Sequoyah Nuclear Plant (SQN)

TVA Nuclear

ITS Project

Electrical Systems Presentation

March 13, 2014

Agenda

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- Purpose of Proposed Changes
- Shutdown Board Maintenance
- SQN Electrical Design
- Current Technical Specifications (CTS)
- Improved Technical Specifications (ITS)
- ITS Example
- Summary

Purpose of Proposed Changes

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- Relax overly restrictive CTS electrical requirements for systems shared between units
- Facilitate Shutdown Board maintenance without requiring a dual unit outage

Shutdown Board Maintenance

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- Periodic preventive maintenance is required for electrical boards
- Shutdown Boards are shared between Unit 1 and Unit 2
- CTS require a dual unit outage to allow enough time to complete Shutdown Board maintenance
- Current Shutdown Board preventive maintenance has been deferred

Shutdown Board Maintenance

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Changes Needed to Allow Shutdown Board Maintenance Without a Dual Unit Outage

- License amendment to allow one ERCW Pump per train
- Plant modification to the auxiliary control air system
- ITS implemented

SQN Electrical Design

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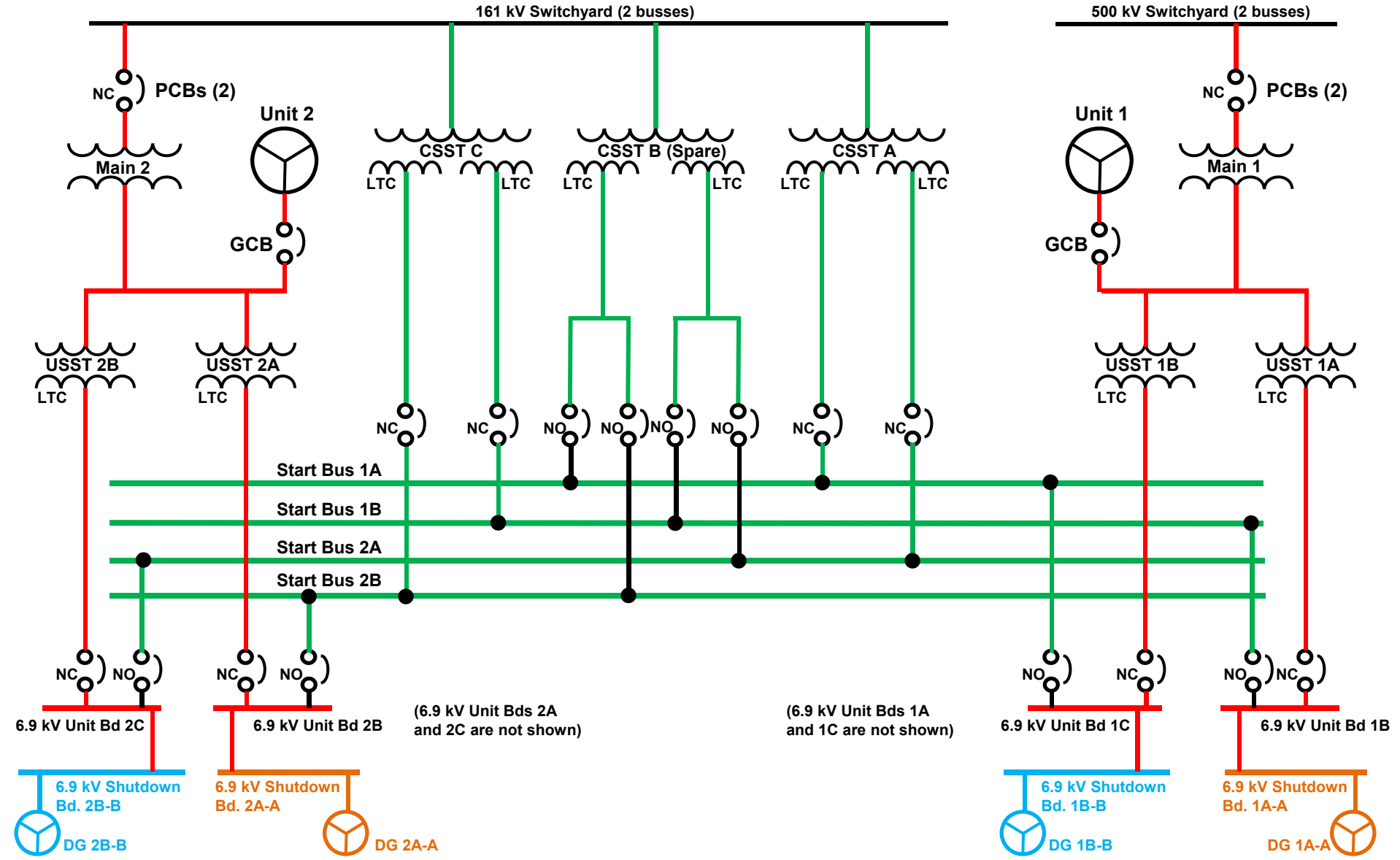
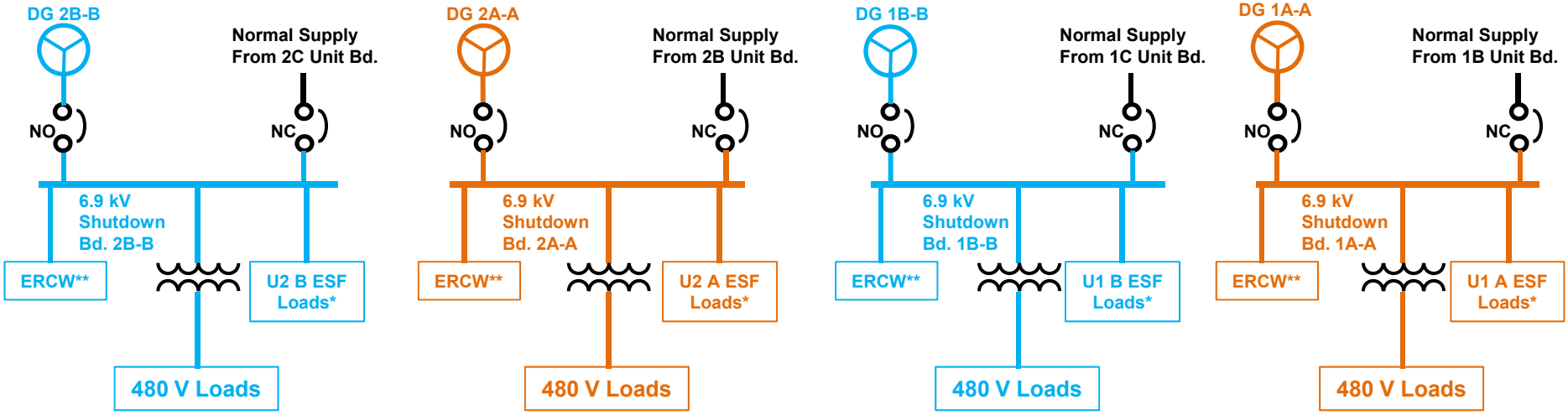
- The following slides show the SQN electrical system from the switchyard to the onsite Class 1E distribution system
- There are two load groups, each load group is powered from two 6.9 kV shutdown boards
  - Load Group A (1A-A and 2A-A)
  - Load Group B (1B-B and 2B-B)

SQN Electrical Design – Normal Alignment



Safety Related Power Distribution System – Normal Alignment, Both Units in Operation



**Shared System

*Unit Specific ESF Loads
CCP, SIP, RHR, AFW, CSS, Przr Heaters

Current Technical Specifications

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LCO 3.8.1.1 As a minimum, the following AC electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and
b. Four separate and independent diesel generators (DGs). . .

APPLICABILITY: MODES 1, 2, 3, and 4.

Current Technical Specifications

Nuclear

ACTION:

a. With one offsite circuit inoperable restore offsite circuit within 72 hours.

b. With DGs 1A-A and/or 2A-A or 1B-B and/or 2B-B inoperable restore DGs within 7 days.

c. With one offsite circuit and one DG inoperable restore one of the inoperable sources within 12 hours.

d. With two offsite circuits inoperable restore one offsite source within 24 hours.

e. With either DGs 1A-A and/or 2A-A inoperable simultaneously with 1B-B and/or 2B-B inoperable, restore either: 1) 1A-A and 2A-A, or 2) 1B-B and 2B-B. . . within 2 hours.

Current Technical Specifications

Nuclear

LCO 3.8.2.1 The following AC electrical boards shall be OPERABLE and energized with tie breakers open between redundant boards:

6900 Volt Shutdown Boards 1A-A & 1B-B
6900 Volt Shutdown Boards 2A-A & 2B-B
480 Volt Shutdown Boards 1A1-A, 1A2-A, 1B1-B, & 1B2-B
480 Volt Shutdown Boards 2A1-A, 2A2-A, 2B1-B, & 2B2-B
120 Volt A.C. Vital Instrument Power Board Channels 1-I and 2-I energized from inverters 1-I and 2-I
120 Volt A.C. Vital Instrument Power Board Channels 1-II and 2-II energized from inverters 1-II and 2-II
120 Volt A.C. Vital Instrument Power Board Channels 1-III and 2-III energized from inverters 1-III and 2-III
120 Volt A.C. Vital Instrument Power Board Channels 1-IV and 2-IV energized from inverters 1-IV and 2-IV

APPLICABILITY: MODES 1, 2, 3, and 4.

Current Technical Specifications

Nuclear

ACTION:

a. With less than the above compliment of AC boards OPERABLE and energized, restore the inoperable boards to OPERABLE status within 8 hours. . .

Current Technical Specifications

Nuclear

OPERABLE - OPERABILITY

A system, subsystem, train, or component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, a normal and {emphasis added} an emergency electrical power source, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

Current Technical Specifications

Nuclear

LCO 3.0.5

When a system, subsystem, train, component or device is determined to be inoperable solely because its emergency power source is inoperable, or solely because its normal power source is inoperable, it may be considered OPERABLE for the purpose of satisfying the requirements of its applicable Limiting Condition for Operation, provided: (1) its corresponding normal or emergency power source is OPERABLE; and (2) all of its redundant system(s), subsystem(s), train(s), component(s) and device(s) are OPERABLE, or likewise satisfy the requirements of this Specification. Unless both conditions (1) and (2) are satisfied, within 2 hours action shall be initiated to place the unit in a MODE in which the applicable Limiting Condition for Operation does not apply by placing it as applicable in:

1. At least HOT STANDBY within the next 6 hours,
2. At least HOT SHUTDOWN within the following 6 hours, and
3. At least COLD SHUTDOWN within the subsequent 24 hours.

This Specification is not applicable in MODES 5 or 6.

Improved Technical Specifications

Nuclear

LCO 3.8.1 The following AC electrical sources shall be OPERABLE:

a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; and
b. Four diesel generators (DGs) capable of supplying the onsite Class 1E AC Electrical Power Distribution System.

APPLICABILITY: MODES 1, 2, 3, and 4.

Improved Technical Specifications

Nuclear

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One offsite circuit inoperable for reasons other than Condition C.	A.1	Perform SR 3.8.1.1 for OPERABLE offsite circuit.	1 hour AND Once per 8 hours thereafter
	AND		
	A.2	Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to 6.9 kV Shutdown Board 1A-A or 1B-B concurrent with inoperability of redundant required feature(s)
	AND		
	A.3	Restore offsite circuit to OPERABLE status.	72 hours

Highlighted portions of ITS Action A reflect CTS Action a requirements for the restoration of an inoperable offsite circuit, with the exception that inoperable offsite power sources to Shutdown Board 2A-A or 2B-B are addressed in Condition C.

Improved Technical Specifications

Nuclear

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. DG 1A-A inoperable. OR DG 1B-B inoperable. OR DGs 1A-A and 2A-A inoperable. OR DGs 1B-B and 2B-B inoperable.	B.1	Perform SR 3.8.1.1 for the offsite circuits.	1 hour AND Once per 8 hours thereafter
	AND		
	B.2	Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	AND		
	B.3.1	Determine OPERABLE DGs are not inoperable due to common cause failure.	24 hours
	OR		
	B.3.2	Perform SR 3.8.1.2 for OPERABLE DGs.	24 hours
	AND		
	B.4	Restore DG(s) to OPERABLE status.	7 days

Highlighted portions of ITS Action B reflect CTS Action b requirements for the restoration of inoperable DG(s), with the exception that inoperable DGs on Shutdown Boards 2A-A and 2B-B are addressed in Condition D.

Improved Technical Specifications

Nuclear

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. Two offsite circuits inoperable.	E.1	Declare required feature(s) inoperable when its redundant required feature(s) is inoperable.	12 hours from discovery of Condition E concurrent with inoperability of redundant required features
	AND		
	E.2	Restore one offsite circuit to OPERABLE status.	24 hours

Highlighted portions of ITS Action E reflect CTS Action d requirements for the restoration of an inoperable offsite circuit.

Improved Technical Specifications

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CONDITION	REQUIRED ACTION	COMPLETION TIME
F. One offsite circuit inoperable for reasons other than Condition C. AND DG 1A-A or 1B-B inoperable.	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating," when Condition F is entered with no AC power source to 6.9 kV Shutdown Board 1A-A or 1B-B. ---------- F.1 Restore offsite circuit to OPERABLE status. OR F.2 Restore DG to OPERABLE status.	 12 hours 12 hours

Highlighted portions of ITS Action F reflect CTS Action c requirements for the restoration of either an inoperable offsite power source or a DG, with the exception that combinations involving inoperable offsite power sources and/or DGs to Shutdown Board 2A-A or 2B-B are addressed in Conditions G, H or I.

Improved Technical Specifications

Nuclear

CONDITION	REQUIRED ACTION	COMPLETION TIME
J. One or more Train A DG(s) inoperable. AND One or more Train B DG(s) inoperable.	J.1 Restore one train of DGs to OPERABLE status.	2 hours

Highlighted portions of ITS Action J reflect CTS Action e requirements for the restoration of one train of inoperable DGs.

Improved Technical Specifications

Nuclear

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One offsite circuit inoperable solely due to an offsite power source to 6.9 kV Shutdown Board 2A-A or 2B-B inoperable.	C.1	Perform SR 3.8.1.1 for OPERABLE offsite circuit.	1 hour AND Once per 8 hours thereafter
	AND		
	C.2	Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to 6.9 kV Shutdown Board 2A-A or 2B-B concurrent with inoperability of redundant required feature(s)
	AND		
	C.3	Declare associated required feature(s) inoperable.	7 days

ITS Action C contains Required Actions for an inoperable offsite power source to Shutdown Board 2A-A or 2B-B.

Requires declaring required features with no offsite power available inoperable 24 hours from discovery of concurrent inoperable redundant feature, or 7 days from time offsite power source declared inoperable.

Improved Technical Specifications

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. DG 2A-A or 2B-B inoperable.	D.1	Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	1 hour AND Once per 8 hours thereafter
	AND		
	D.2	Declare required feature(s) supported by the inoperable DG inoperable when its redundant required feature(s) is inoperable.	4 hours from discovery of Condition D concurrent with inoperability of redundant required feature(s)
	AND		
	D.3.1	Determine OPERABLE DGs are not inoperable due to common cause failure.	24 hours
	OR		
	D.3.2	Perform SR 3.8.1.2 for OPERABLE DGs.	24 hours
	AND		
	D.4	Declare associated required feature(s) inoperable.	7 days

ITS Action D contains Required Actions for an inoperable DG to Shutdown Board 2A-A or 2B-B.

Requires declaring required features supported by the inoperable DG inoperable 4 hours from discovery of concurrent inoperable redundant features, or 7 days from time DG declared inoperable.

Improved Technical Specifications

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CONDITION	REQUIRED ACTION	COMPLETION TIME
G. One offsite circuit inoperable solely due to an offsite power source to 6.9 kV Shutdown Board 2A-A or 2B-B inoperable. AND DG 1A-A or 1B-B inoperable.	G.1 Declare required feature(s) on associated Unit 2 6.9 kV Shutdown Board inoperable.	7 days

ITS Action G contains requirements related to a combination of an inoperable offsite power source to Shutdown Board 2A-A or 2B-B with an inoperable Unit 1 DG.

Required Action for declaring required features supported by the inoperable DG or offsite circuit inoperable with concurrent inoperable redundant features are addressed in ACTIONS A, B, C, and D, as applicable.

Improved Technical Specifications

Nuclear

CONDITION	REQUIRED ACTION	COMPLETION TIME
H. One offsite circuit inoperable for reasons other than Condition C. AND DG 2A-A or 2B-B inoperable.	H.1 Declare required feature(s) on associated Unit 2 6.9 kV Shutdown Board inoperable.	7 days

ITS Action H contains requirements related to a combination of an inoperable offsite power source to Shutdown Board 1A-A or 1B-B with an inoperable Unit 2 DG.

Required Action for declaring required features supported by the inoperable DG or offsite circuit inoperable with concurrent inoperable redundant features are addressed in ACTIONS A, B, C, and D, as applicable.

Improved Technical Specifications

Nuclear

CONDITION	REQUIRED ACTION	COMPLETION TIME
I. One offsite circuit inoperable solely due to an offsite power source to 6.9 kV Shutdown Board 2A-A or 2B-B inoperable. AND DG 2A-A or 2B-B inoperable.	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating," when Condition I is entered with no AC power source to 6.9 kV Shutdown Board 2A-A or 2B-B. ---------- I.1 Restore offsite circuit to OPERABLE status. OR I.2 Restore DG to OPERABLE status.	 7 days 7 days

ITS Action I contains requirements related to a combination of an inoperable offsite power source and DG to Shutdown Board 2A-A or 2B-B.

Required Actions for declaring required feature(s) supported by the inoperable DG or offsite circuit inoperable with concurrent inoperable redundant feature(s) are addressed in ACTIONS A, B, C, and D, as applicable.

Note requires entering Conditions and Required Actions of LCO 3.8.9 when 6.9 kV Shutdown Board 2A-A or 2B-B is de-energized.

Improved Technical Specifications

Nuclear

LCO 3.8.9 Train A and Train B AC, vital DC, AC vital, and diesel generator (DG) DC electrical power distribution subsystems shall be OPERABLE.

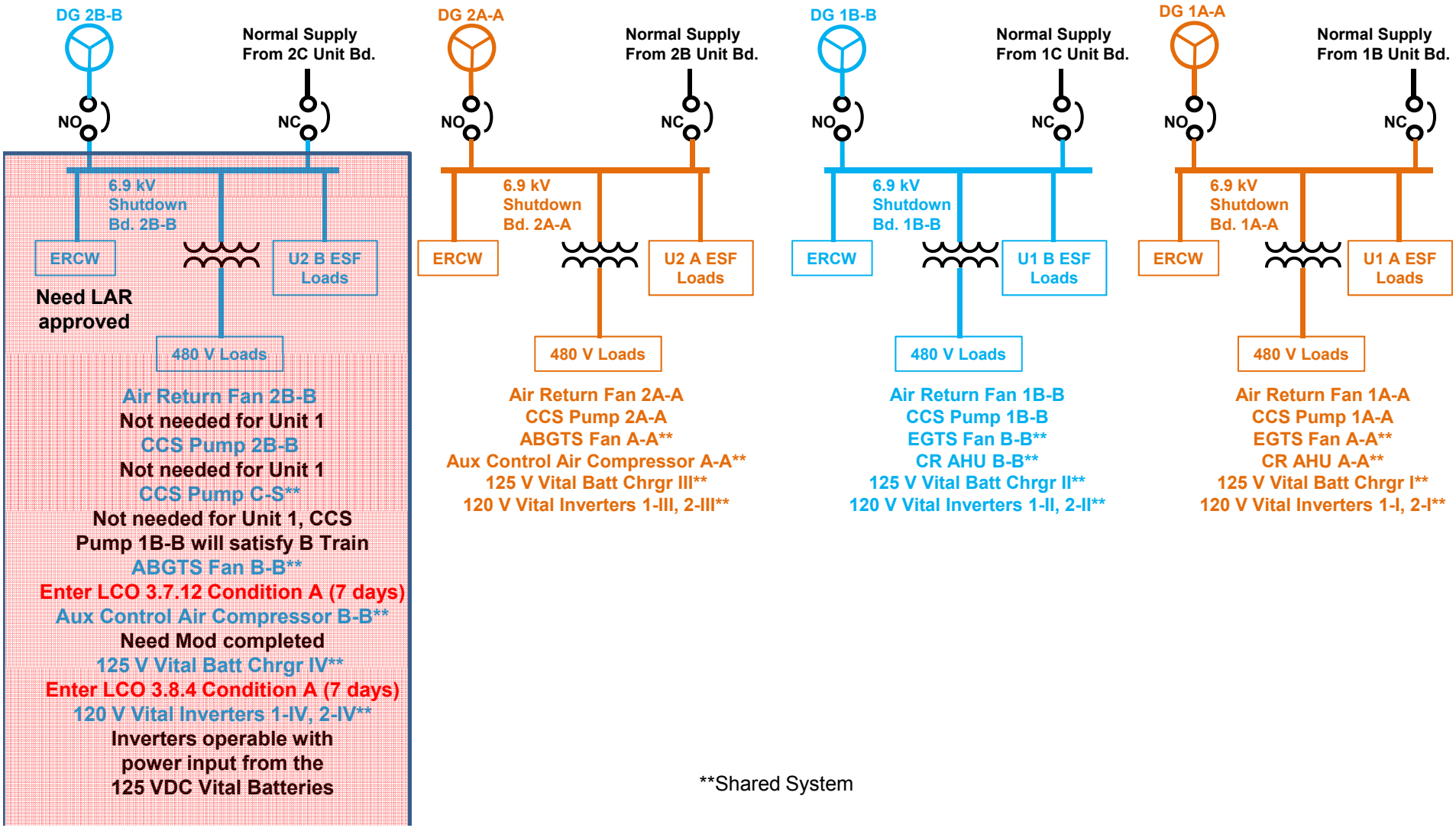
APPLICABILITY: MODES 1, 2, 3, and 4.

Improved Technical Specifications

Nuclear

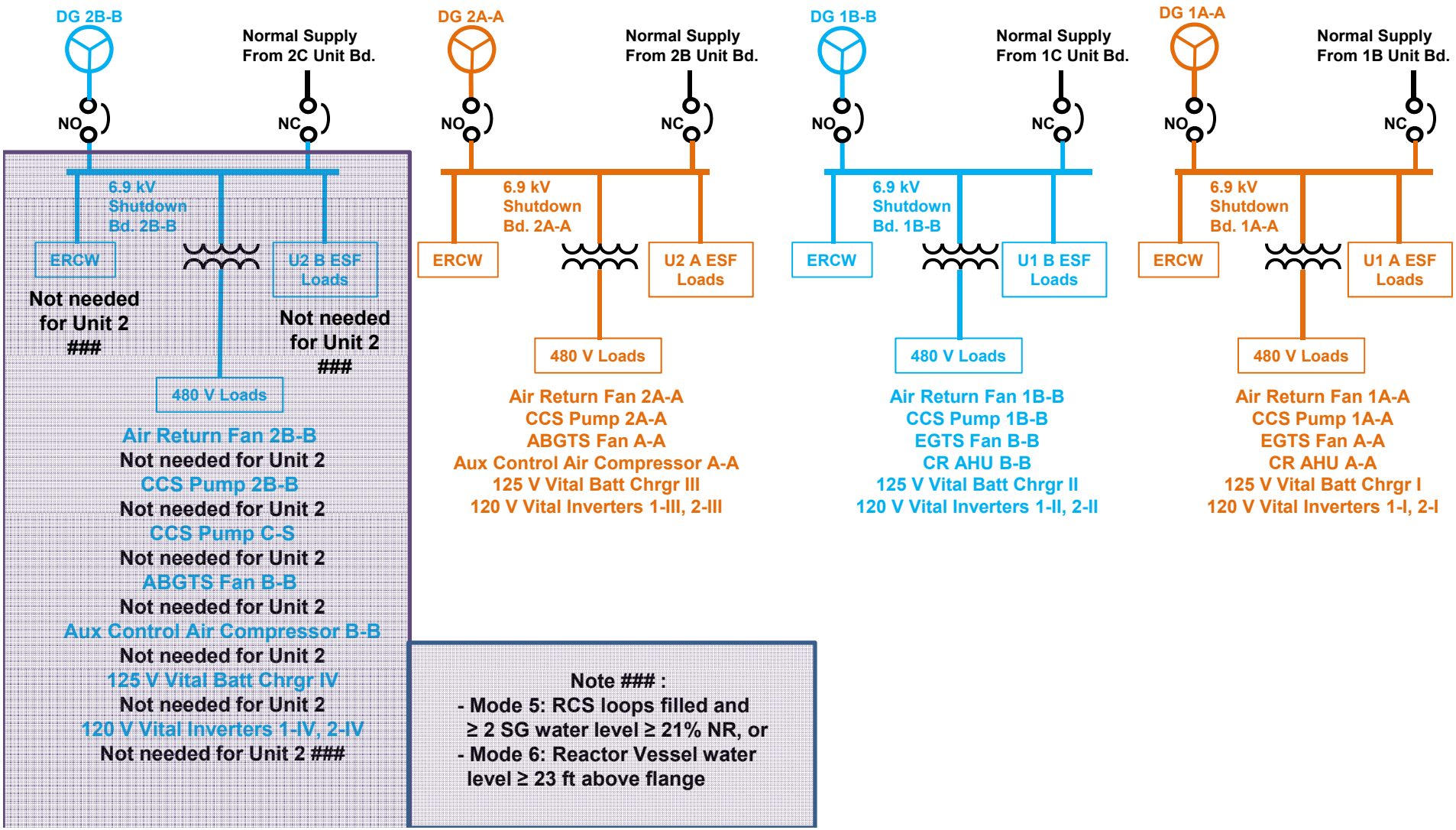
CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Unit 1 AC electrical power distribution subsystems inoperable.	A.1 ----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources - Operating," for vital DC trains made inoperable by inoperable power distribution subsystems. ---------- Restore Unit 1 AC electrical power distribution subsystem(s) to OPERABLE status.	8 hours
B. One or more AC vital subsystems inoperable.	B.1 Restore AC vital subsystem(s) to OPERABLE status.	8 hours
C. One vital DC electrical power distribution subsystem inoperable.	C.1 Restore vital DC electrical power distribution subsystem to OPERABLE status.	2 hours
D. One or more Unit 2 AC electrical power distribution subsystems inoperable.	D.1 Declare associated required feature(s) inoperable.	Immediately

ITS Example – Shutdown Board 2B-B De-Energized; Unit 1 in Mode 1-4 (Unit 2 in Mode 5 or 6)



**Shared System

ITS Example – Shutdown Board 2B-B De-Energized; Unit 2 in Mode 5 or 6



Summary

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- Changes to the SQN TSs are required to facilitate 6.9 kV and 480 V board maintenance and alleviate the overly restrictive CTS requirements
- ITS will establish controls commensurate with the safety function of the affected equipment
- Additional Actions for inoperable AC power sources (or de-energized boards) on the opposite unit have been developed
- ITS LCO 3.8.1 Actions will require declaring required features supported by the inoperable AC power source inoperable when redundant features are also inoperable, with a backstop
- ITS LCO 3.8.9 Actions will require declaring the required features supported by the de-energized board inoperable immediately