Core Cooling Systems Pump Room cooler (VF) during a Loss of Coolant Incident (LOCI). A massive fish impingement more severe than any previous event, of all the traveling water screens, and the failure of operators to stop the Circulating Water Pumps in accordance with procedure would be necessary for degradation of the Saltwater System's ability to mitigate the consequences of a LOCI. Therefore, the overall safety significance of this event is considered minimal.

Several long-term corrective actions are currently being evaluated to prevent recurrence of this event:

1. Upgrading the existing traveling water screens or replacing with dual-flow or center-flow types that would be activated continuously to improve the capability for fish removal.

2. Installing a sound system to act as a "behavioral barrier" to fish.

The contact for further discussion of this event is S. R.Cowne, telephone: (30)-260-4366.

BALTIMORE GAS AND ELECTRIC COMPANY

P.O. BOX 1475

BALTIMORE, MARYLAND 21203

NUCLEAR POWER DEPARTMENT
CALVERT CLIFFS NUCLEAR POWER PLANT
LUSBY, MARYLAND 20657

December 10, 1984

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Docket No. 50-317

License No. DPR 53

Dear Sirs:

The attached LER 84-15 is being sent to you as required by 10 CFR 50.73.

Should you have any questions regarding this report, we would be pleased to discuss them with you.

Very truly yours,

L B Russell

L. B. Russell
Plant Superintendent

LBR/SRC/pah

cc: Dr. Thomas E. Murley
Director, Office of Management Information
and Program Control
Messrs: A. E. Lundvall, Jr.
J. A. Tiernan

IE22
1/1