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 FACIL: 50-331 Duane Arnold Energy Center, Iowa Electric Light & Pow: 05000331
 AUTH: NAME: AUTH: AFFILIATION
 ROOT: L. D. Iowa Electric Light & Power Co.
 RECIP: NAME: RECIPIENT AFFILIATION
 IPPOLITO, T. A. Operating Reactors Branch 2

SUBJECT: Forwards completed diesel generator history questionnaire per NRC 810720 request for info re Unsolved Safety Issue A-44, station blackout.

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Iowa Electric Light and Power Company

November 20, 1981

LDR-81-326



LARRY D. ROOT
ASSISTANT VICE PRESIDENT
NUCLEAR GENERATION

Mr. Thomas A. Ippolito, Chief
Operating Reactors Branch #2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Duane Arnold Energy Center

Subject: Information Request Regarding
Station Blackout, Unresolved
Safety Issue A-44

File: A-107c, NRC-1

Dear Mr. Ippolito:

Attached please find the completed diesel generator history questionnaire that was requested by your letter dated July 20, 1981 (Information Request Regarding Station Blackout, Unresolved Safety Issue A-44).

Very truly yours,

for *R. W. McDoughly*
Larry D. Root
Assistant Vice President
Nuclear Generation

LDR/JV/p1

- Attachments:
- 1) Table 1, Diesel Generator Operations Data
 - 2) Table 2, Diesel Generator Scheduled Down Time Record
 - 3) Table 3, Diesel Generator Unscheduled Down Time Record
 - 4) Table 4, Onsite Emergency Diesel Generator and Auxiliary Equipment Modification Record

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cc: J. Van Sichel
D. Arnold
L. Liu
S. Tuthill
NRC Resident Office

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PDR ADOCK 05000331
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TABLE 1

Diesel Generator Operations Data
 Calendar Year 1976

Reason for DG Operation, & scheduled Duration of Run	DG No.	Number of Starts	Number of Failures	Percent Loading of DG (KW)	Duration of Run Before Stop For Each DG Failure	Identification of Failure (Refer to attached LERs or Table 3)
Tech. Spec Req'd Test						
Operability Demonstration (30 minutes) (1 start/test)	1G-31	10	0	88	-	
	1G-21	13	0	88	-	
	1G-31	22	0	35	-	
	1G-21	17	1	35	31 minutes	LER #21
Monthly Surveillance (1 hour) (2 starts/test)	1G-31	28	1	100	30 minutes	LER #26
	1G-21	30	2	100	30 min., 21 min.	LER #28 and 27
Simulated Automatic Start (start and load only) (1 start/test)	1G-31	1	0	88	-	
	1G-21	1	0	88	-	
DG Actual Demand Starts not for Testing	1G-31	3	0	0	-	Multiple Starts
	1G-21	3	0	0	-	Multiple Starts
Miscellaneous Tests (Specify Type)						
Verify Repairs (1 hour)	1G-21	1	0	18	-	
	1G-21	2	0	35	-	

TABLE 1

Diesel Generator Operations Data
 Calendar Year 1979

Reason for DG Operation, & scheduled Duration of Run	DG No.	Number of Starts	Number of Failures	Percent Loading of DG (KW)	Duration of Run Before Stop For Each DG Failure	Identification of Failure (Refer to attached LERs or Table J)
Tech. Spec Req'd Test						
Operability Demonstration (1 hour) (1 start/test)	1G-31	13	1	100	65 minutes	LER #12
	1G-21	16	1	100	1 minute	TBI 3, #34
Operability Demonstration (30 minutes) (1 start/test)	1G-31	0	0	100	-	
	1G-21	5	0	100	-	
Monthly Surveillance (1 hour) (2 starts/test)	1G-31	28	1	100	5 minutes	TBI 3, #33
	1G-21	32	0	100	-	
Simulated Automatic Start (start and load only) (1 start/test)	1G-31	1	0	88	-	
	1G-21	1	0	88	-	
DG Actual Demand Starts not for Testing						
	1G-31	1	0	0	-	
Miscellaneous Tests (Specify Type)						
24 Hour Continuous Load Test	1G-31	1	0	100	-	
	1G-21	2	1	100	20 hours	LER #9

TABLE 1

Diesel Generator Operations Data
 Calendar Year 1980

Reason for DG Operation, & scheduled Duration of Run	DG No.	Number of Starts	Number of Failures	Percent Loading of DG (KW)	Duration of Run Before Stop For Each DG Failure	Identification of Failure (Refer to attached LERs or Table 3)
Tech. Spec Req'd Test						
Operability Demonstration (1 hour) (1 start/test)	1G-31	3	0	100	-	
	1G-21	10	1	100	1 minute	LER #4
Monthly Surveillance (1 hour) (2 starts/test)	1G-31	23	0	100	-	
	1G-21	22	2	100	1 min , 0 min	LER #3 and 2
Simulated Automatic Start (start and load only) (1 start/test)	1G-31	1	0	88	-	
	1G-21	1	0	88	-	
DG Actual Demand Starts not for Testing						
	1G-31	2	0	20	-	TB 3, #38, 1 Multiple Start
	1G-21	2	0	20	-	TBL 3, #29 and 38, 1 Multiple Start
Miscellaneous Tests (Specify Type)						
Exhaust Expansion Joint Test (1 start/test) (20 minutes)	1G-31	1	0	100	-	
Verify Repairs (1 start/test) (1 hour)	1G-31	2	0	100	-	
	1G-21	2	0	100	-	
Verify Repairs (start only)	1G-21	1	0	0	-	

TABLE 2

Diesel Generator Scheduled Downtime Record
 Calendar Year 1976

Enclosure 1 - Page 2
 Plant Name Duane Arnold
 Unit No. 1

Reason for Downtime	Hours of Downtime										Comments	
	Reactor shutdown					Reactor not shutdown						
	DG# 1G-31	DG# 1G-21	DG#	DG#	DG#	DG# 1G-31	DG# 1G-21	DG#	DG#	DG#		
Scheduled Maintenance												
Preventive Maintenance	9	0				258	178					
Equipment Modification	0	0				59	57					Filters installed in diesel air start system, diesels down at different times.
Time DG is unavailable for emergency service because of required tests	0	0				0	0					D/G is unavailable for emergency service for a very short period after each test start while starting air is being admitted to engine for 10 seconds.

TABLE 2

Diesel Generator Scheduled Downtime Record
Calendar Year 1977

Enclosure 1 - Page 2
Plant Name Duane Arnold
Unit No. 1

Reason for Downtime	Hours of Downtime										Comments	
	Reactor shutdown					Reactor not shutdown						
	DG# 1G-31	DG# 1G-21	DG#	DG#	DG#	DG# 1G-31	DG# 1G-21	DG#	DG#	DG#		
Scheduled Maintenance												
Preventive Maintenance	300	401				22	0					
Equipment Modification	0	0				0	0					Work to install D/G fuel header piping modifications was done concurrent with annual maintenance during reactor shutdown.
Time DG is unavailable for emergency service because of required tests	0	0				0	0					D/G is unavailable for emergency service for a very short period after each test start while starting air is being admitted to engine for 10 seconds.

TABLE 2

Diesel Generator Scheduled Downtime Record
 Calendar Year 1978

Enclosure 1 - Page 2
 Plant Name Duane Arnold
 Unit No. 1

Reason for Downtime	Hours of Downtime										Comments	
	Reactor shutdown					Reactor not shutdown						
	DGF 1G-31	DGF 1G-21	DGF	DGF	DGF	DGF 1G-31	DGF 1G-21	DGF	DGF	DGF		
Scheduled Maintenance												
Preventive Maintenance	168	320				0	10					
Equipment Modification	0	0				0	0					
Time DG is unavailable for emergency service because of required tests	0	0				0	0					D/G is unavailable for emergency service for a very short period after each test start while starting air is being admitted to engine for 10 seconds.

TABLE 2

Diesel Generator Scheduled Downtime Record
Calendar Year 1979

Enclosure 1 - Page 2
Plant Name Duane Arnold
Unit No. I

Reason for Downtime	Hours of Downtime										Comments
	Reactor shutdown					Reactor not shutdown					
	DG# 1G-31	DG# 1G-21	DG#	DG#	DG#	DG# 1G-31	DG# 1G-21	DG#	DG#	DG#	
Scheduled Maintenance											
Preventive Maintenance	125	167				59	90				
Equipment Modification	0	0				0	0				
Time DG is unavailable for emergency service because of required tests	0	0				0	0				D/G is unavailable for emergency service for a very short period after each test start while starting air is being admitted to engine for 10 seconds.

TABLE 2

Diesel Generator Scheduled Downtime Record
Calendar Year 1980

Enclosure 1 - Page 2
Plant Name Duane Arnold
Unit No. 1

Reason for Downtime	Hours of Downtime										Comments	
	Reactor shutdown					Reactor not shutdown						
	DGF 1G-31	DGF 1G-21	DGF	DGF	DGF	DGF 1G-31	DGF 1G-21	DGF	DGF	DGF		
Scheduled Maintenance												
Preventive Maintenance	8	58				0	0					
Equipment Modification	0	0				0	0					
Time DG is unavailable for emergency service because of required tests	0	0				0	0					D/G is unavailable for emergency service for a very short period after each test start while starting air is being admitted to engine for 10 seconds.

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1976

Enclosure 1 - Page 3
Plant Name Duane Arnold
Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivery, etc.	Repair/replace	
21	18.2	6.2	0	12	
23	0	0	0	0	Update of LER #25
24	0	0	0	0	Not a failure to operate, late surveillance
25	46.3	0	0	46.3	Not a failure to operate, broken coupling hub
26	4	.5	0	3.5	
27	233				Because the plant was in cold shutdown and operability of the D/G was not required, maintenance on the D/G was given low priority.
28	.75	0	0	.75	

TABLE 3

**Diesel Generator Unscheduled Downtime Record
Calendar Year 1977**

Enclosure 1 - Page 3
Plant Name Duane Arnold
Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivery, etc	Repair/replace	
16	0	0	0	0	Update of LER #22
17	0	0	0	0	Not a failure to operate, diesel fuel tank level below Tech. Spec. limit.
18	0	0	0	0	Not a failure to operate, late surveillance.
19	4.3	2.2	0	2.1	Diesel would only load to 2500 KW (88% rated)
20	3.2	2.75	0	.45	Attempt was made to restart D/G before problem was corrected, therefore this event would have been only one failure to start under emergency conditions.
22	466	0	311	155	Vendor experience is that the wiped bearings that were discovered would not have prevented the D/G from operating and carrying the rated load.

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1978

Enclosure 1 - Page 3
Plant Name Duane Arnold
Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivery, etc.	Repair/replace	
13	0	0	0	0	Not a failure to operate, diesel not tested when required.
14	0	0	0	0	Update of LER #15
15	360	0	240	120	Vendor experience is that the wiped bearings that were discovered would not have prevented the D/G from operating and carrying the rated load.
No LER 30	.7	.3	0	.4	While reactor in cold shutdown and defueled, emergency air start solenoid failed to open sufficiently to start D/G 1G-31 during surveillance testing.
31	195	0	0	195	D/G 1G-21 was started for surveillance testing but was declared inoperable before it was loaded due to discovery of oil leak at exhaust manifold. Because the plant was in cold shutdown and defueled, and operability of the D/G was not required, repair of the D/G was given low priority.
32	0	0	0	0	Testing procedure did not sufficiently specify proper control switch alignment which caused D/G to fail to start. This would not have been a failure to start under emergency conditions.
35	0	0	0	0	Not a failure to operate, D/G stopped due to smoking oil on exhaust lagging.
36	0	0	0	0	Not a failure to operate, D/G stopped because of suspected abnormal conditions caused by misreading of temperature gauges.
37	0	0	0	0	Not a failure to operate, D/G stopped because of suspected abnormal conditions caused by misreading of temperature gauges.

TABLE 3

**Diesel Generator Unscheduled Downtime Record
Calendar Year 1979**

Enclosure 1 - Page 3
Plant Name Duane Arnold
Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivery, etc.	Repair/replace	
9	4	0	4	0	Not a failure to operate, during testing, fuel tank level dropped below Tech. Spec. limit.
10	0	0	0	0	Not a failure to operate, out-of-spec delay constant on LPCI trip system delay timer.
11	16.7	0	14.3	2.4	Not a failure to operate, low D/G oil sump level.
12	46.5	0	0	46.5	
No LER 33	4.8	2	0	2.8	Not a failure to operate, indication problem only.
34	3.3	1.8	0	1.5	Not a failure to operate, control room capability to vary voltage was impaired. This capability is not necessary for emergency operation.

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1980

Enclosure 1 - Page 3
Plant Name Duane Arnold
Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivery, etc.	Repair/replace	
1	0	0	0	0	Not a failure to operate, missed surveillance.
2	11.7	0	0	11.7	Not a failure to operate, although the emergency air start failed, normal air start would have started the D/G.
3	48.8	4.5	0	44.3	
4	2.5	2.5	0	0	
5	0	0	0	0	Not a failure to operate, D/G day tank room fire protection system inoperable greater than 14 days.
6	5.9	0	0	5.9	Not a failure to operate, D/G governor oil level found low.
7	181	0	120	61	Vendor experience is that the wiped bearings that were discovered would not have prevented the D/G from operating and carrying the rated load.
8	181	0	120	61	Vendor experience is that the wiped bearings that were discovered would not have prevented the D/G from operating and carrying the rated load.
No LER 29	0	0	0	0	LER #80-14, automatic D/G start during plant shutdown to supply power to an essential bus.
38	0	0	0	0	During cold shutdown, automatic D/G starts to supply power to essential buses that were tripped due to undervoltage.

TABLE 4

Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification Record

Enclosure 1 - Page 4

Plant Name Duane ArnoldUnit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
D/G Fuel Oil Piping	8/74	To facilitate sampling the diesel fuel as required monthly by tech specs without dismantling equipment	Sample connection added to fuel oil piping
D/G Starting Air Compressor System	1/75	To increase reliability of starting air compressor phase of the D/G by reducing vibration levels, thus eliminating component damage	Relocated D/G air compressors to mount them on the floor rather than metal grating to reduce vibration levels. Flexible hoses on exhaust lines relocated to decrease fatigue cracking.
Diesel Air Start System	2/76	To increase starting reliability of D/G by eliminating/reducing solid contaminants in the air that impaired the operation of the air start solenoid valves.	A filter was installed in each of the four air lines upstream of the air solenoid valves on both D/G. Additionally, the necessary isolation valves required to maintain the systems seismic Class I were installed.
D/G Room Floor Drains	2/76	Modification provides D/G room drainage during site flooding conditions and ensures that yard drainage piping will not back up into the D/G rooms during a flood.	Installed a normally closed, manual isolation valve and alternate flow path for D/G room floor drains to the turbine building normal waste sump.
D/G Fuel Header Piping	4/77	In response to small fire caused by hairline fracture on fuel line fitting (see LER abstract no. 21), design change performed to strengthen and stabilize overall integrity of fuel header piping on both diesels.	The injector pump connector tube material was changed and wall thickness increased. Additionally, a tubing hanger was added to support the cantilevered cross-over pipe and reduce the vibration on this item.
Diesel Generator Exhaust	11/77	To satisfy an FSAR commitment	Two exhaust extensions for the D/G were fabricated and placed in storage for use during potential maximum flood conditions.

TABLE 4

Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification Record

Enclosure 1 - Page 4

Plant Name Duane ArnoldUnit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
Diesel Day Tank Room Ventilation	2/80	Ventilation provided to prevent the accumulation of oil vapors in day tank rooms.	An air duct and ventilation fan were installed in each of ventilation trains A & B for the day tank rooms.
D/G Curbs	2/80	Curbs provided to prevent the spread of an oil fire.	Curbs provided at the entrance of D/G rooms.
D/G Lube Oil Sump	3/80	In response to wiped bearing problems (see LER abstract nos. 22, 15, 7, and 8), sump dipstick remarked to preclude future improper sump fill.	The "full" mark on the sump dipstick was relabeled "running" full and a new higher "shutdown" full level mark was added.
Technical Specifications, Section 4.8.A	4/80	To demonstrate that the D/G will accept the emergency load within the specified time sequence after reconnection.	Testing procedure each operating cycle modified to require a simulation of D/G interruption after 5 minutes of D/G operation.
Emergency Power System	4/80	This change allows for grid transients while preventing sustained reactor operation under degraded voltage conditions.	Installed Class 1E undervoltage relay matrices to provide a second level of undervoltage protection on 4.16 KV essential buses.
D/G Day Tank Flame Detectors	5/80	Detectors to provide early warning of a fire and to permit rapid manual action in event of impairment of the automatic pre-action sprinkler system.	One infrared flame detector installed in each D/G day tank room.
Diesel Generator Fire Protection Sprinkler System	5/80	To provide greater availability of D/G by providing sprinkler coverage of diesel engine area of D/G rooms.	Replace existing 1/2" wet-pipe sprinkler system in D/G day tank room with a combination fusible-link sprinkler/pre-action deluge system with thermal detectors and add eight additional sprinklers for each D/G room.

TABLE 4

Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification RecordEnclosure 1 - Page 4
Plant Name Duane Arnold
Unit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
D/G Fuel Oil Day Tank	5/81	Existing level switches were not qualified for Seismic Category I service. This change provides the reliability required for Seismic Category I components.	Replace existing float-type level switches with Barton switches Model #288A.
Surveillance Test Procedure 48A001, D/G Monthly Operability Test	5/81	In response to wiped bearing problems (see LER abstract nos. 22, 15, 7, and 8), test procedure revised to assure that the journal bearing oil film has been fully developed prior to full power operation.	After the prelube and test start, the D/G is to be loaded to approximately 25% of rated capacity for five minutes. Then the D/G is loaded to its rated capacity.
Emergency Service Water Pump Strainer	4/80	As discussed in LER abstract no. 26, mud and silt buildup in the emergency service water pits has previously caused the strainers to clog, resulting in low cooling water flow to the D/G. The self-cleaning strainers are to increase the reliability of the emergency service water system.	Existing emergency service water system basket strainers were replaced with self-cleaning (automatic continuous backwash) strainers.
Surveillance Test Procedure 45G002, Daily Operability Test	10/76	To better demonstrate capability to carry emergency loads.	Increased testing load from 1000 KW to 2500 KW.
Surveillance Test Procedures 45G002 and 48A001, Daily and Monthly Operability Tests	3/77	To ensure proper prelube of D/G before starting to protect bearings.	Increased prelube time before D/G start from 45 seconds to 2 minutes.

TABLE 4

Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification RecordEnclosure 1 - Page 4
Plant Name Duane Arnold
Unit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
Surveillance Test Procedure 45G002, Daily Operability Test	10/77	To demonstrate capability of D/G to carry rated load.	Increased testing load from 2500 KW to 2850 KW.
Surveillance Test Procedure 45G002, Daily Operability Test	5/79	To improve prelube of D/G before starting to protect bearings and to better demonstrate capability to maintain rated load.	Increased prelube time from 2 minutes to 4½ minutes and increased D/G load time from 30 minutes to 1 hour.
Surveillance Test Procedure 48A001, D/G Monthly Operability Test	4/79	To improve prelube of D/G before starting to protect bearings.	Increased prelube time from 2 minutes to 4½ minutes.
Surveillance Test Procedure 48A002, Simulated Automatic Start	7/80	To demonstrate that the D/G will accept the emergency load within the specified time sequence after reconnection.	Testing procedure each operating cycle modified to require a simulation of D/G interruption after 5 minutes of D/G operation.
Surveillance Test Procedure 48A002, Simulated Automatic Start	7/81	Prelube provided to protect bearings.	Prelube of 4½ minutes added to simulated automatic start test procedure.