2.5.7 Non-Class 1E Uninterruptible Power Supply

Design Description

1.0 System Description

The non-Class 1E uninterruptible power supply system (NUPS) provides non-Class 1E uninterruptible power during normal and abnormal operation to non-safety-related Turbine Island and Nuclear Island loads which includes the control rod drive mechanism (CRDM) operating coils. Interruption of power to the CRDM operating coils in a reactor trip condition is a safety-related function accomplished by opening the reactor trip breakers. The reactor trip breakers have a non-safety-related function of opening when the shunt trip coil is energized as a diverse means of opening the breakers.

2.0 Arrangement

2.1 The functional arrangement of the NUPS is as described in the Design Description of Section 2.5.7, Table 2.5.7-1—Non-Class 1E Uninterruptible Power Supply Electrical Equipment Design, and as shown on Figure 2.5.7-1—Non-Class 1E Uninterruptible Power Supply System Functional Arrangement.

2.2 Deleted.

3.0 Mechanical Design Features

3.1 Equipment identified as Class 1E in Table 2.5.7-1 are qualified as Seismic Category I and can withstand seismic design basis loads without a loss of safety function(s).

4.0 I&C Design Features, Displays, and Controls

4.1 Displays listed in Table 2.5.7-1 are indicated on the PICS operator workstations in the MCR and the RSS.

4.2 Controls on the PICS operator workstations in the MCR and the RSS perform the function listed in Table 2.5.7-1.

5.0 Electrical Power Design Features

5.1 Each NUPS battery is able to provide power for starting and operating design loads for a minimum of two hours when the ac supply to the battery charger is lost.

5.2 Each NUPS battery charger supplies assigned NUPS loads while maintaining the respective NUPS battery charged.

5.3 The NUPS inverters are sized to power the design NUPS loads on the respective supplied motor control center (MCC).

5.4 Physical separation exists between Class 1E division reactor trip breakers.

5.5 The reactor trip breakers open when a signal is provided to the shunt trip coil.

6.0 Equipment and System Performance

6.1 The reactor trip breakers open on a protection system reactor trip signal.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.5.7-2 lists the NUPS ITAAC.

Table 2.5.7-1—NUPS Electrical Equipment Design

Description	Tag Number(1)	Location	IEEE Class 1E	Seismic Class	MRC / RSS Displays	MCR / RSS Controls
Reactor Trip Breaker	Division 1 Reactor Trip Breaker	Safeguard Building 2	Yes	I	Reactor Trip Breaker Position / Reactor Trip Breaker Position	Open / Open
Reactor Trip Breaker	Division 2 Reactor Trip Breaker	Safeguard Building 2	Yes	I	Reactor Trip Breaker Position / Reactor Trip Breaker Position	Open / Open
Reactor Trip Breaker	Division 3 Reactor Trip Breaker	Safeguard Building 3	Yes	I	Reactor Trip Breaker Position / Reactor Trip Breaker Position	Open / Open
Reactor Trip Breaker	Division 4 Reactor Trip Breaker	Safeguard Building 3	Yes	I	Reactor Trip Breaker Position / Reactor Trip Breaker Position	Open / Open
Switchboard	32BUB	Safeguard Building 2	Yes	I	Bus Voltage / Bus Voltage	N/A / N/A
Switchboard	33BUB	Safeguard Building 3	Yes	I	Bus Voltage / Bus Voltage	N/A / N/A

1. Equipment tag numbers are provided for information only and are not part of the certified design.

Table 2.5.7-2—Non-Class 1E Uninterruptible Power Supply System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the NUPS is as described in the Design Description of Section 2.5.7, Table 2.5.7-1, and as shown on Figure 2.5.7-1.	An inspection of the as-built NUPS functional arrangement will be performed.	The NUPS conforms to the functional arrangement as described in the Design Description of Section 2.5.7, Table 2.5.7-1, and as shown on Figure 2.5.7-1.
2.2	Deleted.	Deleted.	Deleted.
3.1	Equipment identified as Class 1E in Table 2.5.7-1 are qualified as Seismic Category 1 and can withstand seismic design basis loads without a loss of safety function(s).	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment identified as Class 1E in Table 2.5.7-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. An inspection will be performed of the as-built equipment identified as Class 1E in Table 2.5.7-1 to verify that the equipment, including anchorage, are installed in a condition bounded by the tested or analyzed condition.	a. Test/analysis reports conclude that the equipment identified as Class 1E in Table 2.5.7-1 can withstand seismic design basis loads without a loss of safety function(s). b. Inspection reports conclude that the equipment identified as Class 1E in Table 2.5.7-1, including anchorage, are installed in a condition bounded by the tested or analyzed condition.
4.1	Displays listed in Table 2.5.7-1 are indicated on the PICS operator workstations in the MCR and the RSS.	a. Tests will be performed to verify that the displays listed in Table 2.5.7-1 are indicated on the PICS operator workstations in the MCR. b. Tests will be performed to verify that the displays listed in Table 2.5.7-1 are indicated on the PICS operator workstations in the RSS.	a. Displays listed in Table 2.5.7-1 are indicated on the PICS operator workstations in the MCR. b. Displays listed in Table 2.5.7-1 are indicated on the PICS operator workstations in the RSS.

Table 2.5.7-2—Non-Class 1E Uninterruptible Power Supply System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.2	Controls on the PICS operator workstations in the MCR and the RSS perform the function listed in Table 2.5.7-1.	a. Tests will be performed using controls on the PICS operator workstations in the MCR.	a. Controls on the PICS operator workstations in the MCR perform the function listed in Table 2.5.7-1.
		b. Tests will be performed using controls on the PICS operator workstations in the RSS.	b. Controls on the PICS operator workstations in the RSS perform the function listed in Table 2.5.7-1.
5.1	Each NUPS battery is able to provide power for starting and operating design loads for a minimum of two hours when the ac supply to the battery charger is lost.	a. An analysis will be performed to determine if each as-built NUPS battery is able to provide power for starting and operating analyzed design loads for a minimum time of two hours while battery terminal voltage remains above minimum voltage required for the design loads.	a. An analysis concludes each NUPS battery is able to provide power for starting and operating analyzed design loads for a minimum time of two hours while battery terminal voltage remains above minimum voltage required for the design loads.
		b. A battery discharge test will be performed to verify the capacity of each NUPS battery is equal to or greater than the analyzed battery design duty cycle.	b. The capacity of each NUPS battery is equal to or greater than the analyzed battery design duty cycle.

Table 2.5.7-2—Non-Class 1E Uninterruptible Power Supply System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.2	Each NUPS battery charger supplies assigned NUPS loads while maintaining the respective NUPS battery charged.	a. An analysis will be performed to determine if each as-built NUPS battery charger rating is greater than the analyzed load requirements. b. A battery charger capacity test will be performed to verify each NUPS battery charger can maintain an output current that can supply the assigned NUPS loads while maintaining the respective NUPS battery charged.	a. An analysis concludes each NUPS battery charger rating is greater than the analyzed load requirements. b. Each NUPS battery charger can maintain an output current that can supply the assigned NUPS loads while maintaining the respective NUPS battery charged.
5.3	The NUPS inverters are sized to power the design NUPS loads on the respective supplied MCC.	An test and analysis will be performed to verify as-built NUPS inverters are sized to power the design NUPS loads on the respective supplied MCC.	A report concludes each NUPS inverter rating is greater than the analyzed load requirements.
5.4	Physical separation exists between Class 1E division reactor trip breakers.	An inspection will be performed to verify that the as-built Class 1E reactor trip breakers are located in separate Safeguard Buildings.	The Class 1E reactor trip breakers are located in separate cabinets within the control rod drive mechanism distribution panels in separate Safeguard Buildings.
5.5	The reactor trip breakers open when a signal is provided to the shunt trip coil.	A test will be performed using test input signals to verify that the reactor trip breakers open when a signal is provided to the shunt trip coil.	The reactor trip breakers open when the shunt trip coil is energized.
6.1	The reactor trip breakers open on a protection system reactor trip signal.	A test will be performed using test input signals to verify that the reactor trip breakers open on a protection system reactor trip signal.	The reactor trip breakers open on a protection system reactor trip test input signal.

Figure 2.5.7-1—Deleted

Next File