ATTACHMENT 1

PROPOSED CHANGES

TO THE

AUXILIARY ELECTRIC SYSTEM

Specification LCO 4.4-1

TABLE 4.4-1

INSTRUMENT OPERATING REQUIREMENTS FOR PLANT PROTECTIVE SYSTEM, SCRAM

NO.	FUNCTIONAL UNIT	TRIP SETTING	MINIMUM OPERABLE CHANNELS	MINIMUM DEGREE OF REDUNDANCY	PERMISSIBLE BYPASS CONDITIONS
1a.	Manual (Control Room)	--	1	0	None
1b.	Manual (Emergency Board)	--	2 (f)	1	None
2.	Startup Channel-High	≤ 10^5 cps	2	1	Reactor Mode Sw. in "RUN"
3a.	Linear Channel-High, Channels 3, 4, 5	< 140% power (a)	2 (f)	1	None
3b.	Linear Channel-High, Channels 6, 7, 8	< 140% power (a)	2 (f)	1	None
4.	Primary Coolant Moisture				
	High Level Monitor	<67°F Dewpoint	1 (f,t)	1 (c)	None
	Loop Monitor	≤27°F Dewpoint	2/Loop(f,t)	1/Loop	(h)
5.	Reheat Steam Temperature - High (b)	≤ 1075°F (a)	2(b)(f)	1	None
6.	Primary Coolant Pressure - Low	≤ 50 psig below normal, load programmed (a)	2(f)(k)	1	Less than 30% rated power
7.	Primary Coolant Pressure - High	≤ 7.5% above normal rated, load programmed (a)	2 (f) (k)	1	None
8.	Hot Reheat Header Pressure - Low	≥ 35 psig	2 (f)	1	Less than 30% rated power
9.	Main Steam Pressure - Low	≥ 1500 psig	2 (f)	1	Less than 30% rated power
10.	Plant Electrical System-Loss	≥ 274V (d)	2 (e) (f)	1	None
11.	Two Loop Trouble	--	2	1	Reactor mode switch in "Fuel Loading"
12.	High Reactor Building Temperature (Pipe Cavity)	≤ 325°F	2 (f)	1	None

Specification LCO 4.4.1

NOTES FOR TABLES 4.4-1 THROUGH 4.4-4

(a) See Specification LSSS3.3 for trip setting.

(b) Two thermocouples from each loop, total of four, constitute one channel. For each channel, two thermocouples must be operable in at least one operating loop for that channel to be considered operable.

(c) With one primary coolant high level moisture monitor tripped, trips of either loop primary coolant moisture monitors will cause full scram. Hence, number of operable channels (1) minus minimum number required to cause scram (0) equals one, the minimum degree of redundancy.

(d) Loss of voltage on 2 of 3 480V A.C. essential busses for no longer than 35 seconds.

(e) One channel monitors each of the three 480 V A.C. essential busses. A channel trip will occur when two of the three bus undervoltage relays comprising that channel de-energize (ie. relays are de-energized during a bus undervoltage condition).

(f) The inoperable channel must be in the tripped condition, unless the trip of the channel will cause the protective action to occur.

(g) RWP bypass permitted if the bypass also causes associated single channel scram.

(h) Permissible Bypass Conditions:

I. Any circulator buffer seal malfunction.
II. Loop hot reheat header high activity.
III. As stated in LCO 4.9.2.

(j) Items 1a. or 1c. or 1d. accompanied by 2a., 2b., 2c., or 2d. on Table 4.4-2 are required for loop 1 shutdown. Items 1b. or 1c. or 1f., accompanied by 2a., 2b., 2c., or 2d. on Table 4.4-2 are required for loop 2 shutdown.

(k) One operable helium circulator inlet thermocouple in an operable loop is required for the channel to be considered operable.

(m) Low Power RWP bistable resets at 4% after reactor power initially exceeds 5%.

(n) Power range RWP bistables automatically reset at 10% after reactor power is decreased from greater than 30%. The RWP may be manually reset between 10% and 30%.

(p) Item 7a. must be accompanied by item 7c for Loop 1 shutdown. Item 7b. must be accompanied by item 7c. for loop 2 shutdown.

4.6 AUXILIARY ELECTRIC POWER SYSTEM - LIMITING CONDITIONS FOR OPERATIONS

Applicability

Applies to the minimum operable equipment supplying electric power to the plant auxiliaries.

Objective

To ensure that the capability of supplying electric power to the plant auxiliaries is maintained by defining the minimum operable equipment.

Specification LCO 4.6.1 - Auxiliary Electric System, Limiting Conditions for Operation

As a minimum, the following conditions shall be met with regard to the Auxiliary Electric System.

1. With the reactor in a shutdown condition, the following shall be operable (see Note 1):

   a) One A.C. circuit between the offsite transmission network and the 480V A.C. essential distribution system,

   b) One diesel generator set with:

      1) 325 gallons of fuel contained in the diesel fuel oil day tank,

2) A minimum of 10,000 gallons of fuel in storage,

3) One fuel oil transfer pump from the diesel fuel oil storage tank to the diesel fuel oil day tank,

4) One starting air compressor and receiver,

5) One Boiler Fuel Oil pump operable between the auxiliary boiler fuel supply and the diesel fuel oil day tank(s).

c) Either Battery 1A or Battery 1B, its associated D.C. bus, and a battery charger capable of supplying the battery (see Note 2),

d) The following electrical busses energized as specified:

1) One 4160V A.C. bus and an associated 480V A.C. essential bus,

2) Two 120V A.C. non-interruptible busses energized from their associated inverters connected to their respective D.C. busses,

3) One 125V D.C. bus energized from its associated battery

2. With the reactor in low power or power operation, the following shall be operable:

   a) Two physically independent A.C. circuits between the offsite transmission network and the 480V A.C. essential distribution system (see Notes 3 and 4)

   b) Both diesel-generator sets (see Notes 3, 4, 5, and 6) with:

      1) 325 gallons of fuel contained in each diesel fuel oil day tank,

      2) A minimum of 20,000 gallons of fuel in underground storage (see Note 7),

      3) One fuel oil transfer pump from the diesel fuel oil storage tank to the diesel fuel oil day tanks,

      4) One starting air compressor and receiver per diesel generator set.

      5) One Boiler Fuel Oil Pump operable between the auxiliary boiler fuel supply and the diesel fuel oil day tanks (see Note 8).

   c) 4160V A.C. Bus 1B and either 4160V A.C. Bus 1A or 1C (see Notes 9 and 10). These busses must also be energized and tie breakers open between those with different electrical power sources.

d) The auxiliary power 480V A.C. essential busses 1A, 1B, and 1C (see Notes 9 and 11). These busses must also be energized and tie breakers open between those with different electrical power sources.

e) The following 120V A.C. busses (see Note 12):

1) Non-interruptible A.C. Busses 1A and 1A-1 energized from their associated inverter connected to D.C. Bus 1A,

2) Non-interruptible A.C. Busses 1B and 1B-1 energized from their associated inverter connected to D.C. Bus 1B,

3) Non-interruptible A.C. Busses 1C and 1C-1 energized from their associated inverter connected to Battery 1C,

f) The following 125V D.C busses (see Notes 13 and 14):

1) D.C. Bus 1A energized from Battery 1A,

2) D.C. Bus 1B energized from Battery 1B,

There are no closed connections between the various D.C. sources.

g) The following 125V D.C. electrical sources (see Notes 2 and 15):

1) Battery 1A and its associated charger, Battery Charger 1A,

2) Battery 1B and its associated charger, Battery Charger 1B,

3) Battery 1C and its associated charger, Battery Charger 1C,

Battery Charger 1D can be associated with one battery at any given time.

NOTES FOR SPECIFICATION LCO 4.6.1

NOTE 1: With less than the minimum required electrical power sources and distribution systems operable, immediately suspend all operations involving core alterations, positive reactivity changes, or movement of irradiated fuel, and initiate corrective action to restore the required sources and distribution systems to an operable status as soon as possible.

NOTE 2: If a battery charger becomes inoperable, demonstrate the operability of the associated battery by performing the requirements of SR 5.6.2.a)1) within one hour and at least once per eight hours thereafter, or declare the battery inoperable.

NOTE 3: With either an offsite circuit or diesel generator set inoperable, demonstrate the operability of the remaining A.C. sources by performing the requirements of SR 5.6.1.1.a) within one hour and every 8 hours thereafter, and SR 5.6.1.2.a)5) within one hour unless the operability of the diesel generator set(s) has been confirmed as specified within the previous 8 hours; restore the required A.C. electrical power sources to an operable status within 72 hours, or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 4: With one offsite circuit and one diesel generator set inoperable, demonstrate the operability of the remaining A.C. sources by performing the requirements of SR 5.6.1.1.a) within one hour and every 8 hours thereafter, and SR 5.6.1.2.a)5 within one hour unless the operability of the diesel generator set(s) has been confirmed as specified within the previous 8 hours; restore at least one of the inoperable A.C. sources to an operable status within 12 hours, or initiate an orderly shutdown and be in a shutdown condition within the next 24 hours. Restore the required A.C. electrical sources within 72 hours from the time of the initial loss or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 5: With both diesel generator sets inoperable, demonstrate the operability of two offsite A.C. circuits by performing the requirements of SR 5.6.1.1.a) within 1 hour and every 8 hours thereafter. Restore at least one of the inoperable diesel generator sets to an operable status within 2 hours or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours. Restore both diesel generator sets to an operable status within 72 hours from the time of the initial loss or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 6: With one diesel generator set inoperable, in addition to the actions required in Notes 3 or 4, verify that:

1) The Engine Driven Fire Pump is operable.

2) The Emergency Condensate header is operable.

3) All equipment supplied by the operable diesel generator set associated with Safe Shutdown Cooling is operable.

If these conditions are not satisfied within 2 hours, initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 7: Upon reaching the minimum quantity, the auxiliary boiler(s) shall be shutdown.

NOTE 8: Both Boiler Fuel Oil Pumps may be inoperable for up to 24 hours if at least 5,500 gallons of fuel oil are in the diesel oil storage tank, and both fuel oil transfer pumps between the diesel oil storage tank and the day tanks are operable.

NOTE 9: With one of the required 4160V A.C. busses or one of the required 480V A.C. essential busses not energized, but operable, re-energize the bus within 8 hours, or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 10: With one of the required 4160V A.C. busses inoperable, verify within one hour that:

1) The 480V A.C. essential busses are operable, and,

2) Both diesel generator sets are operable as demonstrated by performing the requirements of SR 5.6.1.2.a)5), unless the operability has been confirmed as specified within the previous 8 hours.

If the required 4160V A.C. bus cannot be returned to an operable status within 12 hours, initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 11: With one of the required 480V A.C. essential busses inoperable, verify within one hour that:

1) The required 4160V A.C. busses are operable,

2) The Engine Driven Fire Pump is operable,

3) The Emergency Condensate Header is operable,

4) The diesel generator set(s) supplying the remaining operable 480V essential busses is (are) operable as demonstrated by performing the requirements of SR 5.6.1.2.a)5), unless the operability has been confirmed as specified within the previous 8 hours.

5) All equipment supplied by the operable diesel generator set associated with Safe Shutdown Cooling is operable.

If the required 480V A.C. essential bus cannot be returned to an operable status within 12 hours, initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 12: With one of the required 120V A.C. busses either not energized from its associated inverter, or with the inverter not connected to its associated D.C bus: (1) re-energize the required 120V A.C. bus within 2 hours, or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours; and (2) re-energize the required 120V A.C. bus from its associated inverter connected to its associated D.C. bus within 24 hours, or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 13: A battery and associated battery charger may be disconnected from its associated D.C. bus for up to 24 hours, as necessary, for the purpose of overcharging the battery provided (1) its associated 120V A.C. busses are energized, and (2) the 120V A.C. busses associated with their other batteries are energized from their associated inverters and connected to their associated D.C. source.

NOTE 14: With one D.C bus not energized from its associated battery (except in the case presented in NOTE 12), re-energize the

D.C. Bus from its associated battery within 2 hours, or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

NOTE 15: With one of the required batteries inoperable, restore the inoperable battery to an operable status within 2 hours, or initiate an orderly shutdown, and be in a shutdown condition within the next 24 hours.

Basis for Specification LCO 4.6.1

The operability of the A.C. and D.C. power sources and associated distribution systems during low power and power operation ensures that sufficient power will be available, as required to perform the intended safety functions under postulated abnormal and accident conditions. The minimum specified independent and redundant A.C. and D.C. power sources and distribution systems satisfy the requirements of General Plant Design Criterion No. 24 as stated in Appendix C of the FSAR.

The normal offsite A.C. power source to plant auxiliaries is the unit auxiliary transformer (UAT) energized by the main turbine-generator. The UAT can also be energized by the offsite transmission network after the links have been removed to isolate the turbine generator. The UAT is connected to the 4160V A.C. busses 1A and 1C.

The alternate offsite A.C. power source is the reserve auxiliary transformer (RAT), normally energized by the

offsite transmission network. The RAT is connected to the 4160V A.C. Bus 1B. This bus can supply, or be supplied from, the other 4160V A.C. busses through tie breaker connections. Upon loss of power from the UAT, power supply to the plant auxiliaries is automatically transferred to the RAT.

Each 4160V A.C. bus can supply an associated 480V A.C. essential bus through a stepdown transformer. Two standby diesel generator sets (comprised of two engines and one generator per set) each supply onsite 480V A.C. power to one 480V A.C. essential bus (bus 1 and bus 3, respectively). Either stepdown transformer or diesel generator set is capable of supplying two of the 480V A.C. essential busses through tie breaker connections. First-in-with-lockout features prevent different power sources from being connected to one another. Redundant 2 out of 3 undervoltage relays are provided on each 480V A.C. essential bus. Undervoltage in two of these busses automatically results in load shedding, startup of the diesel generator sets, and loading by the sequencer.

Operation of both diesel generator sets for Safe Shutdown Cooling, at the required capacity for a week, requires about 20,000 gallons of fuel oil. Such a reserve capacity provides ample time for obtaining additional fuel for continued operation of the diesel generator sets. Storage is distributed between a diesel generator fuel tank and two auxiliary boiler fuel oil tanks. Fuel oil transfer

pumps are provided to supply the day tanks from either fuel storage tank.

There are three separate instrument A.C. and D.C. power sources and distribution systems. Each one includes a battery and battery charger, an inverter, and associated distribution busses. A backup battery charger can be connected to any of the batteries. The normal operating configuration is as specified above in LCO 4.6.1.

Section 8 of the FSAR includes a detailed description of the auxiliary electric power system.

The notes specify action requirements for various allowable levels of degradation of the power sources, and provide restrictions upon continued facility operation commensurate with the level of degradation. The operability of the power sources is consistent with the initial condition assumptions of the safety analyses and are based upon maintaining at least one of the redundant sets of onsite A.C. and D.C. power sources and associated distribution systems operable during accident conditions which postulate the loss of offsite power, compounded by a single failure of the other redundant onsite sources.

The operability of the minimum specified A.C. and D.C. power sources and associated distribution systems during shutdown ensures that the facility can be maintained in the appropriate condition for extended time periods, and

that sufficient instrument and control capability is available for monitoring and maintaining the unit status.

Table 5.4-1

MINIMUM FREQUENCIES FOR CHECKS, CALIBRATIONS, AND TESTING OF SCRAM SYSTEM (continued)

Channel Description	Function	Frequency (1)	Method
11. Hot Reheat Header Pressure	a. Test	M	a. Reduce pressure at sensor to trip channel, verify alarms and indications.
	b. Calibrate	R	b. Known pressure applied at sensor to adjust trips.
12. Main Steam Pressure	a. Test	M	a. Reduce pressure at sensor to trip channel, verify alarms and indications.
	b. Calibrate	R	b. Known pressure applied at sensor to adjust trips.
13. Two Loop Trouble	a. Test	M	a. Special test module used to trip channel by energizing each of four appropriate pairs of two-loop trouble relays.
	b. Test	R	b. Trip logic to cause two loop trouble scram.
14. Plant 480 V Power Loss	a. Test	M	a. Functionally test each undervoltage relay and channel by applying simulated loss of voltage signal(s); verify alarms and indications.
	b. Calibrate	R	b. Known voltage applied to relay. Adjust trip point and indications.
15. High Reactor Building Temperature (Pipe Cavity)	a. Check	D	a. Comparison of three separate channel indicators.
	b. Test	M	b. Trip channel, verify alarms and indications. Internal test signal to verify trips and alarms.
	c. Calibrate	R	c. Compare each thermocouple output to a NBS traceable standard to adjust temperature trip point.

NOTE 1: D - Daily when in use
M - Monthly
R - Once per refueling cycle
P - Prior to each start-up if not done previous week

5.6 EMERGENCY POWER SYSTEMS - SURVEILLANCE REQUIREMENTS

Applicability

Applies to the surveillance of the equipment supplying electrical power to the essential plant services.

Objective

To establish the minimum frequency and type of surveillance for equipment supplying electric power to the plant auxiliaries to ensure that the motive power sources required to safely shut down the plant are available.

Specification SR 5.6.1 - Emergency A.C. Power Sources Surveillance

The surveillance of the emergency A.C. power sources shall be as follows:

1. Each of the required independent A.C. circuits between the offsite transmission network and the onsite 480V A.C. essential distribution system shall be:

   a) Determined operable at least once per week by verifying correct breaker alignments, indicated power availability, and,

   b) Demonstrated operable at least once per 18 months during shutdown by transferring (manually and automatically) unit power supply from the normal circuit to the alternate circuit.

2. Each diesel generator set shall be demonstrated operable:

a) In accordance with the frequency specified in TABLE 5.6.1-1 on a STAGGERED TEST BASIS by:

1) Verifying the fuel level in the day tank,

2) Verifying the fuel level in storage,

3) Verifying the fuel transfer pump starts and transfers fuel from the storage system to the day tank,

4) Verifying the operability of the Boiler Fuel Oil pumps,

5) Verifying the diesel starts from ambient condition and accelerates to normal operating speed. The generator voltage and frequency shall be 480 ± 48 volts and 60 ± 1.2 Hz. within 10 seconds after the start signal. The diesel generator shall be started for this test by using one of the following signals:

a. Manual.

b. An undervoltage relay actuation test signal.

6) Verifying that after the generator is synchronized, it can be loaded to greater than or equal to 1200 KW in less than or equal to

60 seconds, and operates with a load greater than or equal to 1200 KW for at least 2 hours.

7) Verifying the diesel generator is aligned to provide standby power to the associated 480V A.C. essential bus(ses).

8) Verifying the operability of the diesel engine exhaust temperature "shutdown" and "declutch" protective functions.

b) After each operation of the diesel where the period of operation was greater than or equal to 1 hour by checking for and removing accumulated water from the day tank.

c) At least once per quarter by verifying that a sample of fuel oil obtained in accordance with ASTM-D270-1975 has a water and sediment content of less than or equal to .05 volume percent and a kinematic viscosity @ 40°C of greater than or equal to 1.9 but less than or equal to 4.1 when tested in accordance with ASTM-D975-77, and an impurity level of less than 2 mg. of insolubles per 100 ml. when tested in accordance with ASTM-D2274-70.

d) At least once per 18 months, during shutdown, by:

1) Subjecting the diesel to an inspection in accordance with the procedures prepared in conjunction with the manufacturer's recommendations,

2) Verifying the generator capability to reject a load of greater than or equal to 175kw while maintaining voltage at 480 ± 48 volts and frequency at 60 ± 1.2 Hz,

3) Verifying from the parallel condition the generator capability to reject a load of 1200 kw without tripping. The generator voltage shall not exceed 552 volts during and following the load rejection.

4) Verifying that with an undervoltage relay actuation test signal,

a. De-energization of the 480V A.C. essential busses and load shedding from the 480V A.C. essential busses.

b. The diesel starts on the auto-start signal, energizes the 480V A.C. essential busses within 10 seconds after the start signal, energizes the auto-connected emergency (accident) loads through the load sequencer and operates for greater than or equal to

5 minutes while its generator is loaded with the emergency loads. After energization, the steady state voltage and frequency of the 480V A.C. essential busses shall be maintained at 480 ± 48 volts and 60 ± 1.2 Hz during this test.

5) Verifying the diesel generator operates for at least 24 hours. During this test, the diesel generator shall be loaded to greater than or equal to 1200 kw. The generator voltage and frequency shall be 480 ± 48 volts and 60 ± 1.2 Hz within 10 seconds after the start signal; the steady state generator voltage and frequency shall be maintained within these limits during this test. Within 5 minutes after completing this 24-hour test, perform Surveillance Requirement SR 5.6.1.2.d)7)b.

6) Verifying the diesel generator's capability to:

   a. Synchronize with the offsite power source while the generator is loaded with it emergency loads upon a simulated restoration of offsite power,

   b. Transfer its loads to the offsite power source, and.

   c. Be restored to its standby status.

7) Verifying that each fuel oil transfer pump transfers fuel from the fuel storage tank to the day tank of each diesel via the installed cross-connection lines.

8) Verifying that the automatic load sequence timer is operable with the interval between each load block within ± 10% of its design interval.

9) Calibrating the diesel engine protective functions.

10) Verifying that the auto-connected loads to each diesel generator set do not exceed 1200 KW.

e) At least once per 10 years or after any modifications which could affect diesel generator interdependence by starting both diesel generators simultaneously, during shutdown, and verifying that both diesel generator sets accelerate to normal operating speed.

f) At least once per 10 years by draining each fuel oil storage tank, removing the accumulated sediment and cleaning the tank using a sodium hypoclorite solution.

3. The required A.C. busses shall be determined energized in the required manner at least once per week by verifying correct breaker alignment and indicated voltage on the busses.

4. The required D.C. busses shall be determined energized in the required manner at least once per week by verifying correct breaker alignment and indicated voltage on the busses.

TABLE 5.6.1-1

DIESEL GENERATOR TEST SCHEDULE

Number of Failures in Last 100 Valid Tests*	Test Frequency
≤ 1	At least once per month
2	At least once per two weeks
3	At least once per week
≥ 4	At least once per three days

* Criteria for determining number of failures and number of valid tests shall be in accordance with Regulatory Position C.2.e of Regulatory Guide 1.108, Revision 1, August 1977, where the last 100 tests are determined on a per nuclear unit basis. For the purposes of this test schedule, only valid tests conducted after the OL issuance date shall be included in the computation of the "last 100 valid tests." Entry into this test schedule shall be made at the monthly test frequency.

Basis for Specification SR 5.6.1

The above surveillance requirements are adequate to demonstrate the operability of the offsite and onsite A.C. power sources, and of the A.C. power distribution system to perform their intended safety functions under postulated abnormal and accident conditions.

In particular, the surveillance requirements for the standby diesel generator sets are consistent with the intent of Regulatory Guide 1.108 "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants", Revision 1, August 1977.

Specification SR 5.6.2 - D.C. Power Sources Surveillance

Each 125-volt battery bank and charger shall be demonstrated operable:

a) At least once per week by verifying that:

   1) The parameters in Table 5.6.2-1 meet the Category A limits, and,

   2) The total battery terminal voltage is greater than or equal to 129 volts on float charge.

b) At least once per quarter and within one week after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 150 volts, by verifying that:

1) The parameters in Table 5.6.2-1 meet the Category B limits,

2) There is no visible corrosion at either terminals or connectors, and,

3) The average electrolyte temperature of every fifth cell is above 60°F.

c) At least once per 18 months by verifying that:

1) The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration,

2) The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material,

3) The temperature difference of each cell-to-cell and terminal connection is less than 10°F, and,

4) The battery chargers will supply the manufacturer's name plate current for at least 8 hours at normal float voltage.

d) At least once per 18 months, during shutdown, by verifying that the battery capacity is adequate to supply and maintain in operable status all of the emergency loads for the design duty cycle when the battery is load-tested to partial discharge.

TABLE 5.6.2-1

BATTERY SURVEILLANCE REQUIREMENTS

	CATEGORY A (1)	CATEGORY B (2)	
Parameter	Limits for each designated pilot cell.	Limits for each connected cell.	Allowable value for each connected cell. (3)
Electrolyte Level	>Minimum level indication mark, and ≤ ¼" above maximum level indication mark.	>Minimum level indication mark, and ≤ ¼" above maximum level indication mark.	Above top of plates, and not overflowing.
Float Voltage	≥ 2.13 volts.	≥ 2.13 volts (c)	> 2.07 volts
		≥ 1.195	Not more than .020 below the average of all connected cells.
Specific Gravity(a)	≥ 1.200 (b)	Average of all connected cells > 1.205.	Average of all connected cells ≥ 1.195 (b)

(a) Corrected for electrolyte temperature and level.
(b) Or battery charging current is less than (2) amps when on charge.
(c) Corrected for average electrolyte temperature.
(1) For any Category A parameter(s) outside the limit(s) shown, the battery may be considered operable provided that within 24 hours all the Category B measurements are taken and found to be within their allowable values, and provided all Category A and B parameter(s) are restored to within limits within the next 6 days.
(2) For any Category B parameter(s) outside the limit(s) shown, the battery may be considered operable provided that the Category B parameters are within their allowable values and provided the Category B parameter(s) are restored to within limits within 7 days.
(3) Any Category B parameter not within its alowable value indicates an inoperable battery.

Numbers in parentheses assume a manufacturer's recommended full charge specific gravity of 1.205 to 1.220.

Basis for Specification SR 5.6.2

The type of battery surveillance called for in this specification has been demonstrated through experience to provide a reliable indication of a battery cell initial breakdown well before it becomes unserviceable. Since batteries will deteriorate with time, these periodic tests will avoid precipitious failure

The manufacturer's recommendation for equalizing charge is vital to maintenance of the ampere-hour capacity of the battery. As a check upon the effectiveness of this charge, each battery will be load tested to determine its ampere-hour capacity. In addition, its voltage shall be monitored as a function of time. If a cell has deteriorated or if a connection is loose, the voltage under load will drop excessively, indicating need for replacement or maintenance.

ATTACHMENT 2

SAFETY ANALYSIS

FOR

PROPOSED MODIFICATIONS

TO THE AUXILIARY ELECTRIC POWER SYSTEM

I. INTRODUCTION

This safety analysis describes proposed electrical modifications to the Fort St. Vrain Nuclear Generating Station scheduled during the third refueling and evaluates those modifications which require changes to the Technical Specifications. The two modifications which require changes to the Technical Specifications revise the protective relaying for the Auxiliary Electric Power System and modify the Instrument Power System. Changes to the 480V A.C. distribution system and 4160/480V A.C. transformers, scheduled for the third refueling, do not require changes to the Technical Specifications and are therefore not evaluated in this safety analysis. Specifically, the proposed modifications to the Instrument Power System require minor changes to the basis of LCO 4.6.1, which describes the Instrument Power System. The proposed revisions to the protective relaying associated with the Auxiliary Electric Power System require minor revisions to LCO 4.4.1, Table 4.4-1, item 10, and notes (d) and (e) and Specification SR 5.4.1, Table 5.4-1, item 14.

The specific changes to equipment and their effect on the operation of the Fort St. Vrain electrical system are described in the Technical Description. The safety evaluation demonstrates that none of the activities described herein involves an unreviewed safety question or results in undue risk to the health and safety of the public.

Nuclear Regulatory Commission concerns relating to the Instrument Power System are discussed in IE Bulletin 79-27,

issued on November 3C, 1979, requesting licensees to review Class 1E and Non-Class 1E instrument and control power systems which affect the ability to achieve shutdown conditions. Public Service Company responded to the inquiries in IE Bulletin 79-27 on April 25, 1980 (P-80087), stating that adding an undervoltage relay and associated instrumentation to the non-interruptible 120V A.C. Bus 1C was the only modification required as a result of IE Bulletin 79-27. Public Service Company also informed the Nuclear Regulatory Commission that design modifications to the 120V A.C. instrument busses were under consideration and were being pursued independently of IE Bulletin 79-27.

The electrical modifications to the protective relaying for the Auxiliary Electric Power System are a result of Nuclear Regulatory Commission concerns initially expressed in two letters from the Nuclear Regulatory Commission to Public Service Company, both dated August 25, 1980 (G-80149 and G-80150). In these letters, the Nuclear Regulatory Commission requested that Public Service Company evaluate the offsite and onsite emergency power systems with regard to Nuclear Regulatory Commission Staff Positions concerning system response to sustained degraded voltage conditions at the offsite power sources and the interaction between the offsite and onsite emergency power systems. Additionally, the Nuclear Regulatory Commission requested that Public Service Company analytically determine whether the offsite power system and onsite distribution system have sufficient capacity and capability for safe shutdown in the event of an unanticipated transient or accident, coincident with

loss of all onsite A.C. power sources. This includes the ability to automatically start and operate all required safety loads (within their required voltage ratings) regardless of other actions the electric power system automatically initiates, and without the need for manual shedding of any electric loads. Public Service Company responded on October 24, 1980 (P-80373), December 16, 1981 (P-81317), May 28, 1982 (P-82169) and June 7, 1982 (P-82184), as results of testing and analysis became available and the design of proposed modifications was completed.

II. TECHNICAL DESCRIPTION

The 480V A.C. Essential Busses 1A, 1B, and 1C, located in the 480V Switchgear Room, will be replaced with three new essential busses having greater load supplying capacity. The three 4160V/480V A.C. transformers which supply the 480V A.C. Essential Busses 1A, 1B, and 1C are presently integrally installed with the 480V A.C. essential busses. Three new higher capacity 4160V/480V A.C. transformers will be installed outside, and will supply the three 480V A.C. essential busses. Relocating these three 4160V/480V A.C. transformers outside will reduce the heat load in the 480V Switchgear Room. This modification in no way affects the design intent of the Fort St. Vrain onsite electrical power distribution system. The increased load supplying capacity will provide more flexibility in the operation of the plant with no change in function. This modification will have no effect on any accident previously evaluated in the FSAR since the design intent and function of

these equipment items is unaffected. No new accidents are created since no new failure modes are introduced. This activity has no effect on the basis for Technical Specification LCO 4.6.1 and does not require any changes to the Technical Specifications.

EG&G, under contract to the Nuclear Regulatory Commission, reviewed these proposed modifications in their analysis of the adequacy of station electric distribution system voltages. EG&G's technical evaluation and the Nuclear Regulatory Commission's safety evaluation which relate to the 480V A.C. essential bus and 4160V/480V A.C. transformer replacement is contained in Nuclear Regulatory Commission letter to Public Service Company dated August 17, 1982 (G-82265).

The present Instrument Power System (refer to Figure 1) at Fort St. Vrain consists of three 120V A.C. non-interruptible busses (Instrument Power Busses 1A, 1B, and 1C) and one interruptible bus (Instrument Power Bus 3). The non-interruptible busses are considered 'non-interruptible' because they are supplied by D.C. to A.C. inverters. D.C. power continuity to the inverter is ensured by a battery to battery charger connection through a D.C. bus. The battery chargers for 125V D.C. busses 1A and 1B are fed from 480V A.C. Essential Busses 1A and 1B, respectively. Instrument Power Bus 1C is fed from a battery charger/battery/inverter, lineup. The battery charger/inverter power source is Instrument Power Bus 3 (interruptible).

Backup power for the non-interruptible instrument busses is presently available by manual transfer action from Instrument Power Bus 3. Battery charger 1D supplies an additional source of D.C. power available to 125V D.C. Bus 1A and 1B via a bus tie.

The proposed modifications to the Instrument Power System (refer to Figure 2) will increase the reliability and capacity of the system. The existing Battery Charger 1D, which is rated at 200 amps output, will be replaced by a 400 amp battery charger. A new safety switch disconnect will be installed to allow an additional D.C. source to inverter 1C from the existing bus tie. Each D.C. bus has its own battery charger and this feature allows the availability of an additional backup charger for each bus.

The 200 amp battery charger, removed from service as "Battery Charger 1D", will replace the existing 10KVA battery charger/inverter on Instrument Power Bus 1C and will be operated in conjunction with a new 15KVA inverter/static transfer switch. The new charger/inverter combination and 120V A.C. Instrument Power Bus 1C-1 will provide the capability for future loading requirements. The existing 1C battery will be replaced with a new battery whose capacity exceeds that required by the FSAR for safe shutdown (320 amp hours). The overall reliability of Instrument Power Busses 1C and 1C-1 will be greatly enhanced by the static transfer capability of the new inverter/static transfer switch. The alternate power source for Instrument Power Busses 1C and 1C-1 will be from 480V A.C. Essential Bus 1A

via new Instrument Power Transformer 1C-1. Upon a loss of voltage to Instrument Power Bus 1C or 1C-1, a high speed automatic transfer to the alternate source will occur from its preferred power source (Battery 1C through the inverter) so that the interruption in power cannot be detected by any of the connected loads.

The 14.5 KVA Instrument Power Inverters, 1A and 1B, will be replaced with new inverter/static transfer switch units rated at 25KVA. Batteries 1A and 1B will be replaced with batteries whose capacity exceeds that required by the FSAR for safe shutdown (832 amp hours). New 25 KVA Instrument Power Transformers 1A-1 and 1B-1, fed from 480V A.C. Essential Busses 1A and 1C respectively, will be the backup power sources to the 1A and 1B inverters. Additional circuits will be obtained by the addition of Instrument Power Busses 1A-1 and 1B-1.

The reliability of Instrument Power Busses 1A, 1A-1, 1B, and 1B-1 will also be increased by the static transfer ability. Loss of the preferred power source (power from D.C. bus 1A or 1B through the associated inverter) will result in a high speed automatic transfer to the alternate power source supplied from the 480V A.C. essential bus. The loads on Instrument Power Bus 1A or 1B will not detect the interruption in power. Instrument Power Bus 3 is presently supplied from either 480V A.C. Essential Bus 1A via Instrument Power Transformer 1A or 480V A.C. essential Bus 1C via Instrument Power Transformer 1B. A three phase static transfer switch is being added to facilitate an automatic transfer to the remaining source upon

loss of power to Instrument Power Bus 3. This action must be taken manually with the present design. Instrument Power Transformers 1A and 1B loading will be substantially relieved during system upset conditions by the removal of the backup power to each non-interruptible bus from Instrument Power Bus 3.

Proposed modifications to the protective relaying for the Auxiliary Electric Power System have been evaluated by EG&G and the Nuclear Regulatory Commission (Nuclear Regulatory Commission to Public Service Company letter dated October 12, 1983, G-82338). A detailed technical description of this proposed modification is contained in this letter which has been included (Attachment 5) for ease of reference. The proposed design of these modifications has incorporated, exactly, the requirements specified in the evaluations completed by EG&G and the Nuclear Regulatory Commission. (Attachment 5).

III. EVALUATION CRITERIA

General Design Criteria 17, "Electric Power Systems", Appendix A to 10 CFR 50.

IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations".

IEEE Standard 308-1980, "Criteria for Class 1E Power Systems for Nuclear Power Generating Stations."

IE Bulletin 79-27 "Loss of Non-Class 1E Instrumentation and Central Power System Bus During Operation", November 30, 1979.

"Nuclear Regulatory Commission Staff Positions Relative to Emergency Power Systems for Operating Reactors" (G-80149), August 25, 1980.

Nuclear Regulatory Commission Generic Letter to Public Service Company, June 3, 1977.

IV. SAFETY EVALUATION

The modifications to the Instrument Power System and to the protective relaying for the Auxiliary Electric Power System increase the reliability and ensure continued safe operation of the Fort St. Vrain electrical system.

The importance of redundant and independent circuits for reliability is emphasized in the Standard Review Plan. The independence of parallel circuits will be increased by the electrical modifications to the Instrument Power System. Each pair of instrument power busses will continue to be supplied from its associated 125V D.C. bus and D.C./A.C. inverter as its preferred power source. Instrument Power Busses 1C and 1C-1 will be supplied from Battery 1C, Instrument Power Busses 1A and 1A-1 will be supplied from D.C. bus 1A, and Instrument Power Busses 1B and 1B-1 will be supplied from D.C. bus 1B. Each pair of instrument power busses will be supplied through individual inverter/static transfer switches. Increased reliability will be provided by the addition of a separate power source (serving as an alternate power source) to each of the inverter/static transfer switches. This modification provides alternate power sources with greater independence than the existing shared alternate source, Instrument Power Bus 3. The possibility of multiple failures from a single event will therefore be decreased. The fast acting static transfer switches will transfer the power source from the preferred to the alternate with no loss of instrument function for those instruments powered from the Instrument Power Busses 1A and 1A-1, 1B and

1B-1, 1C and 1C-1. This is preferable to the existing manual power transfer design, and reduces the consequences of loss of the preferred D.C. power source to the instrument inverters.

The increased number of circuits provided by the addition of non-interruptible Distribution Panels 1A-1, 1B-1, and 1C-1 ensure continued reliable safe operation and flexibility for the addition of future increased loads. The addition of these busses will not increase the potential for any accident or malfunction, but will incorporate accepted standard safety practices in their design.

The installation of a safety switch disconnect from the existing bus tie will increase the reliability of Inverter 1C by providing an additional source of D.C. power. Therefore, the consequences of a loss of the 1C battery, battery charger and/or feed from the 480V A.C. Essential Bus 1B will be reduced by this modification. The possibility of loss of power to the loads supplied by Instrument Power Busses 1C and 1C-1 is also decreased.

The ability of each battery to supply shutdown D.C. loads for not less than one hour following a loss of all A.C. power, as stated in the FSAR, is still ensured. Continuity of power for essential functions through the 120V A.C. instrument power busses, as committed to in the FSAR, is also provided for in the proposed design by redundant power sources. These are the only accidents and malfunctions specifically evaluated in the FSAR for the Instrument Power System.

In a letter from the Nuclear Regulatory Commission to Publ'c Service Company, dated October 12, 1982, (G-82338), the Nuclear Regulatory Commission provided Public Service Company with a copy of the Nuclear Regulatory Commission's safety evaluation covering degraded grid voltage protection for the Fort St. Vrain essential electrical power system. This safety evaluation provides a detailed evaluation of the proposed protective relaying modification to the Auxliary Electric Power System, which was found acceptable by the Nuclear Regulatory Commission. Public Service Company has not changed any features of the design previously evaluated by the Nuclear Regulatory Commission. Public Service Company is in agreement with the Nuclear Regulatory Commission's safety evaluation and, therefore, a separate safety evaluation of the protective relaying modification is not necessary. The October 12, 1982 letter containing this safety evaluation is included as Attachment 5 of this letter for ease of reference. In regard to the Non-Class 1E undervoltage relays on the Reserve Auxiliary Transformer, referred to in the Attachment 5 letter, all Class 1E functions will be removed from these relays and will instead be performed by Class 1E relays installed on the 480V A.C. essential busses.

V. CONCLUSIONS

It is concluded that the changes to the plant electrical system will enhance the overall reliability and safety of the plant. It is also concluded that operation of Fort St. Vrain with the proposed modifications will not (1) involve an increase in the probability or consequences of any accident previously evaluated in the FSAR, (2) create the possibility of a new or different kind of accident from any accident previously evaluated in the FSAR, or (3) involve any reduction in a margin of safety defined in the basis for a Technical Specification. Therefore these modifications do not create an unreviewed safety question and no significant safety hazards are involved.

UNITED STATES
..JCLEAR REGULATORY COMMISSIC
WASHINGTON, D. C. 20555

Dm W.

OCT 1 2 1982

Docket No. 50-267

G-82338

Mr. O. R. Lee
Vice-President, Production
Public Service Company of Colorado
P. O. Box 840
Denver, Colorado 80201

rec'd
11-12-82

Dear Mr. Lee:

SUBJECT: DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS.

We are transmitting herewith our subject safety evaluation and its attachment, EG&G's Technical Evaluation Report (TER) dated September 1982. We find the electrical systems design modification proposed by PSC to be acceptable. You have provided preliminary technical specification information for these modifications and have committed to formally submit the finalized technical specifications late this year.

The existing undervoltage protection at Fort St. Vrain uses two non-Class 1E relays to monitor the 4160 volt output of the reserve auxiliary transformer. Spurious actuation or failure of one relay will lead to undesired separation of the 480 volt essential buses from the preferred offsite power system, initiation of load shedding on the Class 1E buses and result in unnecessary challenges to the onsite emergency diesel generators. For example, on June 5, 1982, while the reactor was at 15% power, inadvertent actuation of one of these existing non-Class 1E relays resulted in a temporary loss of AC power to all 480 volt Class 1E buses. However, the proposed protective relay system for the 480 volt Class 1E buses meets staff requirements and provides the necessary undervoltage protection for all Class 1E equipment without reliance on the non-Class 1E protective relays.

The above concerns regarding the existing undervoltage protection have been discussed with your staff. If the existing non-Class 1E undervoltage protective relays are to be retained as protection for the 4160 volt non-Class 1E buses, we require that the Class 1E functions, i.e., diesel generator starting 480 volt bus breaker tripping and load shedding on the 480 volt Class 1E buses, be deleted from these relays. These safety functions shall be carried out only by Class 1E protective relay systems to be installed on the 480 volt Class 1E buses.

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Our safety evaluation is based on our review of your submittals and the LLL technical evaluation report EGG-EA-5926 Rev. 1. Upon resolution of the above open item and review of the technical specifications associated with these design changes, we will issue a supplement to the evaluation report.

Should you have any questions or comments please let us know.

Sincerely,

Robert A. Clark

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Enclosure
1. Safety evaluation

cc: w/enclosure
See next page

Ft. St. Vrain
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SAFETY EVALUATION
FORT ST. VRAIN NUCLEAR GENERATING STATION
DOCKET NO. 50-267
DEGRADED GRID VOLTAGE PROTECTION FOR THE CLASS 1E SYSTEM

INTRODUCTION AND SUMMARY

The criteria and staff positions pertaining to degraded grid voltage protection were transmitted to Public Service Company of Colorado (PSC) by NRC Generic Letter dated June 3, 1977. In response to this, by letters dated October 15, 1980, October 20, 1980, December 16, 1981, May 28, 1982, June 7, 1982 and June 23, 1982, the licensee proposed certain design modifications and changes to the Technical Specifications. A detailed review and technical evaluation of these proposed modifications and changes to the Technical Specifications was performed by EG&G, under contract to the NRC, and with general supervision by NRC staff. This work is reported by EG&G in "Degraded Grid Protection for Class 1E Power Systems Fort St. Vrain Nuclear Generating Station" (attached). We have reviewed this technical evaluation report and concur in the conclusion that the proposed electrical design modifications are acceptable.

EVALUATION CRITERIA

The criteria used by EG&G in its technical evaluation of the proposed changes include GDC-17 ("Electric Power Systems") of Appendix A to 10 CFR 50; IEEE Standard 279-1971 ("Criteria for Protection Systems for Nuclear Power Generating Stations"); IEEE Standard 308-1977 ("Voltage Ratings for Electrical Power Systems and Equipment - 60 Hz"); and staff positions defined in NRC Generic Letter to PSC dated June 3, 1977.

PDR
~~8211010501~~

PROPOSED CHANGES, MODIFICATIONS AND DISCUSSION

The existing undervoltage protection at Fort St. Vrain consist of the following:

Two non-Class 1E undervoltage relays set a 79.7% of nominal monitor the 4160 volt output of the reserve auxiliary transformer. Actuation of one of these relays, when the unit is being supplied by the reserve auxiliary transformer, will result in shedding of all three 480 volt essential buses, automatic starting of the diesel generators, initiation of load sequencing and actuation of an alarm in the control room. Actuation of both relays will result in disconnection of the 4 kV non-essential buses, through which the offsite power is fed to the 480 volt essential buses. Auxiliary contacts on the circuit breaker for the diesel generator disable the load shed feature when the emergency diesel generators are supplying the 480 volt Class 1E buses. The load shed feature will be reinstated when the diesel generator output breakers are tripped.

The following electrical system design modifications and technical specification changes were proposed by PSC:

1. Installation of three undervoltage relays (ITE-27H) arranged in a two-out-of-three logic per 480 volt Class 1E bus with a setpoint of 416 ± 20 volts (86.7% of 480 volt nominal). Each relay is connected to a 120 ± 5 second timer. Actuation of any one relay will provide an alarm in the control room. Actuation of two of the three for longer than 120 seconds will separate the affected bus from the offsite power system.

2. Installation of three undervoltage relays (ITE-27H) arranged in a two-out-of-three logic per 480 volt Class 1E bus. These relays have a setpoint of 288 ± 14.4 volts (60% of 480 volt nominal) with a timer set at 30 ± 1.5 seconds. Actuation of two-out-of-three of these relays on two-out-of-three of the 480 volt Class 1E buses will after a 30 second time delay initiate a reactor scram.

3. Installation of three inverse time (CV-2) undervoltage relays arranged in a two-out-of-three logic per 480 volt Class 1E bus. These relays are set at 93 volts ± 3% time dial 5 (77.5% of 480 volt nominal). Actuation of two of these relays on a bus will restore power to the affected bus by automatic throwover to its adjacent bus. There are three 480 volt Class 1E buses. This automatic throwover will allow connection of bus 1 and bus 2 or bus 2 and bus 3 to the same power source. These relays only affect an automatic throwover for a loss of offsite power to the 480 volt Class 1E buses. Interlocks are provided to prevent connecting more than two Class 1E buses together. In addition interlocks will prevent a second automatic throwover if the first automatic throwover fails to restore power to the affected bus.

4. Installation of three inverse time (CV-2) undervoltage relays arranged in a two-out-of-three logic per 480 volt Class 1E bus. These relays are set at 82 volts, time dial 6 (68.3% of 480 volt nominal). Actuation of two-out-of-three of these relays on two-out-of-three 480 volt Class 1E buses will trip the offsite source breakers to all three 480 volt Class 1E

buses, start both emergency diesel generators, and initiate load shedding on all three 480 volt Class 1E buses. Upon achieving satisfactory voltage and frequency diesel generator 1A breaker will close and loads will be sequenced on 480 volt bus 1 and similarly diesel generator 1B breaker will close and loads will be sequenced on 480 volt bus 3. The 480 volt bus 2, which does not have a connected diesel generator, will be connected by the automatic throwover switch to either 480 volt bus 1 or bus 3. The power source selected for bus 2 is determined by which of the diesel generator buses first achieves satisfactory frequency and voltage. Circuitry which incorporates timers, lock out relays and throwover switch auxiliary contacts is used to provide interlocks that will prevent the closure of more than one throwover attempt, i.e., bus 2 to 1 or bus 2 to 3. Once the selection of power to bus 2 has been made and the applicable throwover switch has been positioned, these interlocks and relays will prevent any additional automatic operation to connect bus 2 to an alternate power source. If power to bus 2 should be subsequently lost, this circuitry will require manual operator action, controlled by plant procedures, to reset the lockout relay prior to transferring bus 2 to an alternate source.

5. The technical specification changes and additions required for the proposed modifications have not been formally submitted by the licensee. However, they have provided preliminary information which will be required in the technical specifications. PSC has committed to formally submit the finalized technical specifications in October, 1982. This will coincide with equipment installation.

We find that the proposed modifications will ensure that the Class 1E equipment is protected from the effects of degraded voltage. However; the existing undervoltage protection uses two non-Class 1E relays to monitor the 4160 volt output of the reserve auxiliary transformer. Spurious actuation or failure of one of these relays will lead to undesired separation of the 480 volt essential buses from the preferred offsite power system, initiation of load shedding on the Class 1E buses and result in unnecessary challenges to the onsite emergency diesel generators. An example, on June 5, 1982, while the reactor was at 15% power, inadvertent actuation of one of these existing non-Class 1E relays resulted in a temporary loss of AC power to all 480 volt Class 1E buses. The proposed protective relay system for the 480 volt Class 1E buses meets staff requirements and provides the necessary undervoltage protection for all Class 1E equipment without reliance on the existing non-Class 1E protective relays.

The above concerns regarding the existing undervoltage protection have been discussed with the licensee. If the existing non-Class 1E undervoltage protective relays are to be retained as protection for the 4160 volt non-Class 1E buses, we require that the Class 1E functions i.e., diesel generator starting, 480 volt bus breaker tripping and load shedding on the 480 volt Class 1E buses be deleted from these relays. These safety functions shall be carried out only by the proposed Class 1E protective relay system to be installed on the 480 volt Class 1E buses.

CONCLUSIONS

We have reviewed the EG&G technical evaluation report and the licensee's submittals and find that:

1. The proposed degraded grid modifications will protect the Class 1E equipment from sustained degraded voltage of the offsite power system.

2. The existing load shedding circuit will block load shedding once the emergency diesel generators are supplying the safety loads. The load shedding feature will be reinstated if the diesel generator breaker should trip.

3. The preliminary technical specification information supplied by the licensee is acceptable. However; we require that a formal submittal be made of the changes and additions to technical specifications prior to installation of the proposed modification.

4. If the non-Class 1E undervoltage protective relays which presently monitor the 4160 volt output of the reserve auxiliary transformer are to be retained as protection for the non-Class 1E 4160 volt bus and equipment, we require that the Class 1E functions i.e., diesel generator starting, 480 volt bus breaker tripping and load shedding on the 4160 volt Class 1E buses be deleted from these relays.

We therefore find the licensee's proposed modifications acceptable subject to completion of items 3 and 4 above. After resolution of these items with PSC, PSB will issue a supplement to this evaluation report.

Attachment:
EG&G Technical Evaluation
Report

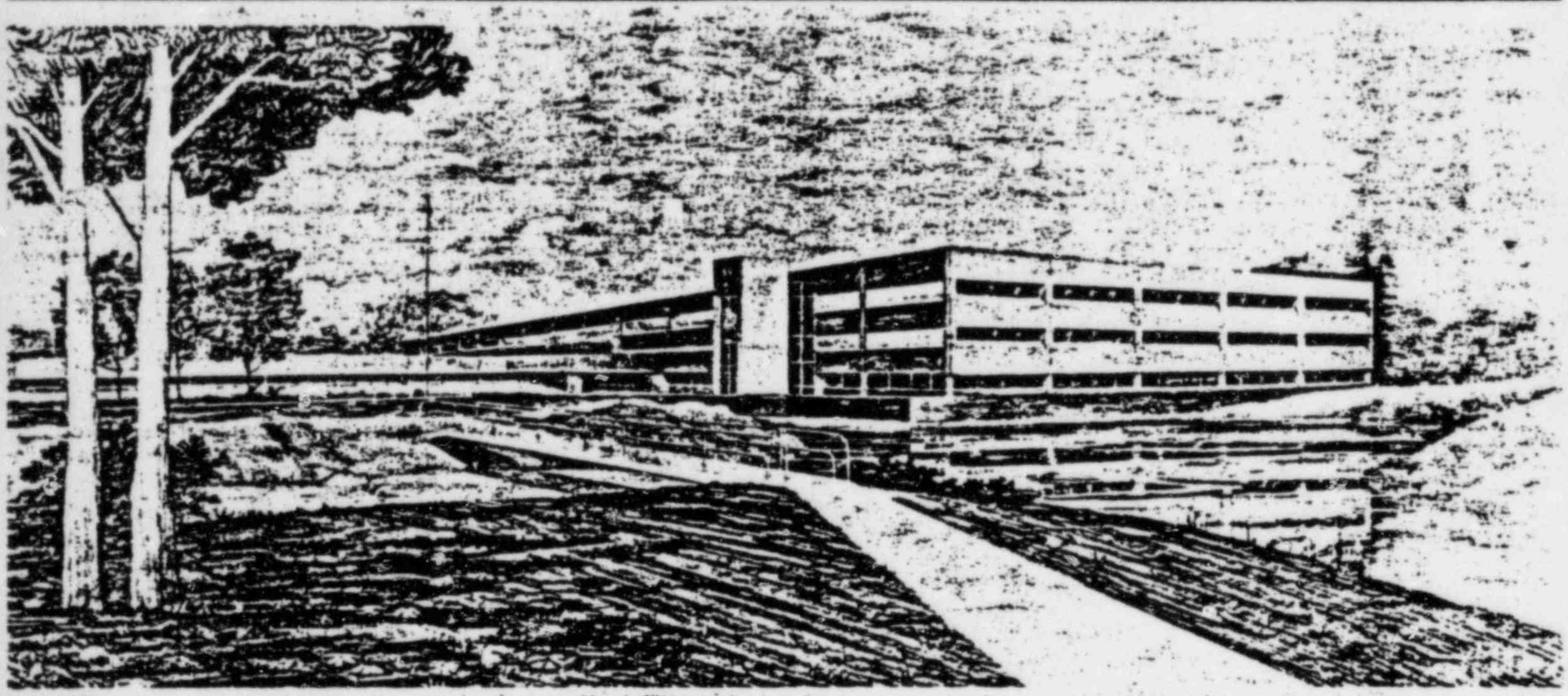
EGG-EA-5926, REV. 1

SEPTEMBER 1982

DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS
FORT ST. VRAIN NUCLEAR GENERATING STATION

A. C. Udy

Idaho National Engineering Laboratory
Operated by the U.S. Department of Energy



This is an informal report intended for use as a preliminary or working document

Prepared for the
U.S. NUCLEAR REGULATORY COMMISSION
Under DOE Contract No. DE-AC07-76ID01570
FIN No. A6429

EG&G Idaho

EG&G Idaho Inc

FORM EG&G-398
(Rev. 03-82)

Accession No. ______

Report No. EGG-EA-5926, Rev. 1

Contract Program or Project Title:

Selected Operating Reactors Issues

Subject of this Document:

Degraded Grid Protection for Class 1E Power Systems, Fort St. Vrain Nuclear Generating Station

Type of Document:

Letter Report

Author(s):

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Date of Document:

September 1982

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Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C.
Under DOE Contract No. DE-AC07-76ID01570
NRC FIN No. A6429

DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS

FORT ST. VRAIN NUCLEAR GENERATING STATION

September 1982

A. C. Udy
Reliability and Statistics Branch
Engineering Analysis Division
EG&G Idaho, Inc.

TAC No. 46504
Docket No. 50-267

ABSTRACT

This EG&G Idaho, Inc. report reviews the susceptibility of the safety-related electrical equipment, at the Fort St. Vrain station, to a sustained degradation of the offsite power sources.

FOREWORD

This report is supplied as part of the "Selected Operating Reactor Issues Program (III)" being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Licensing, by EG&G Idaho, Inc., Reliability and Statistics Branch.

The U.S. Nuclear Regulatory Commission funded the work under Authorization B&R 20-19-10-11.

FIN No. A6429--Selected Operating Reactors Issues

CONTENTS

DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS

FORT ST. VRAIN NUCLEAR GENERATING STATION

1.0 INTRODUCTION

On August 25, 1980, the NRC requested the Public Service Company of Colorado (PSC) to assess the susceptibility of the safety-related electrical equipment at the Fort St. Vrain station to a sustained voltage degradation of the offsite source and interaction of the offsite and onsite emergency power systems.[1] The letter contained three positions with which the current design of the plant was to be compared. After comparing the current design to the staff positions, the licensee was required to either propose modifications to satisfy the positions and criteria or furnish an analysis to substantiate that the existing facility design has equivalent capabilities.

PSC initially responded to the NRC letter on October 15, 1980,[2] and on October 20, 1980.[3] PSC provided a summary of activities and a status report on this, and on a related topic on December 16, 1981.[4] PSC consolidated the previous information supplied in a submittal of May 28, 1982.[5] This last submittal proposed to request technical specification changes in October 1982. Portions of this submittal were clarified by telephone conversations in June 1982[6]. A voltage analysis was submitted to the NRC on June 7, 1982.[7] PSC submitted additional information on June 23, 1982.[8]

2.0 DESIGN BASE CRITERIA

The design base criteria that were applied in determining the acceptability of the system modifications to protect the safety-related equipment from a sustained degradation of the offsite grid voltage are:

1. General Design Criterion 17 (GDC 17), Electric Power Systems, of Appendix A, General Design Criteria for Nuclear Power Plants, of 10 CFR 50.[9]

2. IEEE Standard 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations.[10]

3. IEEE Standard 308-1974, IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations.[11]

4. Staff positions as detailed in a letter sent to the licensee, dated August 25, 1980.[1]

5. ANSI Standard C84.1-1977, Voltage Ratings for Electrical Power Systems and Equipment (60 Hz).[12]

3.0 EVALUATION

This section provides, in Subsection 3.1, a brief description of the existing undervoltage protection at the Fort St. Vrain station; in Subsection 3.2, a description of the licensee's proposed scheme for the second-level undervoltage protection; and, in Subsection 3.3, a discussion of how the modified system meets the design base criteria.

3.1 Existing Undervoltage Protection

The present design utilizes undervoltage relays on the secondary side of the reserve auxiliary transformer to sense loss of voltage (setpoint: 45% of 4160V nominal) and to start the diesel generators. The Class 1E buses (480V buses 1, 2, and 3) have separate undervoltage relays (setpoint: 75% of 480V nominal) on buses 1 and 3 (bus 2 does not have its own diesel) that also start their associated diesel generators.

Auxiliary contacts on the circuit breakers of the diesel generators are part of the load shed circuitry. This insures that if a loss of offsite voltage is detected, the 480V Class 1E buses will have their loads

shed to enable the subsequent load sequencing onto diesel supplied power. The diesel generator circuit breakers for buses 1 and 3 must be open, or all four undervoltage relays (2 on 480V bus 1 and 2 on 480V bus 3) de-energized to enable the load shed feature that is initiated from the undervoltage relays at the reserve auxiliary transformer. Once the diesel generator breakers are closed, the loss of voltage relays associated with those buses return to their energized state, preventing any subsequent load shedding.

3.2 Modifications

The licensee has proposed the addition of several sets of undervoltage relays to protect the Class 1E equipment and buses from abnormal voltages. To protect against the effects of degraded voltage, each 480V Class 1E bus will have three undervoltage relays (ITE 27H) arranged in a two-out-of-three logic with a setpoint of 416 ± 20V (86.7% of 480V nominal). Each relay is individually connected to an alarm and a 120 ± 5 second timer. Actuation of any individual relay is annunciated in the control room. If two of the three relays of a bus trip, and remain tripped for 120 seconds, the offsite power circuit breaker for that bus is opened. De-energizing a 480V Class 1E bus will actuate Westinghouse CV-2 inverse time delay relays, arranged in a 2/3 logic per bus. This will attempt to restore power by automatic throwover to its neighboring 480V Class 1E bus. Interlocks are installed to prevent connecting more than two Class 1E buses together. These CV-2 relays are set on the 93V tap, time dial 5 (77.5% of 480V nominal). Each 480V Class 1E bus also has three additional 27H relays (setpoint 288 ± 14.4V, 60% of 480V nominal). These also use a 2/3 logic. The output of this logic initiates a 30 + 1.5 second timer. Should power not be restored before the timer times out on two of the three 480V Class 1E buses, a reactor scram will occur.

On a loss of bus voltage caused by the loss of offsite power or by the operation of the degraded voltage relays, a second set of CV-2 relays will actuate. These CV-2 relays are arranged in a two out of three logic and are set on the 82V tap, time dial 6 (68.3% of 480V nominal). Operation of

two of these three CV-2 relays on two of the three buses or operation of the degraded voltage relays on two of the three buses will trip all three offsite power circuit breakers. Then both diesel-generator sets will be started, loads shed on all three buses, the two diesel generator breakers closed and the loads sequenced onto the diesel generators. The tie breakers between bus 2 and bus 1 and between bus 2 and bus 3 will be tripped as part of the load shedding, regardless of whether the breaker was open or closed. A tie will then be established between bus 2 and either bus 1 or bus 3 (but not both) automatically. The tie is established to the bus that is first energized by the diesel generator. Bus 2 is interlocked so that it can be connected to only one of the other two buses. When used in conjunction with diesel supplied power, the bus tie is effected by one of two redundant motor operated timers. The timers are interlocked so that only one timer is in the control circuit and only that timer operates. Additionally, the control circuit has interlocks provided by tie breaker and generator lockout relay contacts. These interlocks prevent bus numbers 1 and 3 from being tied simultaneously to bus 2, or sequentially, by automatic operation, to bus 2. A fault on bus 2 cannot be automatically propagated to both of the other Class 1E buses. If bus 2, after being powered by one of the diesel supplied buses, subsequently requires connection to the other Class 1E bus, manual operator action following written procedures is required. The operator would have to manually reset the interlocks and lockout relays, and shed the bus 2 loads and the existing tie before the new bus tie can be established.

The existing loss of voltage relays on the secondary side of the reserve auxiliary transformer will be retained as an independent method of starting the diesel generator sets; however, they will not, by themselves, initiate any direct load transfers of the Class 1E buses. They are still an intergral portion of the load shedding circuitry.

Once the diesel generator is supplying its associated Class 1E bus, load-shedding is blocked by interlocks and auxiliary relays in the under-voltage protection logic circuitry. As stated above, this is already incorporated in the existing logic circuits.

The licensee has provided the required technical specification information which covers the surveillance requirements, allowable limits for the setpoint and the time delay, and limiting conditions for operation for the undervoltage monitors. However, a formal technical specification submittal has not been received. Upon receipt of this formal submittal, it will be evaluated.

3.3 Discussion

The first position of the NRC staff letter[1] required that a second level of undervoltage protection for the onsite power system be provided. The letter stipulates other criteria that the undervoltage protection must meet. Each criterion is restated below and followed by a discussion regarding the licensee's compliance with that criterion.

1. "The selection of voltage and time setpoints shall be determined from an analysis of the voltage requirements of the safety-related loads at all onsite system distribution levels."

   The licensee's proposed setpoint of 416V at the 480V buses is 90.4% of the motor nominal voltage rating of 460V. This is greater than the minimum allowable motor voltage (90% of nominal voltage). As the motors are the most limiting equipment in the system, this setpoint is acceptable. The licensee's analysis considered other factors, such as motor control center fuses and contactor pick-up and drop-out voltage.

2. "The voltage protection shall include coincidence logic to preclude spurious trips of the offsite power sources."

   For the proposed modification, all of the relay logic is arranged in two-out-of-three logic, thereby satisfying this criterion.

3. "The time delay selected shall be based on the following conditions:

a. "The allowable time delay, including margin, shall not exceed the maximum time delay that is assumed in the FSAR accident analysis."

The licensee indicates that there is no critical time delay assumed in the FSAR accident analysis.[5] Thus the proposed time delays satisfy this NRC criterion.

b. "The time delay shall minimize the effect of short-duration disturbances from reducing the unavailability of the offsite power source(s)."

The licensee's proposed time delay is long enough to override any short inconsequential grid disturbances. Further, review of the PSC analysis shows that any voltage dip caused by starting large motors will not trip the offsite source.

c. "The allowable time duration of a degraded voltage condition at all distribution system levels shall not result in failure of safety systems or components."

A review of the licensee's voltage analysis[7] indicates that the time delay will not cause any failures of the safety-related equipment since the voltage setpoint is within the allowable tolerance of the equipment voltage rating. Further, all Class 1E motors have a service factor of 1.15, which allows operation at less than normal voltage for short time periods.

4. "The voltage monitors shall automatically initiate the disconnection of offsite power sources whenever the voltage setpoint and time-delay limits have been exceeded."

A review of the licensee's proposal substantiates that this criterion is met.

5. "The voltage monitors shall be designed to satisfy the requirements of IEEE Standard 279-1971."

The licensee has stated that the circuits associated with the undervoltage relays meet the applicable requirements of IEEE Standard 279-1971.

6. "The Technical Specifications shall include limiting conditions for operation, surveillance requirements, trip setpoints with minimum and maximum limits, and allowable values for the second-level voltage protection monitors."

The licensee has not proposed technical specification changes. PSC will request the technical specification changes after they have completed internal reviews. This is expected to be in October 1982.[5]

The licensee has proposed the following to be included in their request for technical specification changes:[8]

1. No change for limiting conditions for operation (LCO) for the 480V buses.

2. A LCO to place an inoperable loss of voltage or degraded voltage relay in the tripped position until repaired or replaced.

3. Channel check will be by observation of the relay alarms in the control room.

4. Functional test will be by verifying relay operation on removal of voltage.

5. Relays and time delays will be calibrated on a refueling basis.

The setpoints and time delays are identified, including nominal setpoint or time delay, ± tolerance and allowable limits (the voltages are expressed in relation to the relays nominal voltage or tap and time dial).

The second NRC staff position requires that the system design automatically prevent load-shedding of the emergency buses once the onsite sources are supplying power to all sequenced loads. The load-shedding must also be reinstated if the onsite breakers are tripped.

The licensee states in his submittal that this feature is already incorporated in the existing circuit design, and will also be incorporated in the modified system. Load shedding is prevented if either diesel generator is supplying its bus. Thus they are not completely independent of each other, and any subsequent load shedding and load sequencing of a single diesel generator is a manual operation.

The third NRC staff position requires that certain test requirements be added to the Technical Specifications. These tests are to demonstrate the full-functional operability and independence of the onsite power sources and are to be performed at least once per 18 months during shutdown. The tests are to simulate loss of offsite power in conjunction with a simulated safety injection actuation signal and to simulate interruption and subsequent reconnection of onsite power sources. These tests verify the proper operation of the load-shed system, the load-shed bypass when the emergency diesel generators are supplying power to their respective buses, and that there is no adverse interaction between the onsite and offsite power sources.

The licensee has indicated that their formal request for technical specification changes will include the loss of offsite power testing on a refueling basis.[8] The following things will be verified as part of the test:

1. Verify de-energization and load shedding of the essential 480V buses

2. Verify the auto start of the diesel generators, closure of the diesel generator breakers, operation of the permanently connected loads and the loads that are sequenced on

3. Verify that, on the trip of both diesel generators, the loads are shed, the diesels restarted on the auto start signal, the permanently connected loads and the sequenced loads (sequenced on by the load sequencer) again operate, and

4. Verify that all undervoltage relays operate as designed.

In both verifications 2 and 3 above, the diesel generators will be loaded with essential loads for greater or equal to five minutes to establish equilibrium conditions in the diesel generators and in the bus loads. Thus, the requirements of the NRC letter will be met.

4.0 CONCLUSIONS

Based on the information provided by the licensee, it has been determined that the proposed changes do comply with NRC staff position 1. All of the staff's requirements and design base criteria have been met. The setpoint and time delay will protect the Class 1E equipment from a sustained degraded voltage condition of the offsite power source. However, a formal request for technical specification changes has not yet been supplied.

The existing load-shed circuitry does comply with staff position 2 and will prevent adverse interaction of the offsite and onsite emergency power systems.

The technical specification changes outlined and equipment arrangement comply with staff position 3.

Therefore, the licensee's proposed changes are acceptable. As the second-level undervoltage protection modifications are to be installed during the third refueling, it is recommended that the licensee proposed technical specification changes, due to be submitted in October 1982, be

approved as a supplement to this report and implemented to coincide with the installation.

5.0 REFERENCES

1. NRC letter, R. L. Tedesco to D. Warembourg, PSC, August 15, 1980.

2. PSC letter, D. Warembourg to R. L. Tedesco, NRC, "Technical Specifications, Electrical Power Systems," October 15, 1980.

3. PSC letter, F. E. Swart to R. L. Tedesco, NRC, "Emergency Power Systems," October 20, 1980.

4. PSC letter, H. L. Brey to G. Kuzmycz, NRC, "Electrical Power Systems," December 16, 1981.

5. PSC letter, H. L. Brey to G. Kuzmycz, NRC, "Electrical Power Systems," May 28, 1982.

6. Telecon, A. Udy, EG&G and M. Niehoff, PSC, June 6, 9, and 21, 1982.

7. PSC letter, H. L. Brey to G. Kuzmycz, NRC, "Electrical Power Systems," June 7, 1982.

8. PSC letter, H. L. Brey to G. Kuzmycz, NRC, "Electrical Power Systems," June 23, 1982.

9. General Design Criterion 17, Electric Power Systems, of Appendix A, General Design Criteria of Nuclear Power Plants, to 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities.

10. IEEE Standard 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations.

11. IEEE Standard 308-1974, IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations.

12. ANSI C84.1-1977, Voltage Ratings for Electric Power Systems and Equipment (60 Hz).

ATTACHMENT 3

SAFETY ANALYSIS

FOR

AUXILIARY ELECTRIC SYSTEM

TECHNICAL SPECIFICATIONS

I. LIMITING CONDITIONS FOR OPERATION

A. General

LCO 4.6.1 specifies limiting conditions for operation applicable to the auxiliary electric power system. The proposed changes generally upgrade these conditions to more closely conform with those specified in the Standard Technical Specifications (STS) for electric power systems (NUREG 0452, Rev. 4).

The revised Technical Specification provides limiting conditions applicable to all modes of plant operation (Shutdown, Low Power and Power Operation), and to instances or combinations of degraded power sources or distribution equipment, as they are addressed in the STS. This should eliminate any ambiguity when the various conditions apply or as to what actions are required when those conditions are not met.

B. Evaluation

1.0 Reactor Shutdown

Proposed LCO 4.6.1.1 is new and was added to specify the minimum AC/DC power sources and power

distribution equipment required to be operable with the reactor shutdown. The shutdown mode is defined in Section 2 of the Technical Specifications. The LCO also includes actions required to be taken when the various conditions cannot be met. Both the conditions and actions are consistent with the STS, with the FSV design, and with the FSAR, and will ensure that the plant auxiliaries are provided with sufficient power to maintain the reactor in a safe shutdown condition. Since conditions applicable to this mode were not previously specified, these changes will provide additional assurance of safe plant operation.

2.0 Reactor in Operation

Proposed LCO 4.6.1.2 specifies the minimum A.C./D.C. power sources and power distribution equipment required to be operable with the reactor operating. LCO 4.6.1.2 covers the same types of limiting conditions as in existing LCO 4.6.1; however, it now applies to low power operation as well as power operation. These operating modes are defined in Section 2.0 of the Technical Specifications. In addition, actions to be taken

if the conditions for normal operation are not met were changed to provide clear statements as to when and how they apply. These changes are described and evaluated in more detail below.

2.1 A.C. Power Sources

LCO 4.6.1.2(a) and 4.6.1.2(b) specify the minimum offsite 230KV and onsite 4160V A.C. power sources required to be operable with the reactor in operation. These conditions are basically unchanged from the current LCO (4.6.1(a) and 4.6.1(d)). However, the wording of LCO 4.6.1.2(a) is more inclusive and now more clearly applies to portions of the 230KV and 4160V A.C. switchgear associated with the auxiliary transformers, as well as the transformers themselves. The proposed conditions are consistent with the STS, with the design of the FSV standby diesel generator sets and their supporting auxiliary systems (fuel oil and compressed air), and with the FSAR.

Notes 3, 4, 5, 6, 7 and 8 to proposed LCO 4.6.1 provide requirements for continued plant operation consistent with the severity of the degraded condition. Some of the degraded conditions addressed in the proposed technical specification are not allowable under current limiting conditions for operation (e.g. one offsite and one onsite A.C. power source inoperable, and two onsite A.C. power sources inoperable). The additional operational flexibility allowed in the proposed technical specification still provides reasonable assurance of electric power supply to equipment required for safe shutdown cooling by requiring that one of the 4160V A.C. split busses be operable during reactor operation (as discussed in Section 2.2 below).

The specified grace periods allowable under the proposed technical specifications may, in some instances, be less conservative than those specified under the current technical specifications for equivalent degraded conditions. This is acceptable because more

stringent specified conditions are required to demonstrate the operability of the remaining power sources, and because additional operational flexibility is provided as noted above.

The proposed action statements are consistent with the STS and with the FSV system design and provide an equivalent degree of assurance concerning the availability of A.C. power to essential equipment.

2.2 A.C. Power Distribution

Proposed LCO 4.6.1.2(c) and 4.6.1.2(d) specify the minimum 4160V A.C. and 480V A.C. essential electrical busses required to be operable and energized with the reactor in operation. Similar conditions are specified in existing LCO 4.6.1(b) and 4.6.1(c). The requirements for operable 480V A.C. essential busses remain unchanged. The proposed conditions applicable to the 4160V A.C. busses have been changed and now require both the 4160V A.C. Bus (1B) and either Bus 1A or 1C to be operable.

Previously, only the 4160V A.C. Bus 1B was required to be operable. This ensured that at least one circuit would be immediately available to provide offsite power to the essential busses, since the reserve auxiliary transformer is automatically connected to the 4160V A.C. Bus 1B on loss of the normal circuit (from the main turbine generator to the 4160V A.C. split busses). The proposed conditions now ensure that power from the offsite network can be routed to the 480 V A.C. essential busses through two independent circuits; i.e. from the reserve auxiliary transformer through the 4160V A.C. Bus 1B, or from the unit auxiliary transformer through Bus 1A or 1C. The new conditions also require these busses to be energized and specify tie breaker alignment.

The proposed cond ions are consistent with the STS, with the design of the 4160V A.C. and 480V A.C. essential busses, and with the FSAR. The degree of protection provided has been increaseo by specifying that the original

design intent, which provided for two independent circuits from the offsite network, is preserved during power operation. Operation with these limiting conditions when the system is in a degraded mode (a combination of one 4160V A.C. bus and one 480V A.C. essential bus inoperable) uses the existing equipment more effectively by providing alternate methods of supplying essential power. This provides additional safety during abnormal or accident conditions.

Notes 9, 10 and 11 to proposed LCO 4.6.1 are applicable to LCO 4.6.1.2(c) and 4.6.1.2(d) and specify actions required with degraded conditions for this equipment. Note 9 specifies an allowable grace period for continued operation with one of the required 4160V A.C. and 480V A.C. essential busses not energized. This action statement is consistent with the STS. Notes 10 and 11 provide allowable grace periods and provisions for operability checks when one of the required 4160V A.C. or 480V A.C. essential

busses are inoperable. These action requirements are in addition to those specified in the STS, but are consistent with the STS intent, are appropriate to the FSV design, and are consistent with the existing LCO. The proposed actions are considered equivalent to those existing, but are more specific.

2.3 D.C. and Instrument Power Distribution

Proposed LCO 4.6.1.2(e) and 4.6.1.2(f) specify the minimum 125V D.C. electrical busses and 120V A.C. non-interruptible instrument busses required to be energized with the reactor in operation. These conditions are also essentially unchanged from the current LCO (4.6.1(e) and 4.6.1(f)); however, proposed LCO 4.6.1.2(f) requires the D.C. busses to be energized from their associated batteries (versus only being operable) and also specifies tie breaker alignment; LCO 4.6.1.2(e) requires the A.C. instrument busses to be energized from their associated inverter and D.C. source (vs. requiring the inverter to

be operable). The proposed conditions are therefore more specific; they are consistent with the STS, with the design of the FSV D.C. and A.C. instrument power distribution system, and with the FSAR.

Notes 12, 13 and 14 are applicable to LCO 4.6.1.2(e) and (f) and specify grace periods, operability provisions and actions required under degraded conditions. These action statements are consistent with the STS and are generally more stringent than those presently in effect. Therefore, the proposed action statements will provide greater assurance that vital instruments and controls will remain energized.

2.4 D.C. Power Sources

Proposed LCO 4.6.1.2(g) specifies the minimum 125V D.C. power sources required to be operable with the r actor in operation. These conditions are basically unchanged from the current LCO (4.6.1(e) and 4.6.1(f)); however, LCO 4.6.1.2(g) is clearly applicable

to Battery 1C (also formerly referred to as the PPS Battery) as well as to its associated battery charger. Conditions allowing use of the back-up Battery Charger 1D have also been specified. The proposed conditions are consistent with the STS, with the design of the FSV D.C. power equipment, and with the FSAR.

Notes 2 and 15 of the proposed LCO are applicable to LCO 4.6.1.2(g) and specify grace periods, operability provisions, and actions required if the LCO cannot be met. The proposed action statements are consistent with the STS and are more stringent than those presently in effect. Therefore, they provide greater assurance that the D.C. sources will be available when required.

II. SURVEILLANCE REQUIREMENTS

The surveillance requirements for the FSV auxiliary electric power system specified in Section 5.6 of the plant Technical Specifications demonstrate the operability of the required systems and components.

A. Current Surveillance Requirements

1. Diesel Generator Sets

Surveillance requirements for the diesel generator sets currently include:

1.1 2-hour weekly loading of each set to at least 50 percent capacity.

1.2 Semi-annual demonstration of set operability, including automatic controls and load sequencers, under simulated loss of outside power and turbine trip.

1.3 Monthly functional test and annual calibration of the engine temperature "declutch" and "shutdown" features.

1.4 Annual calibration of the engine protective functions.

Implementation of the above requirements results in verifying the operability of many features associated with the diesel generator sets as an emergency onsite A.C. power supply source.

2. Batteries

Surveillance requirements for the batteries currently include:

2.1 Weekly verification of overall battery voltage, pilot cell specific gravity and voltage, and temperature of adjacent cells.

2.2 Quarterly verification of electrolyte level, specific gravity, temperature, and voltage of every fifth cell.

2.3 Annual load testing during a plant shutdown of the batteries to partial discharge.

B. Proposed Surveillance Requirements

The proposed surveillance requirements for the auxiliary electrical power system are directly derived from the Standard Technical Specifications, modified as appropriate for compatibility with features unique to the Fort St. Vrain design.

They are summarized below:

1. <u>Offsite A.C. Sources</u>

The proposed surveillance requirements include:

1.1 Weekly verification of the operability of each circuit.

1.2 Every 18 months, a verification of transfer capability from the normal to the alternate circuit.

2. <u>Diesel Generator Sets</u>

The principal proposed surveillance requirements for the diesel generator sets include:

2.1 Variable frequency (semi-weekly to monthly) demonstration of diesel generator set operability, including auxiliaries.

2.2 Quarterly sampling and analysis of fuel oil.

2.3 Every 18 months, an examination of the diesel generator set, a verification of its load reject capability, a simulation of loss of power to the 480V A.C. essential busses and a verification of load shedding capability.

2.4 At 10 year intervals, a verification of independence between the two diesel generator sets.

2.5 At 10 year intervals, drain and clean the fuel oil storage tanks.

3. A.C. Busses

The proposed surveillance requirements include a weekly verification of bus operability (voltage and breaker alignment).

4. D.C. Busses

The proposed surveillance requirements include a weekly verification of bus operability (voltage and breaker alignment).

5. D.C. Power Sources

The proposed surveillance requirements for the battery chargers and batteries include:

5.1 Weekly verification of overall battery voltage, and pilot cell electrolyte level, voltage and specific gravity.

5.2 Quarterly verification of connected cells' electrolyte level, voltage, specific gravity, the average electrolyte temperature of every fifth cell, and an examination of connections.

5.3 Every 18 months, an examination of the batteries, terminal connections, and a verification of battery charger performance.

5.4 Every 18 months, a load test of the batteries during plant shutdown.

C. EVALUATION

The proposed surveillance requirements are more detailed in their explicit formulation and more comprehensive in their scope. Their implementation will provide additional assurance of equipment operability throughout the Fort St. Vrain auxiliary electric power system.

In some instances, the frequencies specified in the proposed surveillance requirements, derived from the STS, are less conservative than the frequencies currently specified for equivalent tests. This is the case for proposed surveillance requirements in SR 5.6.1.2.a, SR 5.6.1.2.d, and SR 5.6.2.d. Based on past surveillance

experience, decreasing the conservative test frequencies to frequencies generally accepted throughout the industry and endorsed by the STS is considered acceptable, and does not degrade plant safety.

III. CONCLUSION

Based on the above evaluation, it is concluded that the proposed changes to the Technical Specifications for the auxiliary electric power systems will provide at least the existing degree of assurance that electric power will be available to essential equipment at all times. The proposed specifications closely conform with those in the Standard Technical Specifications and provide more specific requirements than those presently in effect.

It is also concluded that operation of Fort St. Vrain in accordance with the proposed changes will not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in any margin of safety.

Therefore, these changes will not increase the risk to the health and safety of the public nor are any significant safety hazard considerations involved.