Emergency A.C. Power System

Chapter 9.2

Objectives

1. Identify the purpose of the Emergency Power system.

2. Recognize the purpose of the following Emergency Power system major components:
   a) Emergency Diesel Generators (EDG)
   b) Normal Station Supply Transformer (NSST)
   c) Reserve Station Supply Transformer (RSST)

3. Describe the distribution of power to the Emergency buses from the:
   a) Emergency Diesel Generators (EDG)
   b) Normal Station Supply Transformer (NSST)
   c) Reserve Station Supply Transformer (RSST)

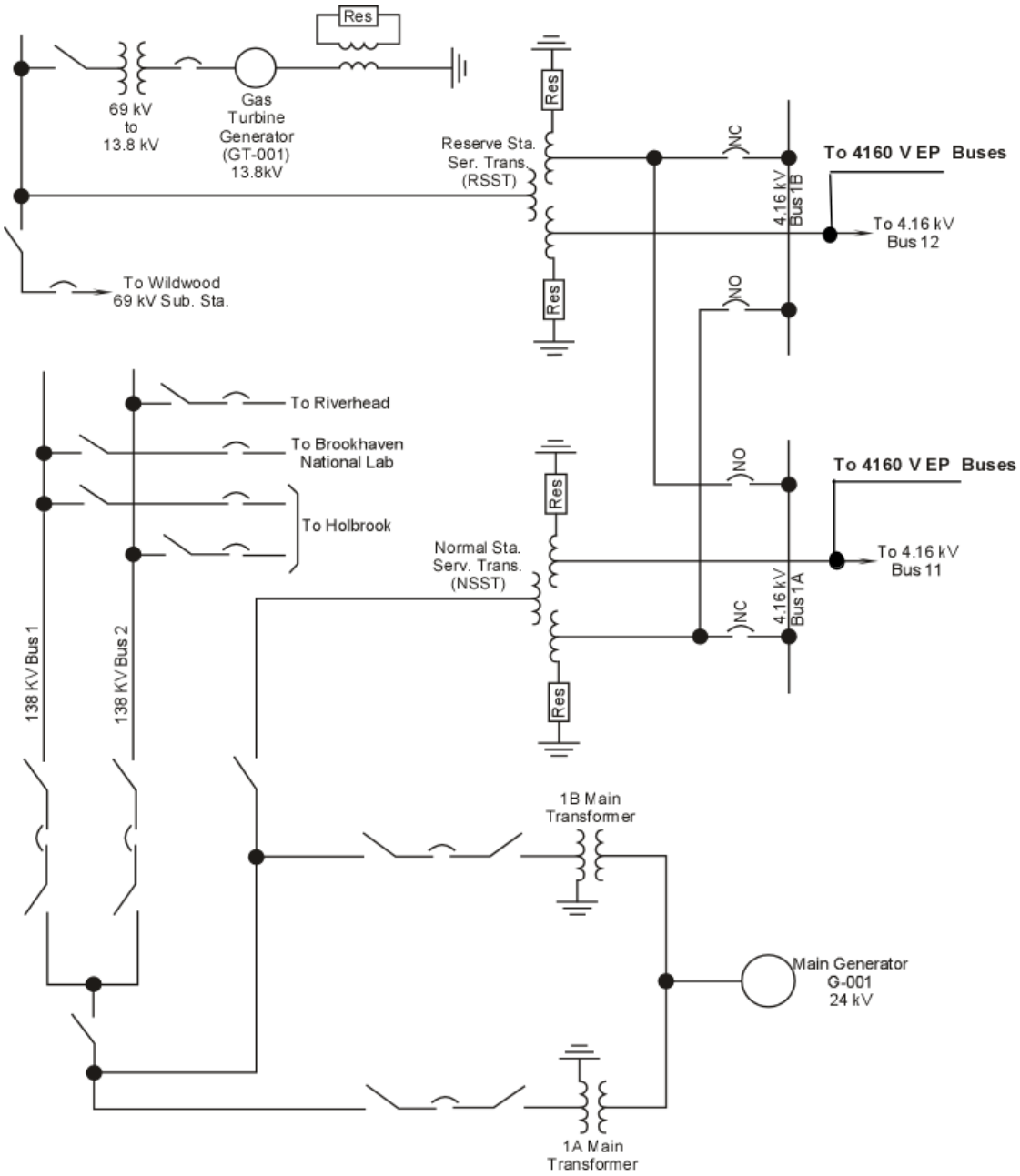
Objectives

4. List the Emergency Power System setpoints which affect the following:
   a) EDG starting
   b) EDG Automatic buss transfer
   c) Automatic buss transfer from the NSST to the RSST

5. Describe how the Emergency Power system interrelates with the following systems/components:
   a) Normal AC Power System (Section 9.1)
   b) 120V Power System (Section 9.3)
   c) DC Power System (Section 9.4)
   d) Reactor Building Service Water System (Section 11.2)

Purpose

The Emergency AC Power (EP) system provides a reliable source of AC power to all loads required for the safe shutdown and cooldown of the plant.



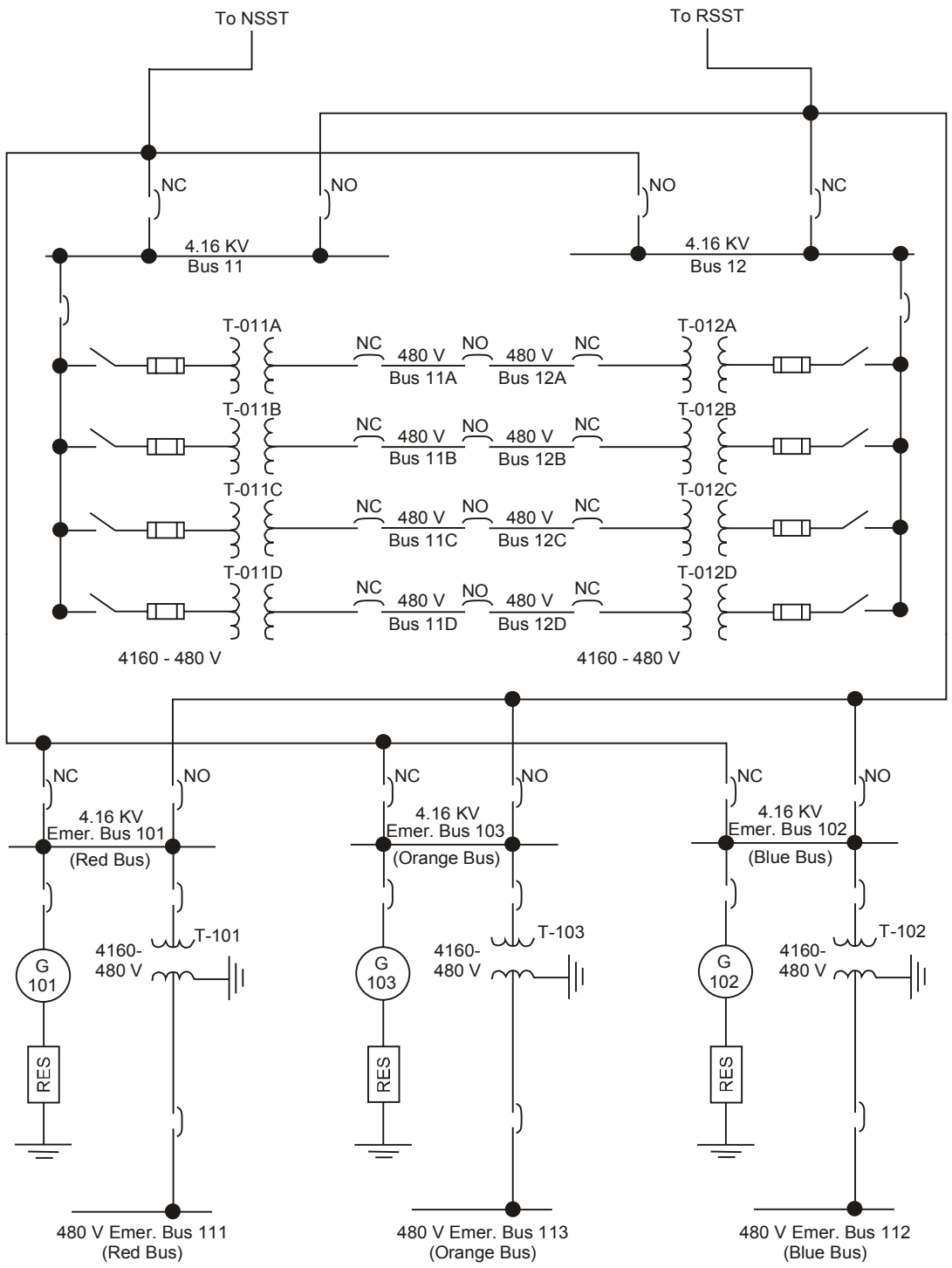
Plant

Distribution

Station Transformers

- The Normal Station Supply Transformer is a 138KV to 4.16KV step down transformer.
  - Takes power from the switchyard and the main generator to supply portions of the in house loads.
  - Normal supply for all three emergency buses

- The Reserve Station Supply Transformer is a 69KV to 4.16KV step down transformer.
  - Takes power from the 69KV line and/or the Gas Turbine generator to supply portions of the in house loads.
  - If the NSST source is not available, the emergency buses will attempt to transfer to the RSST



Emergency Bus Distribution

Emergency Diesel Generators

- 3 identical EDG's each one capable of supplying its 4.16KV emergency bus.
- EDG's are divisionally separated to prevent a singe fault from impacting multiple buses.
- EDG's will automatically tie to the bus on an undervoltage condition.
  - This is after the emergency buses attempt to power from the RSST.
- EDGs start on a LOCA to improve availability in the event they are needed

EMERGENCY BUS LOADS

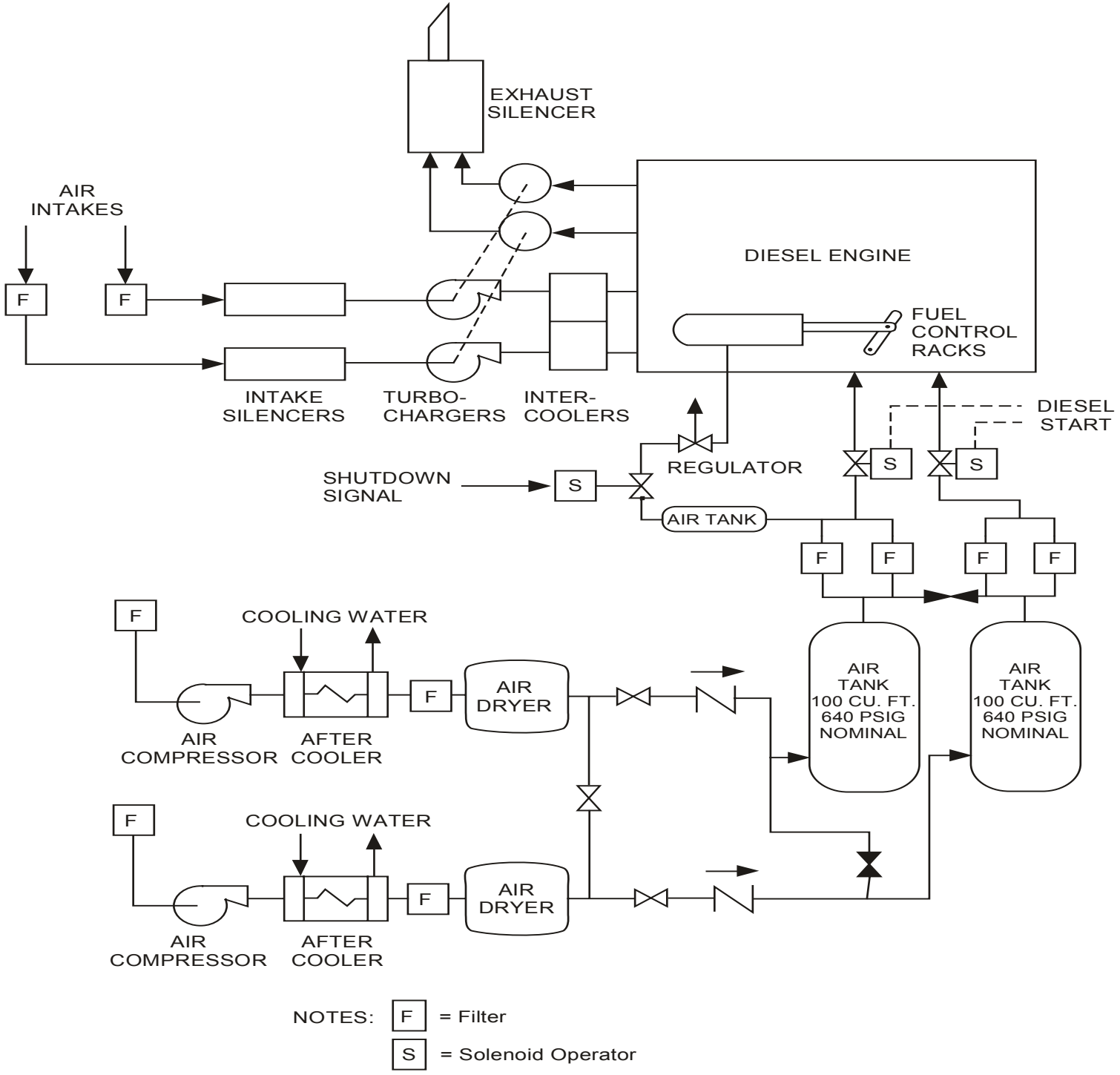
- BUS 101 (RED)
- “A” RESIDUAL HEAT REMOVAL PUMP
- “A” CORE SPRAY PUMP
- “A” RB SERVICE WATER PUMP
- “A” CONTROL ROD DRIVE HYDRAULIC PUMP
- 480 V LOADS
- BUS 102 (BLUE)
- “B” RESIDUAL HEAT REMOVAL PUMP
- “B” CORE SPRAY PUMP
- “B” RB SERVICE WATER PUMP
- “B” CONTROL ROD DRIVE HYDRAULIC PUMP
- 480 V LOADS
- BUS 103 (ORANGE)
- “C”&”D” RESIDUAL HEAT REMOVAL PUMPS
- “C”&”D” RB SERVICE WATER PUMPS
- 480 V LOADS

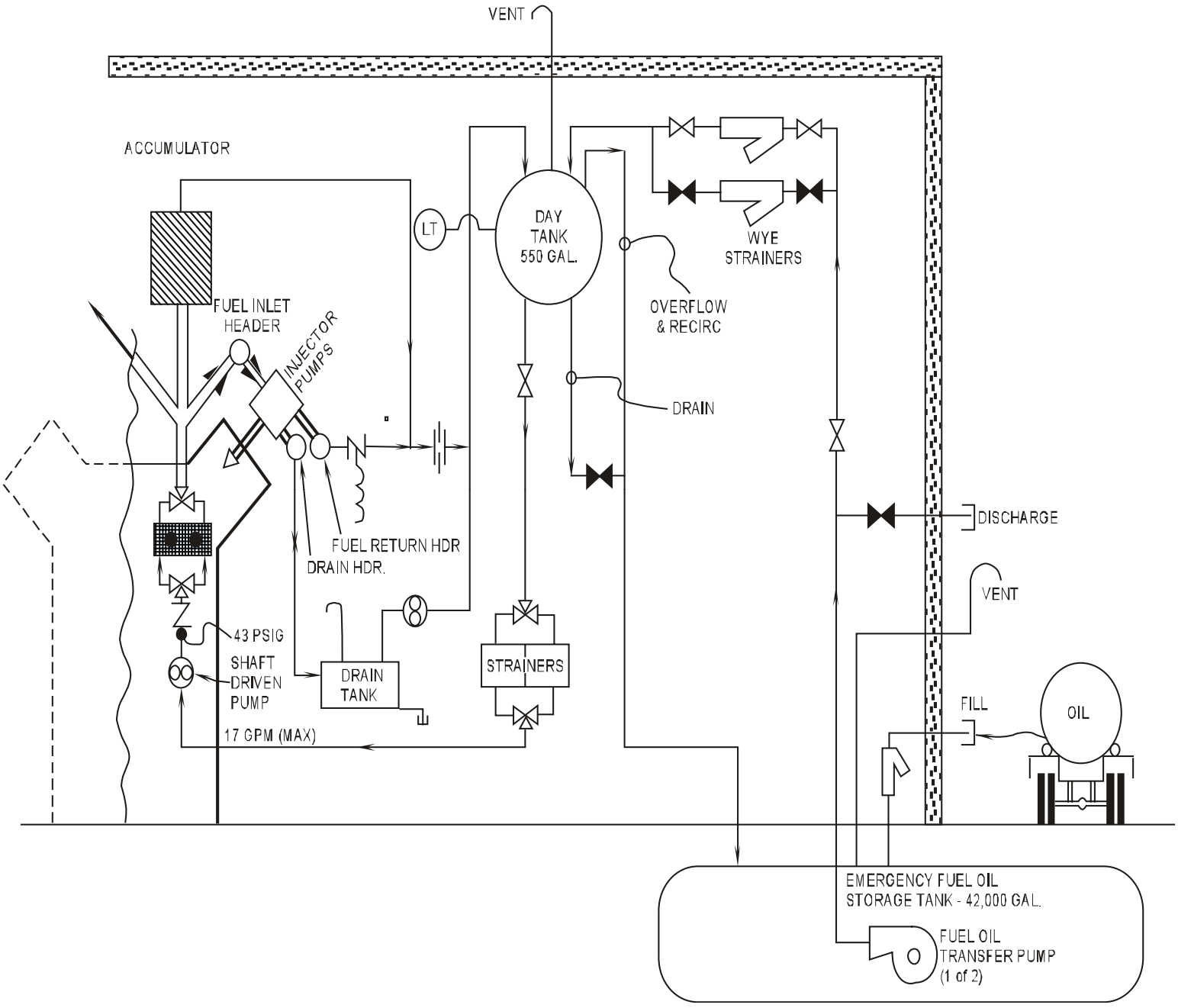
EMERGENCY System Setpoints

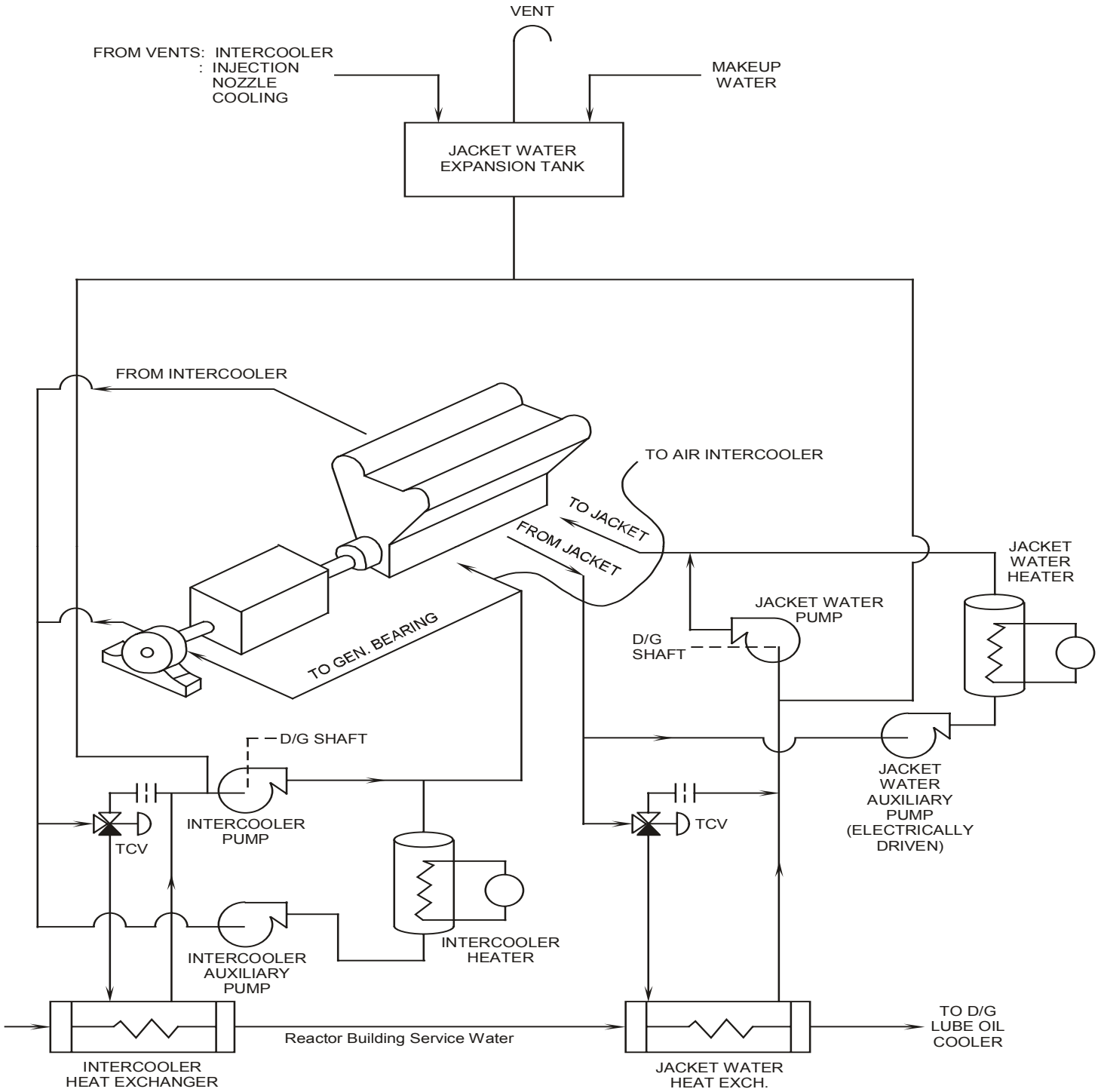
- EDG starts
  - High Drywell pressure
  - Low Reactor Water Level 1
  - Manual ECCS Initiation (CS or RHR)
  - Bus Undervoltage
  - Manual
- NSST to RSST auto transfer
  - Undervoltage from the NSST
  - Fast transfer from NSST (bus loads not interrupted) to RSST in 5 cycles.
  - Slow transfer with 4.16Kv and 480V bus shed at 2 seconds

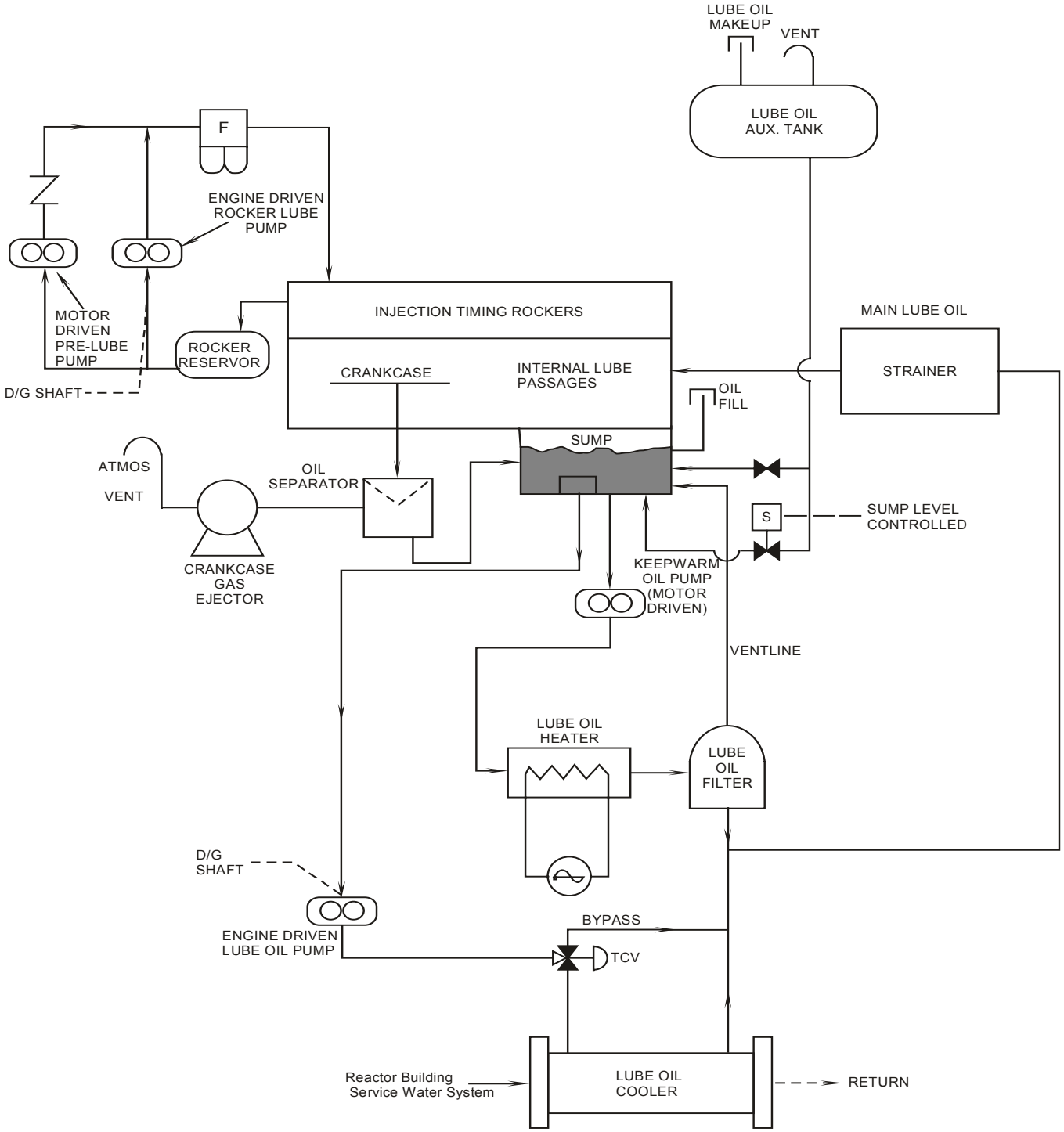
EMERGENCY System Setpoints

- Automatic Bus transfer to EDG
  - Emergency bus undervoltage condition for greater than 5 seconds.
  - All 4.16KV and 480V loads shed from bus
  - EDG ties to bus when at rated speed and voltage


EXHAUST SILENCER
AIR INTAKES
DIESEL ENGINE
FUEL CONTROL RACKS
INTAKE SILENCERS
TURBO-CHARGERS
INTER-COOLERS
DIESEL START
SHUTDOWN SIGNAL
REGULATOR
AIR TANK
COOLING WATER
AIR COMPRESSOR
AFTER COOLER
AIR DRYER
AIR TANK 100 CU. FT. 640 PSIG NOMINAL
AIR TANK 100 CU. FT. 640 PSIG NOMINAL
COOLING WATER
AIR COMPRESSOR
AFTER COOLER
AIR DRYER
NOTES: F = Filter
S = Solenoid Operator


VENT
ACCUMULATOR
LT
DAY
TANK
550 GAL.
WYE
STRAINERS
OVERFLOW
& RECIRC
FUEL INLET
HEADER
INJECTOR
PUMPS
DRAIN
DISCHARGE
FUEL RETURN HDR
DRAIN HDR.
VENT
43 PSIG
SHAFT
DRIVEN
PUMP
DRAIN
TANK
STRAINERS
FILL
OIL
17 GPM (MAX)
EMERGENCY FUEL OIL
STORAGE TANK - 42,000 GAL.
FUEL OIL
TRANSFER PUMP
(1 of 2)


VENT
FROM VENTS: INTERCOOLER
: INJECTION
NOZZLE
COOLING
MAKEUP
WATER
JACKET WATER
EXPANSION TANK
FROM INTERCOOLER
TO AIR INTERCOOLER
TO JACKET
FROM JACKET
TO GEN. BEARING
JACKET
WATER
HEATER
JACKET WATER
PUMP
D/G
SHAFT
D/G SHAFT
INTERCOOLER
PUMP
TCV
TCV
JACKET
WATER
AUXILIARY
PUMP
(ELECTRICALLY
DRIVEN)
INTERCOOLER
HEATER
INTERCOOLER
AUXILIARY
PUMP
Reactor Building Service Water
TO D/G
LUBE OIL
COOLER
INTERCOOLER
HEAT EXCHANGER
JACKET WATER
HEAT EXCH.


LUBE OIL
MAKEUP
VENT
LUBE OIL
AUX. TANK
F
ENGINE DRIVEN
ROCKER LUBE
PUMP
MOTOR
DRIVEN
PRE-LUBE
PUMP
D/G SHAFT
ROCKER
RESERVOR
INJECTION TIMING ROCKERS
CRANKCASE
INTERNAL LUBE
PASSAGES
MAIN LUBE OIL
STRAINER
OIL
FILL
SUMP
ATMOS
VENT
OIL
SEPARATOR
S
SUMP LEVEL
CONTROLLED
CRANKCASE
GAS
EJECTOR
KEEPWARM
OIL PUMP
(MOTOR
DRIVEN)
VENTLINE
LUBE OIL
HEATER
LUBE
OIL
FILTER
D/G
SHAFT
ENGINE DRIVEN
LUBE OIL PUMP
BYPASS
TCV
Reactor Building
Service Water System
LUBE OIL
COOLER
RETURN

System Interrelations

- Normal AC Power System (Section 9.1)
- The NP system energizes the emergency buses during normal operation and is the preferred source of power.
- Power is normally supplied through the NSST but can be supplied from the RSST.

- 120V Power System (Section 9.3)
- The emergency power system provides emergency power to the 120V power system for lighting and small safety related loads.

System Interrelations

- DC Power System (Section 9.4)
- EP system circuit breaker control power, diesel generator field flash are provided by the DC Power system.
- The DC Power system battery chargers are powered from the 480V EP system buses.

- Reactor Building Service Water System (Section 11.2)
- RBSWS supplies divisional cooling water to the diesel generators .

OBJECTIVE REVIEW

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