

Table 3.3.5-1 (page 1 of 1)
LOP DG Start Instrumentation

FUNCTION		REQUIRED CHANNELS PER BUS	SURVEILLANCE REQUIREMENTS	TRIP SETPOINT	ALLOWABLE VALUE
1.	6.9 kV Emergency Bus Undervoltage (Loss of Voltage)				
	a. Bus Undervoltage	3	SR 3.3.5.1 SR 3.3.5.2	$\geq 5994 \text{ V}$ and $\leq 6006 \text{ V}$	$\geq 5967.6 \text{ V}$
	b. Time Delay	2	SR 3.3.5.3	$\geq 0.73 \text{ sec}$ and $\leq 0.77 \text{ sec}$	$\geq 0.58 \text{ sec}$ and $\leq 0.94 \text{ sec}$
2.	6.9 kV Emergency Bus Undervoltage (Degraded Voltage)				
	a. Bus Undervoltage	3	SR 3.3.5.1 SR 3.3.5.2	$\geq 6593.4 \text{ V}$ and $\leq 6606.6 \text{ V}$	$\geq 6570 \text{ V}$
	b. Time Delay	2	SR 3.3.5.3	$\geq 9.73 \text{ sec}$ and $\leq 10.27 \text{ sec}$	$\geq 9.42 \text{ sec}$ and $\leq 10.49 \text{ sec}$
3.	Diesel Generator Start	2	SR 3.3.5.1 SR 3.3.5.2	$\geq 4733.4 \text{ V}$ and $\leq 4926.6 \text{ V}$ with an internal time delay of $\geq 0.46 \text{ sec}$ and $\leq 0.54 \text{ sec}$	$\geq 2295.6 \text{ V}$ with an internal time delay of 0.56 sec at zero volts.
4.	Load Shed	4	SR 3.3.5.1 SR 3.3.5.2	$\geq 4733.4 \text{ V}$ and $\leq 4926.6 \text{ V}$ with an internal time delay of $\geq 2.79 \text{ sec}$ and $\leq 3.21 \text{ sec}$	$\geq 2295.6 \text{ V}$ with an internal time delay of $\leq 3.3 \text{ sec}$ at zero volts.

B 3.3 INSTRUMENTATION

B 3.3.5 Loss of Power (LOP) Diesel Generator (DG) Start Instrumentation

BASES

BACKGROUND

The DGs provide a source of emergency power when offsite power is either unavailable or is insufficiently stable to allow safe unit operation. Undervoltage protection will generate an LOP start if a loss of voltage or degraded voltage condition occurs in the switchyard. There are four LOP start signals, one for each 6.9 kV shutdown board.

Three degraded voltage relays (one per phase) are provided on each 6.9 kV Shutdown Board for detecting a sustained undervoltage condition. The relays are combined in a two-out-of-three logic configuration to generate a supply breaker trip signal if the voltage is below 96% for 10 seconds (nominal). Additionally, three undervoltage relays (one per phase) are provided on each 6.9 kV Shutdown Board for the purpose of detecting a loss of voltage condition. These relays are combined in a two-out-of-three logic to generate a supply breaker trip signal if the voltage is below 87% for 0.75 seconds (nominal).

Once the supply breakers have been opened, either one of two induction disk type relays, which have a voltage setpoint of 70% of 6.9 kV (nominal, decreasing) and an internal time delay of 0.5 seconds (nominal) at zero volts, will start the diesel generators. Four additional induction disk type relays, in a logic configuration of one-of-two taken twice which have a voltage setpoint of 70% of 6.9 kV (nominal, decreasing) and an internal time delay of 3 seconds (nominal), at zero volts, will initiate load shedding of the 6.9 kV Shutdown Board loads and selected loads on the 480 V shutdown boards and close the 480 V shutdown boards' current limiting reactor bypass breaker. The LOP start actuation is described in FSAR Section 8.3, "Onsite (Standby) Power System" (Ref. 1).

Trip Setpoints and Allowable Values

The Trip Setpoints used in the relays and timers are based on the analytical limits presented in TVA calculations, References 3, 5, and 6. The selection of these Trip Setpoints is such that adequate protection is provided when all sensor and time delays are taken into account.

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