

# LICENSEE EVENT REPORT (LER)

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TITLE (4) **High Particulate Levels in the Emergency Diesel Generator 11 Fuel Oil**

EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)							
MON	DAY	YR	YR	SEQUENTIAL NUMBER			REVISION NUMBER		MON	DAY	YR	FACILITY NAMES					
<b>3</b>	<b>10</b>	<b>96</b>	<b>96</b>	<b>-</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>-</b>	<b>0</b>	<b>0</b>	<b>04</b>	<b>09</b>	<b>96</b>				
												DOCKET NUMBER (5) <b>0 5 0 0 0</b>					

OPERATING MODE (9) <b>1</b>	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11)	
POWER LEVEL (10) <b>0 9 6</b>	_____ 10 CFR <u>10CFR50.73(a)(2)(i)(B)</u> _____ OTHER - _____ (Specify in Abstract below and in text, NRC Form 366A)	

LICENSEE CONTACT FOR THIS LER (12)		TELEPHONE NUMBER
<b>Mari Jaworsky - Compliance Engineer</b>		AREA CODE <b>313</b> NUMBER <b>586-1427</b>

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
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO		

ABSTRACT (16)

On March 7, 1996 at 0515 hours Emergency Diesel Generator (EDG) 11 was declared inoperable for maintenance. On March 8, 1996 prior to returning EDG 11 to service, a fuel oil sample was taken as required by Technical Specifications. EDG 11 was declared operable at 2300 hours after completing appropriate testing.

At 0725 hours on March 9, 1996, results of a fuel oil sample analysis indicated a particulate contamination level of 28.6 mg/liter. A backup analysis of the same sample yielded 23.1 mg/liter. Both were above the Technical Specification limit of less than 10 mg/liter. Because it was suspected that either the sample was contaminated or that the analysis was anomalous, an analysis of a second sample was performed. At 1225 on March 9, 1996, the results from the second sample indicated a particulate contamination level of 21.8 mg/liter. Since the 72 hour LCO started at the beginning of the EDG 11 outage and it was unlikely that the Fuel Oil Storage Tank (FOST) could be drained and refilled with fresh fuel oil within the remaining time specified by the LCO, a decision was made to request a Notice of Enforcement Discretion (NOED) for an extension of the LCO time period by an additional 24 hours. At 0340 hours on March 10, 1996, the NRC verbally granted the NOED.

Although within limits, particulate levels in the fuel oil had been trending upward over the past 9 months. It is believed that the spike occurred due to draining the day tank into the bottom of the FOST the day before for maintenance. The draining is believed to have created enough turbulence in the immediate vicinity of the sampling point to have impacted the sample drawn the next day.

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Initial Plant Condition:

Operational Condition: 1 (Power Operation)  
 Reactor Power: 96 Percent  
 Reactor Pressure: 1024 psig  
 Reactor Temperature: 540 degrees Fahrenheit

Description of the Event:

On March 7, 1996 Emergency Diesel Generator (EDG) 11 [EK][DG] was declared inoperable to perform inspection and maintenance activities. On March 8, 1996 prior to returning EDG 11 to service, a monthly fuel oil sample was taken as required by Technical Specification 4.8.1.1.2.d. After the line-ups were verified and monthly Technical Specification surveillances associated with the EDG were performed, EDG 11 was declared operable at 2300 hours.

At 0725 hours on March 9, 1996, results of a fuel oil sample analysis indicated a particulate contamination level of 28.6 mg/liter. A backup analysis of the same sample indicated 23.1 mg/liter. The Technical Specification surveillance 4.8.1.1.2.d specifies a limit of less than 10 mg/liter for total particulate contamination. Previous sample results were less than 7 mg/liter; therefore, it was suspected that either the sample was contaminated or that the analysis was anomalous. Because of the magnitude of the particulate increase from the previous month, the Nuclear Shift Supervisor (NSS) questioned the validity of the test results and directed a second sample to be taken and analyzed. At 1225 on March 9, 1996, the results from the second sample indicated a particulate contamination level of 21.8 mg/liter.

Having confirmation of high particulate in the EDG 11 fuel oil, the NSS declared the EDG 11 inoperable with a 72 hour Limiting Condition for Operation (LCO) as prescribed by Technical Specification 3.8.1.1.b beginning at 0725 hours on March 9, 1996. This LCO start time is consistent with Fermi 2 procedures. A plan was developed to resolve the issue based on a 72 hour LCO starting at 0725, March 9, 1996. Two options were considered: (1) draining and refilling the Fuel Oil Storage Tank [DC][TK], or (2) mechanical filtration of the fuel. Draining and refilling the Fuel Oil Storage Tank could have been accomplished in the 72 hour time frame.

Additionally, Chemistry and Operations were evaluating the problem. Specifically, analysis sheets and trend graphs were reviewed to determine if this problem was limited to EDG 11.

On March 9, 1996 at the afternoon NSS shift turnover, the question was raised as to when the 72 hour LCO time period actually began. The cause of the discussion was that the fuel oil sample that had a high particulate was taken from the Fuel Oil Storage Tank prior to EDG 11 being declared operable. It was reasoned among those involved in the discussion that since the fuel oil sample was taken prior to EDG 11 being declared operable, EDG 11 was not really operable. Therefore, the NSS conservatively

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reset the start of the LCO to the beginning of the EDG 11 maintenance outage, i.e., at 0515 hours on March 7, 1996.

Since it was unlikely that the Fuel Oil Storage Tank could be drained and refilled with fresh fuel oil within the remaining time specified by the LCO, a decision was made to request a Notice of Enforcement Discretion for an extension of the LCO time period by an additional 24 hours. At 0340 hours, on Sunday, March 10, 1996, the NRC verbally granted the Notice of Enforcement Discretion. At 2102 hours on March 10, 1996, EDG 11 was declared operable following draining and filling the Fuel Oil Storage Tank and Day Tank with fresh fuel oil, verifying acceptable fuel oil sample results, and performing an EDG 11 start and load test.

Since the 72 hour restoration and 12 hour shutdown Technical Specification action time limits were exceeded, Fermi 2 was operated in a condition prohibited by the Technical Specifications. Even though Enforcement Discretion was approved for this operation, the condition is reportable under 10CFR50.73(a)(2)(i)(B).

Cause of the Event:

In June, 1994 EDG 11 Fuel Oil Storage Tank was emptied, cleaned, and filled with fresh fuel oil. The fuel oil used for the EDG's is a premium fuel oil which includes a full compliment of additives such as rust inhibitors and antioxidants.

EDG 11 Fuel Oil Storage Tank fuel oil particulate level was slowly trending upwards over the previous nine months; however, previous samples on this tank were below 7 mg/liter. At 7 mg/liter action would normally be initiated to reduce the particulate level in the tank. The most recent reading, prior to the March 8th sample, was 6.3 mg/liter taken on February 8, 1996.

The EDG 12, 13, and 14 Fuel Oil Storage Tanks were all less than 2 mg/liter particulate when last sampled and the levels did not appear to be trending upwards. Fuel Oil Storage Tanks for EDG 12, 13, and 14 were resampled on March 9, 1996 and were found to be less than 2 mg/liter particulate. Therefore, this situation appears to have been limited to the fuel oil in the Fuel Oil Storage Tank for EDG 11.

Experience has shown that increasing particulates in fuel oil trend upward slowly thus allowing time to plan for corrective action to be taken. According to the fuel oil supplier, storage of this type of fuel oil for two to four years is acceptable. Typically, fuel oil experiences oxidation generating particulate matter at a rate of 1 mg/liter per year. Therefore, Detroit Edison believes that the more pronounced upward trend was based on a delivery of 2500 gallons of a less stable fuel oil in May, 1995. This is substantiated by the sampling performed in June, 1995 following this delivery which showed evidence of an increase in suspended material based on the monthly fuel oil Technical Specification analysis. The monthly Technical Specification sample taken in July, 1995 showed an increase in the particulate level to 3.56 mg/liter. Fuel oil from tanks for both EDG 11 and 12 showed an increased level in varnish

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absorbance during a test conducted by Detroit Edison laboratories. EDG 12 had received 300 gallons of fuel from the May, 1995 delivery.

The reason for generation of the particulate material in EDG 11 Fuel Oil Storage Tank could be due to one of several mechanisms occurring, e.g., dirt contamination, catalytic metals present, biological growth, or slow fuel oil oxidation. Initial results from Detroit Edison laboratories eliminated the possibility of either dirt or catalytic metals being the cause for particulate generation in the fuel oil. It was postulated that if there were water accumulation in the bottom of the Fuel Oil Storage Tank, this could lead to biological growth at the fuel oil/water interface. Analysis of the particulate material indicated no evidence of biological material. Also, during the Fuel Oil Storage Tank cleaning and inspection in 1994 no evidence of water accumulation was found in any Fuel Oil Storage Tank. Additionally, an analysis of the fuel oil taken on March 8, 1996 indicated a moisture concentration of less than 25 ppm, the minimum detectable quantity. Analysis of the particulate material at the Detroit Edison laboratories indicated that the particulate material was due to oil degradation products, which is indicative of fuel oil oxidation.

Analysis using the Forty Hour Stress Test was performed by the fuel oil supplier. This analysis indicated that no accelerated oxidation of the fuel oil was occurring.

Based on further evaluation of this event, it is now believed that the fuel oil particulate spike occurred due to draining the day tank [DC][TK] the day before the sample was drawn. An O-ring on the EDG duplex filter [DC][FLT] had failed and in order to repair it, the day tank was drained back to the Fuel Oil Storage Tank via the bottom drain line. The draining is believed to have created enough turbulence in the immediate vicinity of the sampling point to have influenced the sample drawn the next day. This is substantiated by the marked decrease in particulate levels to 5.9 mg/liter indicated by the fuel oil sample taken on March 9, 1996 at 2010 hours following an eleven hour recirculation of the fuel oil in the Fuel Oil Storage Tank.

### Analysis of the Event:

The safety basis for the request for enforcement discretion was that the extension of the allotted out of service time was short, corrective actions were already underway, and a 7 day out of service time for a division of EDG's has been evaluated to result in only small increase in plant risk. The additional allowed outage time requested was one day. For these reasons, a reactor shutdown would be an unnecessary plant transient and would be less desirable from a safety perspective than the requested one time extension of the allowed out of service time for one EDG.

Detroit Edison has previously evaluated an increase in allowed out of service time for one division of EDGs from 72 hours to 7 days for a request for a change to the Technical Specifications. In that submittal (NRC 95-0124 dated November 22, 1995) the results of a risk assessment for adding a 7 day outage to each EDG in each operating cycle were reported. The increase in core damage frequency was less than 2%. The increased one day out of service time increment for a single EDG as requested

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in the enforcement discretion would be a substantially lower risk than that calculated for 7 day outages each cycle for each of the four EDG's.

Additionally, during the period EDG 11 was out of service, all of the Technical Specification required offsite AC Power sources were available and one division of EDG's was operable, which is sufficient to supply loads needed for safe shutdown. Additionally, Combustion Turbine Generator (CTG) 11-1 [EK][TG], which can supply power to Division 1 ESF buses [EK][BU] if a station blackout were to occur, was also operable. These power sources assure the plant could still safely shutdown if an accident were to occur.

The increase in EDG unavailability resulting from the enforcement discretion was less than 16 hours greater than the original 72 hours allowed by Technical Specifications, which was exceeded at 0515 hours on March 10, 1996. The 12 hour shutdown time limit would have expired at 1715 on March 10, 1996 if the Notice of Enforcement Discretion had not been approved. Thus, the effect of the extension was even less than originally predicted.

Also, it is believed that there was no adverse effect on the future performance or operability of EDG 11 as a result of operating for a few hours on March 8, 1996 with fuel oil that exceeded the particulate specifications. Furthermore, based on engineering judgement, it is believed that EDG 11 could have performed its design function during the period of time that EDG 11 had been declared operable on March 9, 1996 and prior to the discovery that the particulate level in the Fuel Oil Storage Tank was elevated. These conclusions are supported by the following:

- Prior to the run on March 8, 1996, new fuel oil filters had been installed and the differential pressure for these filters was observed to be zero during the run.
- After the run, a visual inspection of the filter in service determined that it was in good condition with no visible foreign material on the filter.
- Observation of EDG operating parameters during the test runs on March 10, 1996 determined that indications were normal.
- Based on discussions with the manufacturer, the Technical Specification limit of 10 mg/liter is conservative and, in fact, the EDG could run as designed at higher levels, particularly because the fuel oil flows through a strainer prior to being injected into the EDG.

### Corrective Actions:

The immediate corrective actions consisted of changing out the fuel oil in the Fuel Oil Storage Tank for EDG 11. Changeout of the fuel oil with fresh fuel oil has eliminated the problem of high particulate fuel oil.

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The fuel oil in each of the storage tanks and the day tanks for EDG 12, 13, and 14 was sampled to determine that the particulate levels in those tanks were within administrative and Technical Specification limits. The results of these samples indicated particulate levels less than 2 mg/liter. Further analysis by the fuel oil supplier using the Forty Hour Stress Test was performed on fuel oil from EDG 12, 13, and 14. The results indicated that there has been no accelerated oxidation of the fuel oil.

The slope of the Fuel Oil Storage Tank for EDG 11 has been checked and the tank was found to be level. The slope of each of the three remaining tanks has also been checked and all tanks were found to be level. Therefore, the possibility of water at the bottom of these tanks that cannot be drained is minimal.

A review of the EDG fuel oil system was performed to determine whether there exist brass or copper components in the system. These elements act as catalysts to breakdown fuel oil. No significant components made of these materials were found. In addition, laboratory analysis by Detroit Edison showed copper to be less than 2 ppb and zinc at 3.2 ppb in the fuel oil samples. These levels are below those levels that could lead to oxidation.

Detroit Edison also verified that fuel from the same refinery batch was not added to the Fuel Oil Storage Tanks in the other division when the next delivery occurred the first week of June, 1995.

Long term corrective actions include:

- A particulate analysis upon receipt of fuel oil for the EDG's. This will be performed in addition to currently performed tests. Procedures will be changed by May 1, 1996. In the interim, night orders are in place for this action.
- Changing the Fuel Oil Storage Tank water drain point from the pump suction line to the three inch drain line at the bottom of the tank. This action will be completed prior to the next surveillance.

The above actions will help to keep particulate level at a minimum and to prevent future spikes.

Additional Information:

A. Failed Components

None.

B. Previous LERs on Similar Problems

None.