NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-LOT-001-263-2-00 Revision 6

Q7-18.8-91

TITLE: PLANT DC ELECTRICAL SYSTEM (BYS)

	SIGNATURE	DATE
PREPARER		5/13/91
TRAINING AREA SUPERVISOR		5/13/91
TRAINING SUPPORT SUPERVISOR	J. Leigh for J. LeClair	5-13-91
PLANT SUPERVISOR/ USER GROUP SUPERVISOR		5/16/91

Summary of Pages

(Effective Date: 5/16/91)

Number of Pages: 12

Date	Pages
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MASTER

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VERIFICATION

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ATTACHMENT 6
LESSON PLAN TEMPORARY/PUBLICATION/ADDENDUM CHANGE FORM

The attached change was made to:

Lesson plan title: Plant DC Electrical System

Lesson plan number: 02-LOT-001-263-2-00

Name of instructor initiating change: D. Pettit

Reason for the change: add SOER 83-5 to the ref. section (pg 1 sect I-G.)

Type of change:

1. Temporary change ____
2. Publication change ____
3. Addendum change ✓

Disposition:

✓ 1. Incorporate this change during the next scheduled revision.

____ 2. Begin revising the lesson plan immediately. Supervisor initiate the process.

____ 3. To be used one time only.

Approvals:

Instructor: David W. Pettit /Date 8.9.91

Training Area Supervisor (or designee): [signature] /Date 8/9/91

I. TRAINING DESCRIPTION

A. Title of Lesson: Plant DC Electrical System (BYS) |6

B. Lesson Description: This lesson contains information pertaining to the Plant DC Electrical System. The scope of this training is defined by the learning objectives and in general covers the knowledge requirements of a Licensed Control Room Operator.

C. Estimate of the Duration of the Lesson: 1.5 Hours

D. Method of Evaluation, Grade Format, and Standard of Evaluation: Written examination, passing grade of 80% or greater.

E. Method and Setting of Instruction: This training should be conducted in the classroom.

F. Prerequisites:

1. Instructor:

a. The instructor shall be familiar with the lesson materials and have achieved the necessary instructor certification in accordance with NTP-16.

2. Trainee:

a. In accordance with eligibility requirements of NTP-10.

G. References:

1. Technical Specifications

a. 3/4.8.2, DC Sources

b. 3/4.8.2, Onsite Power Distribution Systems

2. Procedures

a. N2-OP-73A, Normal DC Distribution

b. N2-OP-73B, 24V DC Distribution

c. N2-OP-74A, Emergency DC Distribution

d. N2-OP-74B, HPCS 125V DC Distribution

3. NMP-2 FSAR

Design Basis Volume 16, Chapter 8, Page 8.354

Add ch 8/2/91 4. SOER 83-5 (TRR 600801-09)

II. REQUIREMENTS

A. AP-9, Administration of Training

B. NTP-10, Training of Licensed Operator Candidates

|6

III. TRAINING MATERIALS

A. Instructor Materials:

1. Training Record
2. Instructor's working copy of the lesson plan.
3. Whiteboard and Markers
4. Overhead Projector
5. Transparencies as needed
6. Flip Chart (if necessary)
7. Copy of trainee handouts
8. Trainee Course Evaluation Forms

B. Trainee Materials:

1. Handouts
2. Paper or Notebook
3. Pen or Pencil

IV. EXAM AND MASTER ANSWER KEYS

Will be generated and administered as necessary. They will be on permanent file in the Records Room.

V. LEARNING OBJECTIVES

Upon completion of this training, the trainee will have gained the knowledge to: |6

A. Terminal Objectives:

TO-1.0 Startup a Battery Charger. (2630010101)

TO-2.0 Shift Battery Chargers. (2630030101)

TO-3.0 Monitor the DC Distribution System. (2630040101)

TO-4.0 Check the DC Electrical Distribution System for grounds. (2630050101)

TO-5.0 Perform Ground Isolation. (2639050101)

B. Enabling Objectives:

EO-1.0 State the Purpose of the DC Electrical Distribution System.

EO-2.0 List the division and the corresponding color coding of each of the safety-related divisions of the 125VDC emergency DC system.

EO-3.0 List the safety related 125VDC system loads on Division I, II, III, and the 24 VDC system loads.

EO-4.0 List the source of power (by bus number) for all battery chargers.

EO-5.0 State the conditions and the length of time under which a battery charger can recharge its associated batteries from the design minimum charge to the fully charged state.

EO-6.0 List the non-safety related 125VDC buses.

EO-7.0 List the DC Electrical System support systems.

EO-8.0 Explain the basis for each precaution and limitation listed in N2-OP-73A, 73B, 74A, 74B. |6

EO-9.0 Regarding the Plant DC Electrical System, determine and use the correct procedure to identify the actions and/or locate information related to:

a. Startup

b. Shutdown

c. Normal

d. Off Normal

EO-10.0 Determine the appropriate bases, limiting condition for operations, limiting safety system setting and/or action statement ;as appropriate, given NMP2 Technical Specifications and a set of plant conditions.

VI. LESSON CONTENT

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
I. INTRODUCTION	1. Introduce self to class.	|6
	2. Circulate TR.	|
	3. Discuss Method of Evaluation.	|
	4. Distribute Course Evaluation Forms.	|
Student Learning Objectives	Show TP of Student Learning Objectives.	|6
A. Purpose		
The normal 125VDC system provides a reliable DC source of power for DC control power circuits, instrumentation, DC motors, and other essential DC loads required during normal and abnormal conditions of the plant. The 24VDC system provides a reliable DC source of power for the Source and Intermediate Range Neutron Monitoring systems. The 125VDC emergency power system provides a highly reliable source of continuous power to safety-related control, instrumentation and other essential DC loads required during normal plant conditions and safe reactor shutdown under all postulated Design Basis Accident (DBA) conditions.		EO-1.0 |6
B. General Description		
1. Plant distribution consists of:	Use Figures 1,2, and 3 to describe the Plant DC Distribution System	
a. Emergency (safety related) DC system		
b. Normal (non-safety related) DC system		
2. Emergency DC system		

a. Three physically separate and electrically independent divisions corresponding to the divisions of Emergency AC (ENS, EJS)

b. Each division of DC System supplies DC loads associated with corresponding AC System.

Q: What requires this Divisional Separation? |6

A: 10CFR50 App. R |

Reference the Browns Ferry Fire. |6

3. Normal DC system (125VDC,+24VDC)

a. 125VDC system supplies:
-normal switchgear
-main transformer
-reserve station service transformers
-aux boiler transformer
-other non-safety related loads

b. Three separate 125 VDC buses

c. Two + 24 volt batteries
Each supplies a separate bus.

II. DETAILED DESCRIPTION

A. Safety-Related DC Systems (Class 1E)

1. Emergency DC Power System (BYS,BWS) are designated Div I, II, III corresponding directly to Essential AC Power System (ENS,EJS) Divisions I, II, III.

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES	
2. Color Coded:		EO-2.0	6
a. Green (Div I)	Divisional colors also for AC.		
b. Yellow (Div II)			
c. Purple (Div. III)			
3. For loads see Table 1			
4. Div I/II(2BYS*BAT2A/B) batteries	Div. I & II Supply Loads on their divisions.	EO-3.0	6
a. Calcium grid lead acid batteries			
b. 125VDC			
c. 2550 amp-hrs(8 hrs. rating)	Div. III Supplies CSH System.		6
5. Div III (2BYS*BAT2C)			
a. Data same Div I/II except 100amp-hrs(8 hrs. rating)			
6. Chargers (two 100% cap. chargers for each division.)		EO-5.0	6
7. Div I/II Chargers sized to recharge the battery bank from minimum charge to full charge within 24 hours while supplying steady-state DC Loads. 2BYS*CHGR2A1/2(DIV I) 2BYS*CHGR2B1/2(Div II)	Battery chargers are located outside the Battery Rooms.		6
a. Convert 600 VAC to 125VDC 300 amp (continuous rating).			

8. Div I/II power supplies

EO-4.0 |6

Div I

CHGR2A1-600VAC PNL 2LAC*PNL100A

Emergency Lighting Panel

CHGR2A2-600VAC PNL 2EJS*PNL100A

Emergency Distribution Panel

Div II

CHGR2B1-600VAC PNL 2LAC*PNL300B

Emergency Lighting Panel

CHGR2B2-600VAC PNL 2EJS*PNL300B

Emergency Distribution Panel

9. Div III Chargers

   a. 50 amp (continuous) capacity (other data same as Div I/II)

   b. 125VDC output for 600VAC input.

10. Div III Power Supply

*CHGR2C1 and 2C2 are supplied from emergency MCC 2EHS*MCC201

B. Emergency 125VDC switchgear

1. Div I/II (batteries, chargers and breakers) are connected to switchgear 2BYS*SWG002A/B through a CKT breaker.

2. Div III (battery, chargers and breakers) is connected to 2CES*IPL414.

3. Emergency switchgear buses are ungrounded 2000 amp rated, with manually operated air circuit breakers (Div III bus rated for 100 amps).

C. Nonsafety-Related DC Power System -(Non-class 1E, required for normal plant operation but not safe shutdown) components identified by black color or NO-color coding.

1. Consists of normal 125VDC system and normal +24VDC system.

2. Normal 125VDC system (3 subsystems A, B, C)

600VAC BUS	Charger	Battery	Switchgear
2NJS-US5	2BYS-CHGR1A1	2BYS-BAT1A	2BYS-SWG001A
2NJS-US6	2BYS-CHGR1B1	2BYS-BAT1B	2BYS-SWG001B
2NJS-US6	2BYS-CHGR1C1	2BYS-BAT1C	2BYS-SWG001C

3. Normal 125VDC system feeds all non safety related (non-class 1E) DC instrumentation, control and other DC loads.

4. Normal +24VDC system

600VAC BUS (Thru 600/240 transformers)	Charger	Battery
2NJS-PNL500	2BWS-CHGR3A1	2BWS-BAT3A
	2BWS-CHGR3C1	2BWS-BAT3C
2NJS-PNL600	2BWS-CHGR3B1	2BWS-BAT3B
	2BWS-CHGR3D1	2BWS-BAT3D

EO-6.0 |6

5. +24VDC system feeds all DC neutron monitoring system loads, and consists of two 24V batteries, chargers, distribution panels.

D. Nonsafety-Related DC System Load

1. 125 VDC system consists of three subsystems, each having its own battery bank, charger, and switchgear.
2. Each charger (125VDC, 500 amp) can supply rated loads (excluding UPS loads) and charge batteries from minimum to full charge within 24 hours.
3. With the chargers out of service, each battery bank supplies enough power to operate all required loads for two hours.

E. Nonsafety-Related 24 VDC Power System

1. Provides two redundant DC power sources for Neutron Monitoring System and Emergency Response facility optical isolators.
2. Chargers (24VDC 25 amp) are capable of recharging from minimum to full load within 24 hours while supply normal system loads.
3. Each battery bank can supply enough power to operate all required loads for four hours with a charger out of service.

Source and Intermediate Range. |6

4. Each system consists of a three wire bus, two 24 VDC batteries, and two chargers. One battery is connected between the positive and common ground, the other between the negative and common ground.

III. INSTRUMENT, CONTROLS AND INTERLOCKS

A. Instrumentation

1. Safety-related 125VDC Power Distribution system.
   a. Control room back PNL-852 has indication of Bus volts and amps and charger volts and amps.
   b. Switchgear has indication of bus volts and amps.
2. Nonsafety-related 125VDC
   a. Control room back PNL-852 has indications of battery and charger amps and bus current.
3. Normal +24VDC
   a. Control room back PNL-852 has indications of battery and charger amps and bus current.

B. Controls

1. One ground detection control switch and pushbutton are provided for each battery on back PNL-852. Test pushbutton used with control switch in normal position for ground indication.

C. Interlocks

1. Div. I, II, III chargers have an over-voltage circuit which disconnects the AC input to the chargers when the DC output voltage exceeds a manually present valve.

IV. SYSTEM OPERATION

A. Normal Operation

1. Safety Related 125VDC

a. All breakers closed: chargers supplying power, batteries on "float"

2. Normal 125VDC and 24VDC

a. All breakers are closed and the batteries on float charge.

V. SYSTEM INTERRELATIONS

A. Each battery room has smoke detection fire protection, sufficient ventilation to limit hydrogen accumulation and maintain room temp between 65-104°F, and adequate lighting for inspection and maintenance.

EO-7.0 |6

B. AC power is supplied to DC systems through chargers as listed on pages 7 and 8.

VI. DETAILED SYSTEM REFERENCE REVIEW

Review each of the following referenced documents with the class.

A. Procedures

N2-OP-73A Normal DC Dist
N2-OP-73B 24VDC Dist
N2-OP-74A Emerg DC Dist
N2-OP-74B HPCS 125VDC Dist

Cover all precautions and limitations.

EO-8.0 |6
EO-9.0 |

B. Technical Specification

1. DC Sources LCO 3.8.2
2. Onsite Dist System LCO 3.8.3

EO-10.0 |6

VII. RELATED PLANT EVENTS

A. Refer to: NRCIN: 88-86
SOER 83-5

Discuss in detail the consequences of a loss of DC power as illustrated in SOER 83-5.

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VIII. SYSTEM HISTORY

A. Refer to modification: N/A

IX. WRAP-UP

A. Review the Student Learning Objectives.