

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION (MMM-YYYY) LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	APPROVED BY OMB NO. 3150-0104 EXPIRES MM/DD/YYYY Estimated burden per response to comply with this mandatory information collection request 50 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. If a document used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, information collection.
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TITLE (4): Diesel Fuel Oil Particulates - ASTM Test Methods Yield Varying Results

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	11	1998	1998	-- 004	-- 01	09	01	1998	None	
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE	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)	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)		<input checked="" type="checkbox"/> OTHER Voluntary				
		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 R.W. Krieger, Vice President, Nuclear Generation						TELEPHONE NUMBER (Include Area Code) 949-368-6255				

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	YFAR
Yes (If yes, complete EXPECTED SUBMISSION DATE)				<input checked="" type="checkbox"/> X	No				

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

On 02/05/98, SCE sampled the Diesel Generator (DG) Fuel Oil System Storage Tank 2T036 for DG 2G003. On 02/11/98, (discovery date) the DG fuel oil analysis results were received, indicating a total particulate concentration of 31.9 mg/l, which is above the TS 3.8.3.D and 5.5.2.13.b limit of 10.0 mg/l for total particulates. Following receipt of the February results, SCE had the fuel oil filtered and confirmed by reanalysis on February 16, 1998, that the fuel particulate level was reduced to below the 10 mg/l TS limit. As discussed in the additional information section below, the fuel oil particulate concentration test results using the ASTM acceptable Millipore filters indicated a total particulate level of less than 10 mg/l. Consequently, SCE concludes that no reportable event had occurred. This revised LER is being submitted to change this report to voluntary, and to provide the results of our final evaluation to the NRC.

SCE's evaluation of the testing methodology, techniques, and test equipment has revealed that verbatim compliance with the testing methods described in ASTM D2276-83, can result in test results that vary significantly.

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Plant: San Onofre Nuclear Generating Station (SONGS) Unit 2
 Reactor Vendor: Combustion Engineering
 Event Date: February 11, 1998
 Event Time: Approximately 2:28 p.m.
 Mode: Mode 5 - "Cold Shutdown"
 Power: 0

Description of Event:

As required by the Technical Specifications, SCE obtained the fourth quarter 1997 sample for Diesel Generator (DG) Fuel Oil System [DC] Storage Tank [TNK] 2T036 for DG 2G003, and sent it to an off-site laboratory for analysis. The particulate concentration was reported by the off-site lab on November 20, 1997 to be 8.6 mg/l.

When the particulate value is greater than 7 mg/l but less than 10 mg/l, Procedure SO123-II-6.6 requires the engineer to notify Station Technical and initiate an Action Request (AR). Instead, after discussion with the offsite lab, the SCE chemistry engineer obtained, within a day or two, two (2) new samples from tank 2T036, and reanalyzed both samples separately at SCE's on-site laboratory. The results were recorded as 0.0 mg/l (rounded up from negative 2.3 mg/l and negative 4.4 mg/l), the off-site analysis results were discounted.

On January 14, 1998, an NRC inspector questioned SCE personnel about a DG filter differential pressure (DP) alarm. In response to this question, the system engineer (Station Technical) reviewed the filter DP history on DC 2G003 and discussed the DP trend with Chemistry. Due to the DP alarm, the SCE Chemistry engineer questioned the accuracy of the previous on-site test results. On February 5, 1998, SCE sampled Fuel Oil Storage Tank 2T036 for the first quarter 1998 surveillance. This single sample was split to compare off-site laboratory test results with on-site laboratory test results. On February 11, 1998, (discovery date) the DG fuel oil analysis results were received from the off-site laboratory and the results indicating a total particulate concentration of 31.9 mg/l.

Technical Specification (TS) 3.8.3 "Diesel Fuel Oil, Lube Oil, and Starting Air," Action D, for "One or more DGs with stored fuel oil total particulates not within limits," requires SCE to "restore fuel oil total particulates to within limits," within 7 days. Prior to completing our investigation, SCE thought the fuel in Fuel Oil Tank 2T036 exceeded 10 mg/l for longer than 7 days, and SCE reported this condition in accordance with 10CFR50.73(a)(2)(i)(B) in Revision 0 to this LER. As discussed in the additional information section below, the fuel oil particulate concentration test results using the ASTM acceptable Millipore filters indicated a total particulate level of less than 10 mg/l. Consequently, SCE concludes that no reportable event had occurred. This revised LER is being submitted to change this report to voluntary, and to provide the results of our final evaluation to the NRC.

As noted in the additional information section below, our evaluation has identified unexpected variations in fuel testing results between different ASTM acceptable test methods. Consequently, SCE has included this information (see additional information section below) due to generic considerations.

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Cause of the Event:

Since the Technical Specifications were not violated, no reportable event occurred. However, it is of interest that significantly different test results were caused by unexpected variations obtained from different, but ASTM acceptable, test methods (ASTM allowable filter pore size and filter rinsing techniques).

Corrective Actions:

SCE has implemented the following actions:

1. Following receipt of the February results, SCE had the fuel oil filtered and confirmed by reanalysis on February 16, 1998, that the fuel particulate level was below the 10 mg/l TS limit.
2. To ensure the accuracy and repeatability of the test results, all fuel oil particulate testing will be performed using a standard set of equipment and test method, which should limit the variance allowed in the ASTM standard. (See additional information below.)
3. SCE confirmed all other DG fuel oil tanks were within TS limits by sampling and analysis.
4. The chemical testing frequency of the fuel oil has been increased to monthly basis to improve particulate trending.

Safety Significance:

An evaluation concluded the reported fuel oil particulates in tank 2T036 (either 31.9 mg/l or 16 mg/l) would not affect the DG's ability to start and perform its intended safety function. Additionally, the DG is equipped with duplex filters which can be changed during diesel operation, that would remove the particulate contamination, without effecting the diesel's ability to perform its intended safety function. Also, a fuel oil sample from 2T036 was sent to the supplier who confirmed the fuel tested satisfactorily for combustion properties. The results of the fuel oil analysis on the other three storage tanks, received from the off-site laboratory, were as follows:

Tank	T035	T036
Unit 2	8.7 mg/l	(discussed above)
Unit 3	2.0 mg/l	1.7 mg/l

Consequently, the other DGs for Units 2 and 3 remained unaffected by the condition reported herein. Therefore, there was no safety significance to this occurrence to either Unit 2 or Unit 3.

Additional Information:

As reported in the original LER, there were two personnel errors [cognitive personnel error] associated with this occurrence. The chemistry engineer (utility, non-licensed) responsible for the fuel oil testing did not notify Station Technical and did not write an Action Request (AR). This does not meet management's expectations for procedural compliance. The supervisor (utility, non-licensed) also did not provide adequate oversight when he reviewed and approved the November 1997 test results.

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SCE also noted that the procedural requirements could have been clearer and has revised this procedure step to provide additional clarity. SCE will also ensure that Chemistry management's expectations are clearly reflected in applicable chemistry procedures.

In the past three years, SCE has not reported any similar instances where Chemistry personnel failed to follow procedures as written.

Diesel Fuel Oil Test Methodology:

During the investigation of this condition, differences in laboratory testing methodology and equipment were noted between SCE's in-house laboratory and the outside laboratory. SCE evaluated the implications of these differences.

Though the corrective actions reported in Revision 0 to this LER remain unchanged, SCE's evaluation of the testing methodology, techniques, and test equipment has revealed the following noteworthy conclusions:

Methodology:

Verbatim compliance with the testing methods described in ASTM D2276-83, can result in test results that vary significantly. Final filter rinsing beyond the minimum recommendations of the ASTM Standard provides statistically significant improvements in test results repeatability. The additional washing around the periphery of the filters removes the remaining fuel oil. Residual fuel oil on the bottom filter (from inadequate filter rinsing) could cause the comparison of filter weights to result in a negative particulate concentration. Consequently, when the particulates are measured after additional filter rinsing, a more accurate result is obtained.

Equipment:

Even though filters from different manufacturers may have the same stated filter pore size, and each may be named as a replacement for the other, they can have significantly different absolute filtering characteristics. During this event, the 0.8 micrometer filters used at the off-site laboratory were Gelman Scientific Part # 64679 GN-4 Metracell membrane filters. The 0.8 micrometer filters used at the in-house laboratory were Millipore Catalog # AAWP 047 OM, Filter AA. The Gelman and Millipore filters are referenced as substitutes for each other. Inspecting the filters with an electron microscope at 250x magnification graphically demonstrated that the Gelman filters were a little less porous (tighter) than the Millipore filters.

Also, both Millipore and Gelman filters were checked for pore size by means of a bubble point test. Millipore filters of different batch numbers were tested to have pore sizes of 0.8 micrometers, where the Gelman filters were tested to have pore sizes of 0.5 micrometers. Thus, the Gelman filter with an advertised pore size of 0.8 micrometers will remove more particulate matter and is a tighter filter than the Millipore filter of the same advertised pore size. For example, the February 5, 1998 sample from Fuel Oil Tank 2T036 was split into two unequal volumes and analyzed by the off-site laboratory using the Gelman filters. One test reported 31.9 mg/l, while the other test reported 16 mg/l. On-site analysis of the same sample was recorded as 0.0 mg/l using the Millipore filters. (Negative numbers were rounded to zero.) Therefore, the same

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sample with different but approved ASTM methods and equipment provided significantly different results. SCE believes that the results provided using the Millipore filters provide a more accurate measurement of the particulate concentration in the DG fuel oil, and concludes that the TS limit of 10 mg/l was not exceeded.

To directly compare test results, the laboratory techniques and all equipment used must be identical.