CONNECTICUT YANKEE ATOMIC POWER COMPANY

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US NRC DISTRIBUTION SERVICES BRANCH

November 4, 1980

Docket No. 50-213
A01116

Director of Nuclear Reactor Regulation
Attn: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) W. G. Counsil letter to D. M. Crutchfield dated August 21, 1980.
(2) D. M. Crutchfield letter to W. G. Counsil dated July 1, 1980.

Gentlemen:

Haddam Neck Plant
Adequacy of Station Electric Distribution System Voltages

Reference (1) forwarded Connecticut Yankee Atomic Power Company's (CYAPCO) responses to Questions 2, 3, and 4 of Enclosure 1 to Reference (2), and informed the Staff that answers to Question 1 would be provided by November 26, 1980. Those answer are hereby provided as Attachment 1.

CYAPCO trusts this information will be sufficient to allow the Staff to complete their effort on this topic.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

W. G. Counsil

W. G. Counsil
Senior Vice President

Attachment

THIS DOCUMENT CONTAINS POOR QUALITY PAGES

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DOCKET NO. 50-213

ATTACHMENT 1

HADDAM NECK PLANT

ADEQUACY OF STATION ELECTRIC DISTRIBUTION SYSTEM VOLTAGES

NOVEMBER, 1980

Ref. 1: NRC Letter (W. Gammill) to all Power Reactor Licensees, dated August 8, 1979

Question

Guidelines 1 and 7 (Ref. 1) require that a separate analysis be performed for all available connections to the offsite network and that the analysis be adequately documented for each condition analyzed. Ref. 2 does not fully meet these requirements. To confirm the acceptability of the voltage conditions on the station electric distribution system submit adequate voltage analysis documentation for each case and condition analyzed in Ref. 2 and additional documentation, specifically:

a. Requirements of Guidelines 6 and 11 as well as 5 and 13 (Ref. 1) must be included in each separate case analyzed. These guidelines refer to the use of minimum and maximum expected grid voltages, maximum loads assumed for each analyzed case and a list of assumptions made for each analyzed case.

b. Supply the calculated voltages for all low voltage AC (less than 480 volts) Class 1E buses (including all available source connections) for each analyzed case. Do these buses supply instrumentation or control circuits as required by GDC 13? If so, is all equipment capable of sustaining the analyzed voltages without blowing fuses, overheating, and without affecting the equipment's ability to perform the required function?

c. Per Guidelines 3 and 9 (Ref. 1), compare the effect of starting and running the largest non-Class 1E load on all Class 1E buses and loads with the required voltage range for normal operation of all

Class 1E equipment (starters, contactors, motors, etc.) for each available connection of offsite power. This comparison should occur after the Class 1F buses are fully loaded.

d. By the use of disconnect links or other means, is it possible to backfeed from the 345 KV switchyard through the main transformer (319) and the service station transformer (309) to the Class 1E buses? If this is a viable connection, an analysis is required for this source connection or identify limiting conditions of operation.

Response

The attached data sheets (Attachment 1) summarize the cases analyzed in the voltage studies for Connecticut Yankee. This data should complete the required information requested by the NRC in the July 1, 1980 memo from D. M. Crutchfield to W. G. Counsil.

a. The data sheets include the minimum and maximum expected grid voltages, the loading conditions, mode of operation, and the assumptions made for each case in the analysis. The minimum expected grid voltages used in the analysis are the minimum acceptable grid voltages required to assure starting and running of all accident loads for the worst case bus loadings. The 106 KV level for two transformer operation is below the grid administrative limit of 106.4 KV and represents a voltage level which has a very low probability of occurrence. The probability of dropping below the 110.8 KV figure (for one transformer operation) is higher than that for the 106 KV figure, however this is offset by the low probability of having only one station service transformer available.

The maximum expected grid voltage of 117 KV is based on an early issue of the administrative limits for grid voltage at Connecticut Yankee. This level indicates the possibility of some overvoltages occurring (monitors have been installed to alarm when the voltage limits are exceeded). However, the present operating instructions specify an upper limit of 114.7 KV; a level which the study indicates would eliminate all of the overvoltage conditions identified. The 117 KV limit has been used in the study for the sake of conservation.

The normal full load case in this study includes the operation of both charging pumps, all service water pumps, and all CAR fans. While starting these individual loads during the start sequence, the running load for the motor being started is not removed from the normal full load on the 4.16 KV buses. This provides a conservatism in the analysis by making the bus loadings appear higher than they actually are.

Note: The starting loads are not included in the "LOAD" column of the data sheets because they are modeled as constant impedances rather than constant power loads.

b. All "Vital AC" at Connecticut Yankee is supplied by inverters. All "Semi-Vital AC" is supplied by regulating transformers. The only 120 VAC Class 1E loads not supplied by either the Vital or Semi-Vital AC are the service water filter motors. The voltages for the 120 volt bus supplying these loads are included in the data sheets.

These loads are capable of performing their required functions throughout each case studied. The voltages which fall below the normal required voltage for these loads are due to motor starts and are transient in nature with no significant effect on the performance of the motors.

c. Cases 15 and 29 of the data sheets indicate the voltages which occur during the starting of the largest non-Class 1E load (a steam generator feed pump) while the emergency buses are fully loaded. Once this pump has started, the voltages return to those detailed in cases 13 and 27 respectively. The Class 1E loads and associated equipment are capable of continued operation during and after the voltage dip caused by starting of the SGFP. Starting of the SGFP will not cause the level-two undervoltage scheme to trip the offsite power supply in this situation because the level-two scheme is blocked once the safety injection loads have started to sequence, and remains blocked until the sequence timers are reset.

For comparison purposes, the following voltage levels should be used as minimum bus voltages for either running or starting loads. These levels are adjusted for the cable drops listed under "assumptions" on the data sheet.

Nominal Voltage	Min. Running Voltage	Min. Starting Voltage
4160 Volt	3620 V	3300 V
480 Volt	406 V	402 V
120 Volt	110 V	-

d. There are no interlocks preventing this connection from being used. However, the 309 transformer has a capacity of only 15 MVA; enough to supply the reactor coolant pumps. During normal plant operation, the 309 transformer does not have sufficient capacity to operate the reactor coolant pumps and a division of plant auxiliary loads at the same time. With the plant off-line, the 309 transformer has the capacity to carry the auxiliary loads. Since either the 389 or the 399 transformer (or both) serves this purpose and would not require the 309 to be used in this application, we consider this connection to be not viable. Therefore, no analysis is required for this source connection.

Attachment No. 1

Connecticut Yankee

Auxiliary Bus Voltage Study

Data Sheets

CONNECTICUT YANKEE

CASE NO. 1 NO. OF STA. SERV. XFMR. IN SERV. 1 OR 2 MODE OF OPERATION SHUTDOWN

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION MINIMUM STATION LOAD

ASSUMPTIONS 4160-VOLT CABLE DROPS = 20 V RUNNING LOAD, 100 V STARTING LOAD

480-VOLT CABLE DROPS = 10 V RUNNING LOAD, 50 V STARTING LOAD

STARTING MOTORS ARE MODELED AS CONSTANT IMPEDANCES AND THE STARTING LOAD IS NOT INCLUDED IN THE "LOAD" COLUMN BELOW.

				PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
	NOMINAL BUS VOLTAGE	LOAD		VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
		MVA	p.f.				
SYSTEM	115 KV						
BUS 8	4.16 KV	2.0	0.70	4001 V	4423 V	NO CHANGE RECOMMENDED.	
BUS 9	4.16 KV	2.0	0.70	4001 V	4423 V		
BUS 1-4	480 V	0.50	0.70	453 V	503 V		
BUS 1-5	480 V	0.50	0.70	453 V	503 V		
BUS 1-6	480 V	0.50	0.70	453 V	503 V		
BUS 1-7	480 V	0.50	0.70	453 V	503 V		
LP-P2-1	120 V.	.102	0.70	112 V	128 V		

CONNECTICUT YANKEE

CASE NO. 2 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION STARTUP

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD w/o STEAM GENERATOR FEED PUMPS (SGFP)

ASSUMPTIONS SAME AS CASE 1

SERVICE WATER PUMPS, CAR FANS, AND CHARGING PUMPS ARE RUNNING IN ALL "NORMAL FULL LOAD" CASES. ADDITION OF THESE LOADS TO THE NORMAL LOAD ON THE 4.16 KV BUSES IS A CONSERVATISM IN THE STUDY.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	5.18	0.93	3988 V	4412 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	5.18	0.93	3988 V	4412 V		
BUS 1-4	480 V	1.13	0.91	450 V	499 V		
BUS 1-5	480 V	1.13	0.91	450 V	499 V		
BUS 1-6	480 V	1.13	0.91	450 V	499 V		
BUS 1-7	480 V	1.13	0.91	450 V	499 V		
LP-P2-1	120 V	0.15	0.70	114 V	127 V		

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CASE NO. 3 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION STARTUP

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD W/O SGFP - START SGFP

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	5.18	0.93	3537 V	3915 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	5.18	0.93	3537 V	3915 V		
BUS 1-4	480 V	1.13	0.91	396 V	441 V		
BUS 1-5	480 V	1.13	0.91	396 V	441 V		
BUS 1-6	480 V	1.13	0.91	396 V	441 V		
BUS 1-7	480 V	1.13	0.91	396 V	441 V		
LP-P2-1	120 V	0.15	0.70	100 V	111 V		

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CASE NO. 4 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION FULL POWER

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	9.1	0.92	3943 V	4371 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	9.1	0.92	3943 V	4371 V		
BUS 1-4	480 V	1.13	0.91	444 V	492 V		
BUS 1-5	480 V	1.13	0.91	444 V	492 V		
BUS 1-6	480 V	1.13	0.91	444 V	492 V		
BUS 1-7	480 V	1.13	0.91	444 V	492 V		
LP-P2-1	120 V	0.15	0.70	112 V	124 V		

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CASE NO. 5 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION PLANT TRIP

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD + TRANSFER OF 1 RCP PER DIVISION

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	11.99	0.92	3911 V	4343 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	11.99	092	3911 V	4343 V		
BUS 1-4	480 V	1.13	0.91	440 V	491 V		
BUS 1-5	480 V	1.13	0.91	440 V	491 V		
BUS 1-6	480 V	1.13	0.91	440 V	491 V		
BUS 1-7	480 V	1.13	0.91	440 V	491 V		
LP-P2-1	120 V	0.15	0.70	111 V	124 V		

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CASE NO. 6 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TEIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD + RCP + START LPSI PUMP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	11.99	0.92	3791 V	4211 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	11.99	0.92	3791 V	4211 V		
BUS 1-4	480 V	1.13	0.11	427 V	476 V		
BUS 1-5	480 V	1.13	0.11	427 V	476 V		
BUS 1-6	480 V	1.13	0.11	427 V	476 V		
BUS 1-7	480 V	1.13	0.11	427 V	476 V		
LP-P2-1	120 V	0.15	0.70	108 V	120 V		

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CASE NO. 7 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP W/ LOCA

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD + RCP + RUN LPSI PUMP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	12.90	0.72	3897 V	4331 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	12.90	0.72	3897 V	4331 V		
BUS 1-4	480 V	1.13	0.11	441 V	492 V		
BUS 1-5	480 V	1.13	0.11	441 V	492 V		
BUS 1-6	480 V	1.13	0.11	441 V	492 V		
BUS 1-7	480 V	1.13	0.11	441 V	492 V		
LP-P2-1	120 V	0.15	0.70	111 V	124 V		

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CASE NO. 8 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP, LPSI, START HPSI PUMP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	12.90	0.92	3746 V	4165 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	12.90	0.92	3746 V	4165 V		
BUS 1-4	480 V	1.13	0.11	421 V	471 V		
BUS 1-5	480 V	1.13	0.11	421 V	471 V		
BUS 1-6	480 V	1.13	0.11	421 V	471 V		
BUS 1-7	480 V	1.13	0.11	421 V	471 V		
LP-P2-1	120 V	0.15	0.70	106 V	119 V		

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CASE NO. 3 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP w/LOCA

MIN. EXPECTED GRID VOLTAGE 106KV MAX. EXPECTED GRID VOLTAGE 117KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP, LPSI, HPSI

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	14.04	0.91	3879 V	4316 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.91	3879 V	4316 V		
BUS 1-4	480 V	1.13	0.91	437 V	488 V		
BUS 1-5	480 V	1.13	0.91	437 V	488 V		
BUS 1-6	480 V	1.13	0.91	437 V	488 V		
BUS 1-7	480 V	1.13	0.91	437 V	488 V		
LP-P2-1	120 V	0.15	0.10	110 V	124 V		

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CASE No. 10 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP W/LOCA

MIN EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, FCP, LPSI, HPSI, START CHARGING PUMP

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	14.04	0.91	3782 V	4209 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.11	3782 V	4209 V		
BUS 1-4	480 V	1.13	0.91	426 V	476 V		
BUS 1-5	480 V	1.13	0.91	426 V	476 V		
BUS 1-6	480 V	1.13	0.11	426 V	476 V		
BUS 1-7	480 V	1.13	0.11	426 V	476 V		
LP-P2-1	120 V	0.15	0.70	107 V	120 V		

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CASE NO. 11 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP, LPSI, HPSI, CHARGING PP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	15.51	0.91	3856 V	4296 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	15.51	0.91	3856 V	4296 V		
BUS 1-4	480 V	1.13	0.91	434 V	486 V		
BUS 1-5	480 V	1.13	0.91	434 V	486 V		
BUS 1-6	480 V	1.13	0.91	434 V	486 V		
BUS 1-7	480 V	1.13	0.91	434 V	486 V		
LP-P2-1	120 V	0.15	0.70	110 V	123 V		

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CASE NO. 12 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP, LPSI, HPSI, CHAR. PP, START SERV. WTR. PP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	15.51	0.91	3825 V	4262 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	15.51	0.91	3825 V	4262 V		
BUS 1-4	480 V	1.13	0.91	430 V	481 V		
BUS 1-5	480 V	0.10	0.12	405 V	453 V		
BUS 1-6	480 V	0.10	0.12	405 V	453 V		
BUS 1-7	480 V	1.13	0.11	430 V	481 V		
LP-P2-1	480 V	0.15	0.70	102 V	122 V		

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CASE NO. 13 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, 1 CP, LPSI, HPSI, CHAR PP, SW PP (INCLUDES CAR FANS)

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	15.75	0.90	3852 V	4292 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	15.75	0.90	3852 V	4292 V		
BUS 1-4	480 V	1.13	0.91	433 V	485 V		
BUS 1-5	480 V	1.13	0.91	433 V	485 V		
BUS 1-6	480 V	1.13	0.91	433 V	485 V		
BUS 1-7	480 V	1.13	0.91	433 V	485 V		
LP-P2-1	120 V	0.15	0.70	110 V	123 V		

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CASE NO. 14 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP, LPSI, HPSI, CHAR. PP, SW PP, START CAR FAN

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	15.54	0.91	3822 V	4259 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	15.54	0.91	3822 V	4259 V		
BUS 1-4	480 V	1.13	0.91	430 V	481 V		
BUS 1-5	480 V	0.93	0.91	402 V	450 V		
BUS 1-6	480 V	0.93	0.91	402 V	450 V		
BUS 1-7	480 V	1.13	0.91	430 V	481 V		
LP-P2-1	120 V	0.15	0.70	101 V	114 V		

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CASE NO. 15 NO. OF STA. SERV. XFMR. IN SERV. 2 MODE OF OPERATION LOCA LOADS RUNNING

MIN EXPECTED GRID VOLTAGE 106 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOADS, ACCIDENT LOADS, START SGFP

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV						
BUS 8	4.16 KV	11.55	0.90	3449 V	3836 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	11.55	0.90	3449 V	3836 V		
BUS 1-4	480 V	1.13	0.91	386 V	432 V		
BUS 1-5	480 V	1.13	0.91	386 V	432 V		
BUS 1-6	480 V	1.13	0.91	386 V	432 V		
BUS 1-7	480 V	1.13	0.91	386 V	432 V		
LP-P2-1	120 V	0.15	0.70	98 V	109 V		

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CASE NO. 16 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION STARTUP

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD W/O 1 SGFP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	14.56	0.93				
BUS 8	4.16 KV	5.18	0.93	4078 V	4323 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	9.38	0.92	4078 V	4323 V		
BUS 1-4	480 V	1.13	0.91	460 V	489 V		
BUS 1-5	480 V	1.13	0.91	460 V	489 V		
BUS 1-6	480 V	1.13	0.91	460 V	489 V		
BUS 1-7	480 V	1.13	0.91	460 V	489 V		
LP-P2-1	120 V	0.15	0.70	116 V	124 V		

CONNECTICUT YANKEE

CASE NO. 17 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION STARTUP

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD W/O SGFP – START SGFP

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	14.56	0.93				
BUS 8	4.16 KV	5.18	0.93	3600 V	3820 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	9.38	0.92	3600 V	3820 V		
BUS 1-4	480 V	1.13	0.91	404 V	430 V		
BUS 1-5	480 V	1.13	0.91	404 V	430 V		
BUS 1-6	480 V	1.13	0.91	404 V	430 V		
BUS 1-7	480 V	1.13	0.91	404 V	430 V		
LP-P2-1	120 V	0.15	0.70	102 V	109 V		

CONNECTICUT YANKEE

CASE NO. 18 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION FULL POWER

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	18.20	0.92				
BUS 8	4.16 KV	9.10	0.92	4029 V	4278 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	9.10	0.92	4029 V	4278 V		
BUS 1-4	480 V	1.13	0.91	454 V	483 V		
BUS 1-5	480 V	1.13	0.11	454 V	483 V		
BUS 1-6	480 V	1.13	0.91	454 V	483 V		
BUS 1-7	480 V	1.13	0.91	454 V	483 V		
LP-P2-1	120 V	0.15	0.70	115 V	123 V		

CONNECTICUT YANKEE

CASE NO. 19 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION PLANT TRIP

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, TRANSFER 1 RCP PER DIVISION

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	23.98	0.92				
BUS 8	416 KV	11.99	0.92	3956 V	4211 V	NO CHANGE	RECOMMENDED
BUS 9	416 KV	11.99	0.92	3956 V	4211 V		
BUS 1-4	480 V	1.13	0.91	446 V	476 V		
BUS 1-5	480 V	1.13	0.91	446 V	476 V		
BUS 1-6	480 V	1.13	0.91	446 V	476 V		
BUS 1-7	480 V	1.13	0.91	446 V	476 V		
LP-P2-1	120 V.	0.15	0.70	112 V	120 V		

CONNECTICUT YANKEE

CASE NO. 20 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 1108 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP's, START 2 LPSI

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	23.98	0.92				
BUS 8	4.16 KV	11.99	0.92	3706 V	3949 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	11.99	0.92	3706 V	3949 V		
BUS 1-4	480 V	1.13	0.91	417 V	445 V		
BUS 1-5	480 V	1.13	0.91	417 V	445 V		
BUS 1-6	480 V	1.13	0.91	417 V	445 V		
BUS 1-7	480 V	1.13	0.91	417 V	445 V		
LP-P2-1	120 V	0.15	0.70	105 V	112 V		

CONNECTICUT YANKEE

CASE NO. 21 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP's, LPSI's

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	25.80	0.12				
BUS 8	4.16 KV	12.90	0.92	3925 V	4183 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	12.90	0.92	3925 V	4183 V		
BUS 1-4	480 V	1.13	0.91	442 V	473 V		
BUS 1-5	480 V	1.13	0.11	442 V	473 V		
BUS 1-6	480 V	1.13	0.91	442 V	473 V		
BUS 1-7	480 V	1.13	0.91	442 V	473 V		
LP-P2-1	120 V	0.15	0.70	111 V	120 V		

CONNECTICUT YANKEE

CASE NO. 22 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP's, LPSI's, START HPSI's

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	25.80	0.92				
BUS 8	4.16 KV	12.90	0.92	3615 V	3858 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	12.90	0.92	3615 V	3858 V		
BUS 1-4	480 V	1.13	0.91	406 V	434 V		
BUS 1-5	480 V	1.13	0.91	406 V	434 V		
BUS 1-6	480 V	1.13	0.11	406 V	434 V		
BUS 1-7	480 V	1.13	0.11	406 V	434 V		
LP-P2-1	120 V	0.15	0.70	102 V	110 V		

CONNECTICUT YANKEE

CASE NO. 23 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, PCP's, LPSI's, HPSI's

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	28.09	0.91				
BUS 8	4.16 KV	14.04	0.91	3884 V	4146 V	NO CHANGE	RECOMMENDED.
BUS 9	4.16 KV	14.04	0.91	3884 V	4146 V		
BUS 1-4	480 V	1.13	0.91	437 V	469 V		
BUS 1-5	480 V	1.13	0.91	437 V	469 V		
BUS 1-6	480 V	1.13	0.91	437 V	469 V		
BUS 1-7	480 V	1.13	0.91	437 V	469 V		
LP-P2-1	120 V	0.15	0.70	110 V	119 V		

CONNECTICUT YANKEE

CASE NO. 24 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP's, LPSI's, HPSI's, START 2ND CHAR PP.

ASSUMPTIONS CHARGING PP. ALREADY RUNNING ON BUS 9.

SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	28.09	0.91				
BUS 8	4.16 KV	14.04	0.91	3780 V	4036 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.91	3780 V	4036 V		
BUS 1-4	480 V	1.13	0.91	426 V	455 V		
BUS 1-5	480 V	1.13	0.91	426 V	455 V		
BUS 1-6	480 V	1.13	0.91	426 V	455 V		
BUS 1-7	480 V	1.13	0.91	426 V	455 V		
LP-P2-1	120 V	0.15	0.70	107 V	115 V		

CONNECTICUT YANKEE

CASE NO. 25 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 108 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP's, LPSI's, HPSI's, CHAR. PP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	29.56	0.91				
BUS 8	4.16 KV	15.51	0.91	V	4122 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.91	3857 V	4122 V		
BUS 1-4	480 V	1.13	0.91	434 V	466 V		
BUS 1-5	480 V	1.13	0.91	434 V	466 V		
BUS 1-6	480 V	1.13	0.91	434 V	466 V		
BUS 1-7	480 V	1.13	0.91	434 V	466 V		
LP-P2-1	120 V	0.15	0.70	110 V	118 V		

CONNECTICUT YANKEE

CASE NO. 26 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP w/ LOCA

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP's, LPSI's, HPSI's, CHAR. PP, START SW PP.

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	29.56	0.91				
BUS 8	4.16 KV	15.51	0.91	3823 V	4087 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.91	3823 V	4087 V		
BUS 1-4	480 V	1.13	0.11	430 V	461 V		
BUS 1-5	480 V	0.90	0.92	405 V	439 V		
BUS 1-6	480 V	1.13	0.91	430 V	461 V		
BUS 1-7	480 V	1.13	0.91	430 V	461 V		
LP-P2-1	120 V	0.15	0.70	102 V	111 V		

CONNECTICUT YANKEE

CASE NO. 27 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 108 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD; RCP's, LPSI's, HPSI's, CHAR. PP, SW PP (INCLUDES CAR FANS)

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	29.79	0.91				
BUS 8	4.16 KV	15.75	0.90	3852 V	4118 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.91	3852 V	4118 V		
BUS 1-4	480 V	1.13	0.91	433 V	465 V		
BUS 1-5	480 V	1.13	0.91	433 V	465 V		
BUS 1-6	480 V	1.13	0.91	433 V	465 V		
BUS 1-7	480 V	1.13	0.91	433 V	465 V		
LP-P2-1	120 V	0.15	0.70	110 V	121 V		

CONNECTICUT YANKEE

CASE No. 28 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION TRIP W/LOCA

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, RCP's, LPSI's, HPSI's, CHAR. PP, SW PP, START CAR FAN

ASSUMPTIONS SAME AS CASE 2

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	29.79	0.91				
BUS 8	4.16 KV	15.75	0.90	3817 V	4081 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.91	3817 V	4081 V		
BUS 1-4	480 V	1.13	0.91	430 V	461 V		
BUS 1-5	480 V	0.93	0.91	402 V	431 V		
BUS 1-6	480 V	1.13	0.91	430 V	461 V		
BUS 1-7	480 V	1.13	0.91	430 V	461 V		
LP-P2-1	120 V	0.15	0.70	101 V	109 V		

CONNECTICUT YANKEE

CASE NO. 29 NO. OF STA. SERV. XFMR. IN SERV. 1 MODE OF OPERATION LOCA LOADS RUNNING

MIN. EXPECTED GRID VOLTAGE 110.8 KV MAX. EXPECTED GRID VOLTAGE 117 KV

LOAD DESCRIPTION NORMAL FULL LOAD, ACCIDENT LOADS, START SGFP

ASSUMPTIONS SAME AS CASE 2.

	NOMINAL BUS VOLTAGE	LOAD		PRESENT XFMR. TAP		ALTERNATE XFMR. TAP	
		MVA	p.f.	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM	VOLTAGE FOR GRID MINIMUM	VOLTAGE FOR GRID MAXIMUM
SYSTEM	115 KV	25.60	0.91				
BUS 8	4.16 KV	11.56	0.91	3424 V	3659 V	NO CHANGE	RECOMMENDED
BUS 9	4.16 KV	14.04	0.91	3424 V	3659 V		
BUS 1-4	480 V	1.13	0.91	383 V	411 V		
BUS 1-5	480 V	1.13	0.91	383 V	411 V		
BUS 1-6	480 V	1.13	0.91	383 V	411 V		
BUS 1-7	480 V	1.13	0.91	383 V	411 V		
LP-P2-1	120 V	0.15	0.70	97 V	103 V		