05-51-90

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GEORGIA POWER
POWER GENERATION DEPARTMENT
VOGTLE ELECTRIC GENERATING PLANT

TRAINING LESSON PLAN

TITLE:	DIESEL GENERATOR AUXILIARIES FUEL OIL SYSTEM	NUMBER:	LO-LP-11101-07-C
PROGRAM:	LICENSED OPERATOR	REVISION:	7
SME:	C. BREWER	DATE:	12/6/89
APPROVED:	Lloyd a [signature]	DATE:	12/8/89

INSTRUCTOR GUIDELINES:

I. LESSON FORMAT

A. Lecture with visual aids

II. MATERIALS

A. Transparencies and overhead projector

B. White board and markers

C. Vogtle Training Text, Chapter 16C

III. EVALUATION

A. Written or oral exam in conjunction with other lesson plans

IV. REMARKS

A. **Performance-based** instructional units (IUs) are attached to the lesson plan as students handouts. After the lecture on Diesel Generator Auxiliaries Fuel Oil System the student should be given adequate self-study time for the IUs. The instructor should conduct self-study activities and be available to answer questions that may arise concerning the IU material. After self-study, the student will perform, simulate, observe, or discuss (as identified on the cluster signoff criteria list) the tasks covered in the instructional unit in the presence of an evaluator.

MASTER COPY

Licensed Operator Objectives for this
lesson plan can be found in the Licensed
Operator System Master Plan Section 2.3
(Qualification Signoff Criteria)

Rev 5 Cluster 11 DIESEL GENERATOR

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REFERENCES:

1. PLANT VOGTLE PROCEDURES:

   - 13145 "DIESEL GENERATOR"
   - 13146 "DIESEL GENERATOR FUEL OIL TRANSFER SYSTEM"
   - 14980 "DIESEL GENERATOR OPERABILITY TEST"
   - 13427 "4160 VAC 1E ELECTRICAL DISTRIBUTION SYSTEM"
   - 17035 17038, ANNUNCIATOR RESPONSE PROCEDURES

2. TECHNICAL SPECIFICATIONS:

   - 3.8.1 ELECTRICAL POWER SYSTEMS, AC SOURCES

3. "STANDBY (EMERGENCY) DIESEL GENERATOR," VOGTLE TRAINING TEXT CHAPTER 16C

4. PLANT MANUAL CHAPTER 23

5. P&IDs, LOGICS AND OTHER DRAWINGS

   - PIPING AND INSTRUMENT DIAGRAMS:
   - 1X4DB170-1
   - 1X4DB170-2

   VENDOR DRAWINGS

   - AX4AK01-27 (LUBE OIL)
   - AX4AK01-26 (JACKET WATER)
   - AX4AK01-29 (STARTING AIR)
   - AX4AK01-28 (FUEL OIL)

   CONTROL LOGIC DIAGRAMS

   - 1X5DN107-1 (DG FUEL OIL SYSTEM)
   - 1X5DN107-2 (DG UNIT ENGINE)
   - 1X5DN107-3 (GENERATOR)

   ELEMENTARY DIAGRAMS

   - 1X3D-BH-G03C
   - 1X3D-BH-G03D
   - 1X3D-BH-G03E
   - 1X3D-BH-G03F
   - 1X3D-BH-G03F
   - 1X3D-BH-G03G
   - 1X3D-BH-G03H
   - 1X3D-BH-G03I
   - 1X3D-BH-G03J

   ONE LINE DIAGRAMS

   - 1X3D-AA-A01A

REFERENCES:

- 1X3D-AA-K01A

6. VENDOR MANUALS

- AX4AK01-509
- AX4AK01-510
- AX4AK01-563

7. FSAR: 8.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8

8. COMMITMENTS: NONE

9. INSTRUCTIONAL UNITS

- LO-IU-11101-C-001 RESPOND TO FUEL OIL SYSTEM ALARMS

10. TRANSPARENCIES

- LO-TP-11101-001 LESSON OBJECTIVES
- LO-TP-11101-002 TRAIN A - NORMAL
- LO-TP-11101-003 DAY TANK LEVEL CONTROL LOGIC
- LO-TP-11101-004 DFOST INSTRUMENTATION
- LO-TP-11101-005 DFO DAY TANK INSTRUMENTATION
- LO-TP-11101-006 NORMAL ALIGNMENT - DFOSTS TO DAY TANKS
- LO-TP-11101-007 RECIRCULATION
- LO-TP-11101-008 SUPPLYING TRAIN A DAY TANK FROM TRAIN B DGFOST
- LO-TP-11101-009 TRANSFER OF TRAIN A DFOST CONTENTS TO AUXILIARY BOILER FOST
- LO-TP-11101-010 BASIC FUEL OIL COMPONENTS: DAY TANK TO INJECTORS

III. LESSON OUTLINE.	NOTES
I. INTRODUCTION	
A. Overview	
1. This lesson describes how the fuel oil system functions to provide fuel oil for combustion by the emergency diesel generators	
2. Present lesson objectives	
B. The lesson will be presented in the following sequence:	LO-TP-11101-001 Write on board
1. General Overview	
2. Fuel Oil Storage and Transfer	
3. Component Description	
4. Controls	
5. Instrumentation	
6. System Operation	
7. Fuel Injection	
8. Summary	
II. PRESENTATION	
A. General Overview	
1. <u>Purpose</u> of fuel oil system	
a. Stores and delivers fuel oil for combustion by the diesel engine	
2. Function of fuel oil system	
a. <u>Store</u> enough fuel oil to allow at least 7 days EDG operation with ESF load (plus additional amount for periodic EDG testing)	
b. <u>Transfer</u> fuel oil to the day tank automatically by the DFOST pump	Sometimes called fuel oil transfer pumps
c. <u>Provide fuel</u> to the injector pumps by the engine driven fuel pump	
d. <u>Inject</u> fuel oil into each cylinder for combustion	

III. LESSON OUTLINE:	NOTES
B. Fuel Oil Storage and Transfer	LO-TP-11101-002
1. Four independent fuel storage and transfer systems (i.e. - one per diesel; two per unit)	
2. Each system consists of:	
a. Fuel oil storage tank	
b. Two fuel transfer pumps	
c. Supply and return piping	
d. Day tank	
e. Associated valves, fittings, and instrumentation	
3. Safety design bases	Objective 2
a. The diesel generator fuel oil system provides onsite storage and delivery of fuel oil for approximately 7 days of operation of the safety-related loads as required under accident conditions, assuming the loss of all offsite power sources and an additional amount for periodic testing of the onsite power sources	
b. The diesel generator fuel oil system is designed so that a single failure of any active component cannot affect the ability of the system to store and deliver fuel oil	
c. The diesel generator fuel oil system is designed to remain functional after a safe shutdown earthquake	
d. The diesel generator fuel oil system is protected from the effects of low temperatures	
C. Component Description	
1. DG Fuel storage tanks	
a. Two underground, 80,000 gallon tanks per unit: one per diesel	
1) 2-24 inch flanged opening for	

III. LESSON OUTLINE:	NOTES
mounting transfer pumps	
2) Each tank equipped with a sump and connection heading to a manway	
3) Concrete vault above tank houses instrumentation, pumps and manway	
b. Tank surfaces are coated for corrosion resistance	
c. Level indication and alarms in control room and local	
2. DG fuel oil transfer pumps (Q-EAB)	
a. 480 VAC ESF (STOP-AUTO-START) (1ABF/1BBF) (1.5 hp)	Objective 6
b. Submerged, vertical, centrifugal pumps mounted on FOST	
c. Capacity 25 gpm (approximately 3 times full load consumption rate of DG) at 95 ft (TDH)	
d. Auto start and stop with standby features	
e. Required by Tech. Spec. 3.8.1.1 LCO for operation in Modes 1, 2, 3, 4	
3. Fuel oil day tank	
a. Located in DG enclosure inside 3 hour fire rated barrier	
b. 1250 gallon; 2.5 hour supply (actual time depends on initial level and load on diesel)	
c. Elevated to provide slight NPSH for engine mounted fuel pump	
d. Level indication and alarms locally and in control room	
e. Unit 2 day tank has drain lines to drain tank back to FOST	Unit 1/Unit 2 difference
f. Unit 1 drains to floor	
D. Controls	LO-TP-11101-003

III. LESSON OUTLINE:	NOTES

1. Day tank level control — Objective 3
   a. DFOST pump switches - on QEAB
   b. Day tank and DFOST level gauges - QEAB
   c. Day tank low level (62%) one pump starts if the controls are in AUTO
   d. Day tank high level (92%) running pump stops
   e. Other pump starts next time at 62%
   f. No level alarms normally when pumps are cycling to maintain level
   g. Low-low day tank level causes the second pump to auto start
   h. Running pump discharge pressure low for 10 seconds - second pump starts
   i. DG high or low level day tank alarm
      1) Control room panel
      2) Diesel engine panel
      3) High set point above pump shut-off
      4) Low setpoint slightly below second pump start
      5) Still above Technical Specification minimum
   j. Technical Specification minimum
      1) 52% (650 gal) Objective 11
      2) Read on L19018, 9019
   k. Setpoints in reality vary slightly between Train A and Train B tanks
2. DFOST pump manual control
   a. STOP-AUTO-START on QEAB
      1) 1-HS-9044 for Train A pump 001

III. LESSON OUTLINE: NOTES

2) 1-HS-9046 for Train A pump 002

3) 1-HS-9045 for Train B pump 003

4) 1-HS-9047 for Train B pump 004

b. Switches "maintained", OFF/AUTO/START

c. Unit 2 DFOST pump controls — Unit 1/Unit 2 difference

1) A Train same as Unit 1

2) B Train different

a) Local/remote transfer switches to transfer control out of MCR in case of fire

(1) Located on breaker cubicle 2BBF27

b) In remote (MCR) positions are STOP/AUTO/START

c) In local (at pumps) will run in AUTO only

3. Remote shut down panel operation

a. No remote/local switch for DFOST pumps

b. 1ABF and 1BBF in DG rooms

c. Local operator must observe local level gauges

d. If level low or low alarms come in

1) Could be control problem due to fire

2) Electrician can place jumpers to cause pumps to function correctly in AUTO

E. Instrumentation

1. Control room QEAB — Objective 4

a. DFOST level — LO-TP-11101-004

1) LI-9024: Train `A' DFOST

III. LESSON OUTLINE: | NOTES

2) LI-9025: Train `B' DFOST

3) 0-100% scale

b. DFO day tank level — LO-TP-11101-005

1) LI-9018: Train A

2) LI-9019: Train B

3) 0-100% scale

2. Locally - at DFOST room — LO-TP-11101-004

a. LIS-9022: Train A (input to alarms only)

b. LIS-9023: Train B (input to alarms only)

c. DFOST pump discharge pressure

1) Train A

a) Pump 1: PI-9050

b) Pump 2: PI-9004

2) Train B

a) Pump 3: PI-9049

b) Pump 4: PI-9005

d. LI-9024A, Train A

e. LI-9025A, Train B

f. Flow indicators 19104 (Train A), 19105 (Trai.. B) normally locked closed - pump recirc back to DFOST

3. Locally - at diesel generator room — LO-TP-11101-005

a. Day tank level

1) LIT 9018 (Train A), LIT 9019 (Train B)

2) Located in day tank room

3) Input to alarms

b. Day tank level

III. LESSON OUTLINE: NOTES

1) LI 19192 (Train A), 19193 (Train B)

2) "Bubbler", using air supplied from DSL control air system

3) No control functions

4) PEO "Push-to-read" on PDG 2 or 4

4. Alarms (associated with DFO transfer and storage)

a. ALB35 (Train A), ALB38 (Train B)

b. "Control switch not in AUTO"

1) If fuel oil transfer pumps control switch not in auto

2) Common alarms - has other functions

c. "High or low level day tank"

1) Dual function alarm

d. "Low level main tank"

1) Alarm set point above Technical Specification minimum

e. "High level main tank"

f. "High differential pressure fuel oil filter" indicates filter plugging

g. "Low pressure fuel oil" indicated low fuel pressure downstream of duplex fuel filter

h. "Fuel oil injection line break"

1) High level in fuel oil injection line burst detection tank

F. System Operation

Objective 1 (partial)

1. FOSTs contribute the operation of the emergency diesel system by:

a. <u>Containing</u> more than a 7 days supply (post-LOCA loads)

III. LESSON OUTLINE:	NOTES
1) Est. 7-day post-LOCA load approx. 58,600 gallons	Commitment FSAR Q430.16
2) Low level alarm at greater than Technical Specification	
3) Technical Specification minimum of 68,000 per tank gallons	76% instrument spans
b. Refilling with DG operating	Commitment FSAR Q430.17
1) FOST from opposite train may be manually lined up to supply operating DG day tank	
2) Empty FOST isolated, filled, and sediment allowed to settle prior to realigning tank to its respective diesel	
c. Straining of fuel oil when being filled from tank	
d. Dewatering to remove sediment and water - a manual operation	
2. DFO day tanks contribute to the operation of the EDG by:	
a. Providing positive head to the engine mounted fuel pump	
b. Containing a minimum of 650 gallons	52% instrument span
1) T.S. minimum	
2) Pump auto starts before getting to this point	
c. Allows for sampling and dewatered	Objective 7
1) Required by T.S. if engine was run for ≥ one hour	
2) During that hour the DFOST pumps may have pumped fuel oil containing moisture	
3. DFOST pumps contribute to performance of EDG by:	

III. LESSON OUTLINE:	NOTES
a. Providing redundancy (2/diesel)	
b. Providing 25 gpm each (approximately three times full load consumption of EDG)	
4. Major transfer flowpaths	Objective 5
a. Normal	LO-TP-11101-006
1) Each DGFOST aligned to its day tank	
2) Trains isolated from each other	
3) Pump controls in AUTO	
b. Recirculation	LO-TP-11101-007
1) One pump running continuously	
2) Overflowing its day tank back to its DFOST	
3) Same alignment as normal except pump running	
c. Supplying Train A day tank from Train B DFOST	LO-TP-11101-008
1) Done only in emergency situations or if:	
2) Train A DFOST level is below a minimum and is to be refilled	
3) Isolate valves between units open	
4) Train A DFOST pumps - stopped	
5) Start one Train B pump to make up to train A DFO day tank	
6) Stop when Train A day tank level 92%	
7) Train B DFO day tank may overflow to its DFOST - no problem	
d. Supplying Train B day tank from Train A DFOST generally is the same as above (reversed)	
e. Transfer DFOST contents to auxiliary boiler FOST	LO-TP-11101-009

III. LESSON OUTLINE: | NOTES

1) If DFOST contents have degraded

2) Day tank isolated to transfer

5. Consequences of loss or failure of pumps or instrumentation — Objective 8

a. One DFOST pump

1) If pump is lost or fails while running, low discharge pressure causes second pump to AUTO-START (after 10 seconds)

2) If pump was not running, low day tank level will cause second pump to start

b. Both DFOST pumps

1) DG is inoperable in this situation

2) If running day tank would eventually be exhausted, stopping engine

3) Possible indications:

a) High-low day tank level

b) Level meter (control room) or gauge (local)

c) Pump motor light indicators on hand switch

c. Day tank level instrumentation

1) LIT 9018 (9019) Failing high:

a) Control room meter read high

b) "High or low level day tank" annunciator

c) No effect on pump

2) LIT 9018 (9019) Failing low:

a) Control room meter reads low

b) "High or low level day tank: annunciator

c) No effect on pump

3) LSH 9020, LSL 9020, LSLL 9020 (or 9021) failing high or low

a) Cause pump motor to respond as if the real situation existed - high low, or low-low

b) Annunciators and control room level meter from LIT 9018 (9019), so do not fail

G. Fuel Injection

1. General description

a. Each cylinder fitted with individual fuel injection pump and injection nozzle

b. Engine driven pump takes suction from F.O. day tank via duplex strainer and filter to ensure fuel oil cleanliness

2. Component description and operation — LO-TP-11101-010

a. Engine driven pump

1) Capacity 10 gpm at full load

2) Contributes to EDG performance by providing pressurized fuel oil to the injection pumps while the engine is running ("booster" pump to injector pumps) — Objective 1 (partial)

3) Driven by engine gearset at a speed proportional to engine speed

4) Located at front of diesel engine to the right of the woodward governor actuator and on same accessory drive as the overspeed governor

5) Consequence of failure of pump is the engine will not run since the injector pumps lose supply

b. Fuel oil strainer

1) On suction of engine-driven pump

2) Duplex-type with manual valve to divert flow

3) Removes fine particles below the engine driven pump and filter

4) Loss or failure (complete blockage)

a) Engine stops running - inoperable until corrected

b) Should cause "low press fuel oil" annunciator

c) Local PDI indicating high while clogging was occurring

c. Fuel oil filter

1) On discharge side of engine driven pump

2) Duplex-type with manual valve to divert flow

3) Removes finer particles prior to injectors

4) Consequences of failing (clogging):

a) Engine stopping

b) Clogging can be detected by:

(1) High differential pressure gauge on engine skid

(2) High differential pressure gauge on local control panel

(3) "High differential pressure fuel oil filter" annunciator (alarm S.P. 20 psid)

(4) "Low pressure fuel oil" annunciator

d. Fuel oil pressure control valve

1) Maintains approximately 40 psig on supply header

2) Consequences of failure

a) Full open: engine will stall or not start

- Loss of Train section - low fuel pressure

b) Full closed:

- No train degradation - excess fuel oil due to high pressure diverts to day tank via eductor detection - local gauge

e. Eductor

1) Contributes to performance of the emergency diesel system by educting fuel oil drips from drip headers to to day tank — Objective 1 (partial)

2) Uses fuel oil from supply header as motive force

3) Fuel inlet to eductor shut by pneumatic shutoff valve when engine is not running

f. Fuel injection pump

1) Constant stroke variable delivery positive displacement plunger pump

2) Driven by engine camshaft lobes causing a tappet to move

3) Located at each cylinder head (one per cylinder)

4) Amount of fuel injected controlled by:

a) Woodward governor output shaft position which controls rack position of each injector pump via linkage. Rack position in turn controls the "effective stroke" of that pump

(1) "Effective stroke" is

distance plunger travels during injection until spill port (bypass port) is uncovered

(2) Bypass header fuel oil piped back to day tank

6) Fuel Injectors

a) One per cylinder

b) Supplied from injector pump by high pressure fuel injection line

c) Sprays fuel oil into cylinder for combustion

d) High pressure fuel injection line a potential safety hazard for PEO

e) "Fuel oil injection line break" annunciator

(1) Each high pressure line shrouded by an outer tube

(2) High pressure line breaks routed to fuel oil line leakage tank

(3) Level switch in tank causes the annunciation on increasing level

g. Possible engine malfunctions associated with fuel oil supply from day tank and fuel injection

Not to make operators mechanics, but to look for obvious problems

1) Engine turns on starting air but will not start

a) Fuel line valve closed

b) Fuel low in day tank

c) Air in fuel system

d) Fuel lines clogged

e) Dirty or plugged fuel filter

III. LESSON OUTLINE: NOTES

f) Water in fuel oil

g) Fuel control linkage sticking

h) Fuel oil relief valve stuck open

i) Fuel rack shutoff cylinder not activated

2) Low exhaust temperature in one cylinder

a) Bad fuel pump

b) Bad fuel pump nozzle

3) Erratic speed variation

a) Injector pump or nozzle problems (also governor problems)

4) Excessive vibration

a) Cylinder misfiring due to fuel nozzle, fuel pump problems

III. SUMMARY

A. Review objectives

1. DESCRIBE THE OPERATION OF THE FOLLOWING FUEL OIL SYSTEM COMPONENTS:

DIESEL FUEL OIL STORAGE TANK (DFOST)

Containing more than a 7-day supply

DFOST PUMPS

Providing redundancy and pumping rate of three times full load consumption

DFO DAY TANK

Providing positive head to the engine-mounted fuel pump

ENGINE-DRIVEN FUEL OIL PUMP

Providing pressurized fuel oil to the injection pump which engine is running

III. LESSON OUTLINE: NOTES

EDUCTOR

Educting fuel oil drips from drip headers to day tank

2. STATE THE SAFETY DESIGN BASES OF THE FUEL OIL SYSTEM.

The diesel generator fuel oil system provides onsite storage and delivery of fuel oil for approximately 7 days of operation of the safety-related loads as required under accident conditions, assuming the loss of all offsite power sources and an additional amount for periodic testing of the onsite power sources

The diesel generator fuel oil system is designed so that a single failure of any active component cannot affect the ability of the system to store and deliver fuel oil

The diesel generator fuel oil system is designed to remain functional after a safe shutdown earthquake

The diesel generator fuel oil system is protected from the effects of low temperatures

3. DESCRIBE THE OPERATION OF THE DFOST PUMPS, INCLUDING THE DAY TANK LEVEL PROGRAM, AND STATE THE LOCATION OF THE CONTROL SWITCHES.

- 62% pump starts if controls are in auto
- 92% pumps stop
- Next time other pump starts at 62% and stops at 92%
- Pump discharge low for 10 sec. Second pump starts
- Lo-lo level second pump starts
- Pump switch located on QEAB

4. IDENTIFY ANY OF THE CONTROL ROOM ALARMS AND INDICATIONS ASSOCIATED WITH THE FUEL OIL SYSTEM.

- DFOST level meters
- DFO day tank level meters
- Day tank high or low level alarm

5. DESCRIBE THE FUEL OIL SYSTEM FLOWPATHS UNDER EACH OF THE FOLLOWING CONDITIONS:

   a. RECIRCULATION DFO PUMP

   b. SUPPLY TRAIN A FROM TRAIN B DFOST

   c. SUPPLY TRAIN B FROM TRAIN A DFOST

   d. NORMAL ALIGNMENT, DFOST TO DAY TANK

   Refer to LO-TP-11101-006 through LO-TP-11101-008 and Section II.F.4

6. DETERMINE THE POWER SUPPLIES TO THE DFOST PUMPS.

   1ABF
   1BBF

7. EXPLAIN WHY AND DETERMINE WHEN THE EDG FUEL OIL DAY TANK IS SAMPLED FOR WATER.

   Required by Tech. Specs. If EDG run for ≥ one hour DFOST pumps may have pumped fuel oil containing water

8. PREDICT THE CONSEQUENCES OF LOSS OR FAILURE OF:

   ONE DFOST PUMP

   If pump is lost or fails while running, low discharge pressure causes second pump to AUTO START (after 10 seconds)

   If pump was not running, low day tank level will cause 2nd pump to start

   BOTH DFOST PUMPS

   DG is inoperable in this situation

   If running day tank would eventually be exhausted, stopping engine

   ENGINE-DRIVEN FUEL OIL PUMP

   Engine will not run since injector pumps lose supply

   DAY TANK LEVEL INSTRUMENTATION

III. LESSON OUTLINE: NOTES

- LIT 9018 (9019) Failing high:
- Control room gauge read high
- "High or low level day tank" annunciator
- No effect on pump circuitry

LIT 9018 (9019) FAILING LOW

- Control room gauge reads low
- "High or low level day tank" annunciator

- No effect on pump circuitry

LSH 9020, LSL 9020, LSLL 9020 (or 9021) FAILING HIGH OR LOW

Cause pump motor to respond as if the real situation existed - high-low, or low-low

Annunciators and control room level gauge from LIT 9018 (9019), so do not fail

FUEL OIL STRAINER (CLOGGED)

Engine stops running - inoperable until corrected

Should cause "low press fuel oil annunciator

Local PDI indicating high while clogging was occurring

FUEL OIL FILTER

Engine stopping

FUEL OIL PRESSURE CONTROL VALVE FAILURE (OPEN OR CLOSED)

Full open: engine will stall or not start

- Loss of train section - low fuel pressure

Full closed:

- No train degradation - excess fuel oil due to high pressure diverts to day tank via eductor detection - local gauge

I PURPOSE STATEMENT

Following completion of this lesson, the student will possess those knowledges systematically identified for the performance of the DIESEL GENERATOR AUXILIARIES - FUEL OIL SYS tasks.

II LIST OF OBJECTIVES

1. Describe the operation of the following fuel oil system components:
   a. Diesel Fuel Oil Storage Tank (DFOST)
   b. DFOST pumps
   c. DFO day tank
   d. Engine driven fuel oil pump
   e. Eductor
   (KSA numbers: 064000K103)

2. Explain the safety design bases of the fuel oil system.
   (KSA numbers: 064000A102)

3. Describe the operation of the DFOST pumps including the day tank level program, and the location of the control switches.
   (KSA numbers: 064000K103)

4. Identify any control room alarms and indications associated with the fuel oil system.
   (KSA numbers: 064000A303)

5. Describe the fuel oil system flowpaths under each of the following conditions:
   a. Recirculation DFO pump
   b. Supply train A from train B DFOST
   c. Supply train B from train A DFOST
   d. Normal alignment, DFOST to day tank.
   (KSA numbers: 064000K103)

6. Determine the power supplies to the DFOST pumps.
   (KSA numbers: 064000K202)

7. Explain why and determine when the EDG fuel oil day tank is sampled for water.
   (KSA numbers: 064000A215)

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OBJECTIVES FOR LO-LP-11101 CONTINUED.

8. Predict the consequences of loss or failure of:
   a. One DFOST pump
   b. Two DFOST pumps
   c. Engine-driven fuel oil pump
   d. Day tank level instrumentation failure (high or low)
   e. Fuel oil strainer (clogged)
   f. Fuel oil filter (clogged)
   g. Fuel oil pressure control valve failure (open or closed)
   (KSA numbers: 064000A201)