

NRC FORM 366 (4-95)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98						
LICENSEE EVENT REPORT (LER)											
(See reverse for required number of digits/characters for each block)											
FACILITY NAME (1) BYRON NUCLEAR POWER STATION, UNIT 1					DOCKET NUMBER (2) 05000454			PAGE (3) 1 OF 7			
TITLE (4) INOPERABLE UNIT 1 DIESEL GENERATOR DUE TO LOW LUBE OIL PRESSURE CONDITION											
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	
09	12	98	98	018	00	10	09	98		05000	
OPERATING MODE (9)		1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100		20.2201(b)		20.2203(a)(2)(v)		<input checked="" type="checkbox"/> 50.73(a)(2)(i)		50.73(a)(2)(viii)	
				20.2203(a)(1)		20.2203(a)(3)(i)		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 Dennis Nicol Jose Dubon					TELEPHONE NUMBER (Include Area Code) 815-234-5441, X3065 815-234-5441, X4504						
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).					<input checked="" type="checkbox"/> NO						

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

At 0901, on September 12, 1998, while performing the Diesel Generator monthly surveillance, the 1A Diesel Generator, a Cooper Bessimer KSV 20, tripped on low lube oil pressure. When Operations began to perform the monthly Unit 1 Emergency Diesel Generator (EDG) 1A surveillance, a low lube oil alarm initiated which subsequently lead to an engine trip. The surveillance was being conducted in accordance with ComEd procedure 1BOS 8.1.1.2.a-1, Revision 14. The 1A EDG experienced a Test Mode Trip on "Engine Lube Oil Pressure Low" concurrent with alarms for "Engine Lube oil Pressure Low" and "Turbo Lube Oil Pressure Low." The event was experienced during the local slow start and it occurred during the first minute of the monthly surveillance test run.

The multiple indications of low lube oil pressure (trip and alarms) indicated an actual low lube oil pressure condition existed. This, instead of a spurious signal or out of tolerance pressure sender condition, was verified via multiple pressure alarms for the engine and turbo bearings. The engine is designed to trip upon a low lube oil pressure condition when manually started or when the manual test mode switch is selected at the Main Control Board (MCB).

An immediate investigation was conducted by Maintenance and Systems Engineering personnel to determine the cause of the trip and the basis for the alarms. The investigation revealed that the cause of the trip was due to low lube oil pressure caused by clogged strainers. As part of the trouble shooting investigation, the two parallel lube oil strainers were inspected. Both parallel lube oil strainers were found clogged with a fibrous material consistent with that of the engine main lube oil filter element media. The material was subsequently confirmed through a laboratory analysis to be that of the filter element media. It was subsequently determined that the 1A EDG was historically inoperable from 9/3/98 until 9/14/98 which is a condition prohibited by the Byron Station Technical Specifications. This event is reportable per 10CFR50.73(a)(2)(i)(b).

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LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 7
		98	-- 018	-- 00	

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

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 1 Event Date: 09/12/98 Event Time: 0901

Unit 1 Mode 1 Rx Power 100% RCS [AB] Temperature/Pressure: NOT/NOP
 Unit 2 Mode 2 Rx Power 100% RCS [AB] Temperature/Pressure: NOT/NOP

B. DESCRIPTION OF EVENT:

On September 12, 1998, while Unit 1 was at 100% power, Surveillance Procedure 1BOS 8.1.1.2.a-1, 1A Diesel Generator Operability (staggered) and Semi-Annual (staggered) Surveillance, was being performed. The purpose of the procedure is to verify the Unit 1, 1A Emergency Diesel Generator (EDG) OPERABILITY. The EDG experienced a test mode trip on "Engine Lube Oil Pressure Low" concurrent with alarms for "Engine Lube Oil Pressure Low" and " Turbo Lube Oil Pressure Low." The event occurred at the initiation of a local slow start while performing the monthly surveillance run. The trip occurred during the first minute of the surveillance test run local start. The multiple indications of low lube oil pressure (trip concurrent with alarms) indicated that an actual low lube oil pressure condition existed and, therefore, was not considered to be a spurious signal or an out of tolerance pressure sensor/sender condition. Immediately following notification of the event to the Main Control Room (MCR), the Limiting Condition for Operation Action Requirement (LCOAR) for A.C. Sources (TS 3.8.1.1, Action a.) was entered as required by the Byron Station Technical Specifications (TS).

In an attempt to determine the cause of the event, an immediate investigation by Maintenance and System Engineering personnel was conducted. This investigation included a visual inspection for leaks and obvious incorrect alignments and component failures. The inspection revealed that there were no leaks or obvious component failures and that all piping components were in the correct configuration. The visual investigation was immediately followed by a trouble shooting investigation. The trouble shooting included an internal inspection of the parallel strainers and the filter housing. The trouble shooting revealed that both lube oil strainers were clogged with a fibrous material consistent with that of the engine main lube oil filter element media. The fibrous material was found to have thinly covered the entire internal surface of the strainer element.

The discovery of the fibrous material in the strainers lead to an internal inspection of the lube oil filter housing unit. This inspection revealed that none of the filter elements had undergone a catastrophic failure. However, a decision was made to replace the entire one hundred forty-six (146) filter elements in order to inspect them for signs of metal wear particles and anything unusual that would indicate a breakdown of the filter function. At the time of replacement, it was noted that one of the filter elements was missing its cartridge guide and many were slightly crushed.

Other inspection actions taken were as follows:

The lube oil strainer outlet 6" check valve was removed for inspection and found with no fibrous material present. The check valve was noted to be in good working condition.

The turbo lube oil filters were replaced. No fibrous material was noted on either of the two filter assemblies.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	98	-- 018	-- 00	3 OF 7

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

B. DESCRIPTION OF EVENT (cont.)

The diesel engine crankcase was completely drained and cleaned followed by a general inspection of the internals. No signs of fibrous material were found and no signs of internal damage were noted.

The drained engine oil was sent for laboratory analysis to inspect for wear metal products and fibrous material; no concerns were identified.

The engine lube oil was replaced with a fresh supply.

The circulating lube oil pump (pre-lube) relief valve was removed, inspected and replaced with a new valve. The removed valve was tested following the inspection and found to be functioning properly.

The lube oil temperature control valve, 1DG5003A, was inspected and found to have no visible degradation, blockage or fibrous material.

Following the satisfactory completion of the above inspections, the 1A EDG was tested, the pre-lube and post maintenance run oil pressures were verified normal. The EDG was then returned to ready for test condition status.

On September 14, 1998, the 1A EDG operability surveillance was successfully completed with no further events occurring. Immediately following the surveillance, both lube oil strainers were disassembled, inspected and were found to be clean. Oil samples from before and after the test run, were sent for laboratory analysis and results were reported to be within specification requirements. On September 14, 1998, at 18:12 hours, the 1A EDG was returned to service and the LCOAR for A.C. Sources (3.8.1.1) was exited.

C. CAUSE OF EVENT:

The cause of the event was investigated through the ComEd Corrective Action Program's (CAP) Root Cause Analysis (RCA) investigation process. The investigation determined that the cause of the EDG engine trip event was a result of low lube oil pressure caused by clogged lube oil strainers. The lube oil strainers were determined to be obstructed with fibrous material that originated from the lube oil filter media. This was confirmed from laboratory analysis of the material that caused the clogging effect.

Other factors that contributed to the event were determined to be an inadequate maintenance procedure and inadequate maintenance practice. The maintenance procedure did not provide specific instructions to install the filter elements and the filter housing cover. Per the manufacturer, the installation of the cover must be done carefully to ensure that the filter elements are not disturbed from their position during the lowering of the cover. Any sideways motion that occurs after the initial contact of the cover with the springs may result in one or several of the filter elements not being properly loaded by the springs and potential crushing or misalignment of the filter elements. The maintenance procedure did not contain this level of detail to warn and advise personnel on the proper method for re-assembly of the filter housing.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	98	-- 018	-- 00	4 OF 7

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

C. CAUSE OF EVENT (cont.)

The inadequate maintenance practice was determined to be a lack of attention to detail. One of the filter elements was found to have been installed without its cartridge guide and many of the filter elements were found to have been crushed slightly. It was determined that the crushing of the elements occurred when the springs that provide the force to keep the elements in place may have been tilted during cover installation. The crushing of the elements was discussed with the manufacturer who confirmed the theory of the tilted springs causing uneven compression forces that may affect the proper function of the filtering action and could result in crushed elements. Lack of attention to detail resulted in one of the filter elements being installed without its cartridge guide which could have contributed to significant bypass of unfiltered oil. Absence of the cartridge guide for an extended period of time would likely result in dislodging of the filter element during variable flow or pressure conditions resulting in this significant bypass of unfiltered oil.

D. SAFETY ANALYSIS:

The safety of the plant and the public were not affected or challenged before, during, or after this event. The event is classified as a condition prohibited by the Plant's Technical Specifications. Subsequent to the event, it was determined that the plant was operated outside the Technical Specification Limiting Condition for Operation (LCO) for a period of time longer than that permitted by the Action Statement. The condition was discovered after the allowable time had elapsed and the condition was rectified immediately. The previous successful operability surveillance was performed on August 19, 1998. The point in time from 8/19/98 when the operability status of the EDG became questionable could not be determined exactly. However, a review of the operating history of the 1A EDG indicates there was indication of a degraded condition on the engine on 9/3/98 when plant operators identified a lifting relief valve in the lube oil system upstream of the strainers. As part of the historical review for this event, it was determined that the cause of the lifting relief valve was due to the lube oil system blockage at the strainers. This would have effectively created a low lube oil pressure condition in the engine at start-up. The ability of the 1A EDG to perform its required function with a low lube oil pressure condition is uncertain and therefore, the operability of the EDG is questionable from the identification of the lifting relief valve on 9/3/98. Byron Station has conservatively determined to report this event as required by 10CFR50.73 as a condition prohibited by the plant's Technical Specifications.

Note that the EDG would have successfully started in the event of an emergency and no other EDG was in an inoperable condition at the start and during this event.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	98	-- 018	-- 00	5 OF 7

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

D. SAFETY ANALYSIS (cont.)

The safety-related function of the EDG is to provide an independent emergency source of power in the event of a complete loss of offsite power. The diesel generator supplies all of the electrical loads which are required for reactor safe shutdown either with or without a Loss of Coolant Accident (LOCA). The nuclear safety concern is the question regarding whether or not the EDG would have been able to start in an emergency as required by the Current Licensing Basis. The EDG is designed to automatically trip on a low lube oil pressure condition when manually started or when the manual test mode switch is selected at the Main Control Board (MCB) for surveillance testing. This is a function designed to protect the engine from internal damage for those engine runs that are not associated with an emergency start. Additionally, the EDG is designed to auto start if needed during a low lube oil condition at the time of the auto start ESF signal. The lube oil acts in the same manner as cooling water; a continuous circulation of lube oil is provided during standby periods with a lube oil circulating pump. The circulating pump is in continuous operation during standby conditions to maintain the internal parts lubricated and thereby facilitate rapid starts. During engine runs, the main engine-driven lube oil pump takes oil from the oil cooler and to a header which supplies lube oil to various parts of the engine. Therefore, the EDG would have been able to start if an actual emergency would have presented itself. Low lube oil pressure does not keep the engine from starting from a standby condition. However, the ability of the 1A EDG to continue to operate with low lube oil condition is questionable and provides the basis for the determination of historical operability.

The EDG performed well, without incident, during the Loss of Offsite Power (LOOP) event that occurred at Byron Station on August 4, 1998. In addition, the 1A EDG has performed well during 1998 for a total period of 50 hours and 11 minutes which includes the 12 hours during the LOOP event.

It is concluded that the EDG lube oil system strainers worked as designed. The strainers trapped the foreign material floating in the lube oil. The lube oil system performed its intended function correctly in that it filtered the oil, the instrumentation sensed the low pressure condition and the correct signals to trip the engine and protect it from unnecessary damage, due to the low lube oil pressure, were initiated.

A secondary evaluation was performed to evaluate the impact of the 1A EDG inoperability during the period of September 3, 1998 to September 14, 1998. This evaluation determined that additional Technical Specification requirements would have been applicable during the period of the 1A EDG inoperability besides the LCOAR for TS 3.8.1.1, Action a. An example is Action c.1 of TS LCOAR 3.8.1.1. This action requires that when one diesel generator is determined to be inoperable, it must be verified that "All required systems, subsystems, trains, components, and devices that depend on the remaining Operable diesel generator as a source of emergency power are also Operable,..." otherwise the LCOAR actions must be followed. This verification of other components was not performed from September 3, 1998 until the failed surveillance on September 12, 1998 since there was no indication at the time that the 1A EDG was inoperable. Once the appropriate LCOAR was entered on September 12, 1998 following the failed surveillance, all of the required action contained in TS 3.8.1.1 fc. AC Sources were followed. Note that the 1A EDG was not called upon to perform an emergency function from August 19, 1998 until the EDG was returned to service on September 14, 1998. In addition, the 1B EDG was verified to have been always operable during this period of time. In addition, the emergency bus cross-tie to the Byron Unit 2 sources of AC power were always available during this period. Therefore, the health and safety of the public were never affected by this event and it was determined that the overall safety impact for the plant due to this event was minimal.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	98	-- 018	-- 00	6 OF 7

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

D. SAFETY ANALYSIS (cont.)

A review of the LCOAR AC Sources - Operating Tech Spec LCO # 3.8.1.1 package was conducted to determine if all of the immediate actions taken successfully completed all of the surveillances required by the respective Tech Spec actions statements. This review concluded that all the respective surveillances as required by the Tech Specs were completed on time and all components were determined to be OPERABLE.

E. CORRECTIVE ACTIONS:

Immediate:

The immediate corrective actions included:

The immediate entry into LCOAR for A.C. Sources TS 3.8.1.1, action a.

The verification of operability for the redundant EDG including both Unit 2 EDGs.

A complete inspection of each of the 1A EDG lube oil system components.

An internal inspection of both parallel lube oil strainers.

A complete replacement of all the filter elements.

Long Term:

Revise the Mechanical Maintenance Procedure BMP 3208-2 to provide specific instructions and inspection requirements for the lube oil filter assembly. (NTS # 454-180-98-SCAQ00018-01)

Systems Engineering will develop a pre-define work instruction to inspect the strainers after every filter element replacement until such time that it is determined this inspection is no longer needed. This will be performed after the lube oil has been re-circulating. (NTS # 454-200-98-SCAQ00021-04)

Design Engineering will initiate a modification to provide appropriate indication of strainer pressure and/or Delta pressure to be permanently installed on all four Diesel Generator Engine lube oil systems. (NTS # 454-200-98-SCAQ00021-05)

Self Assessment #98-0037 on the 1A Diesel Generator Lube Oil System failure operability determination will be completed and corrective actions as appropriate will be assigned to communicate lessons learned from the Lube Oil System safety relief valve chattering event that was inadequately evaluated. (NTS #454-201-98-CAQ02840)

An engineering evaluation to determine on line use of both Lube Oil Strainers versus the use of only one strainer at a time will be conducted and appropriate procedures, drawings, configuration control will be revised accordingly. (NTS #454-201-98-CAQ02840-03)

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	98	-- 018	-- 00	7 OF 7

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

E. CORRECTIVE ACTIONS (cont.)

A follow up to the Root Cause Investigation will be an Effectiveness Review conducted to re-analyze this event following the next refueling outage to determine if the probable cause changes and or if the corrective actions were adequate. (NTS # 454-200-98-SCAQ00021-07)

Interim Actions:

A pressure gauge was installed down stream of the lube oil filter to monitor the lube oil strainer performance with the controls of the Temporary Alteration program. This gauge is inspected at least daily to monitor strainer condition until a permanent modification is installed.

F. RECURRING EVENTS SEARCH AND ANALYSIS:

A review of previous reportable events was conducted and concluded that there have not been any previous similar events reported on LERs relating to EDG trip due to a low lube oil system condition.

G. COMPONENT FAILURE DATA:

None, this event did not involve a component failure.