NINE MILE POINT NUCLEAR STATION

UNIT #2 OPERATIONS

LESSON PLAN

02-REQ-001-283-2-00-4

PROCESS COMPUTER SYSTEM

Prepared by: Unit #2 Training Department

APPROVALS	SIGNATURES	DATE AND INITIALS REVISION 4
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Superintendent Operations-Unit #2 R. G. Smith	R. G. Smith	1/23/89

Summary of Pages

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CONTROLLED

THIS LESSON PLAN IS A GENERAL REWRITE

NIAGARA MOHAWK POWER CORPORATION

DOCUMENT

v33

Attachment "A"

OBJECTIVE APPROVAL

Author: UNIT II OP's TRAINING

Training Dept: Unit II OPS.

Lesson Title: Process Computer System

Lesson Plan #: NZ-OLP-64

Training Setting(s): Classroom

Purpose: Instructor shall present information for the student to meet each Student Learning Objective. Additionally, he shall provide sufficient explanation to facilitate the student's understanding of the information presented.

Trainee Job Title: LICENSED OPERATOR CANDIDATE
NON-LICENSED OPERATOR TRAINING
LICENSED OPERATOR REQUALIFICATION

Approvals/Review	Signatures	Date
Training Supervisor	[signature]	1/20/89
Plant Supervisor	[signature]	1/20/89
Training Analysts Supervisor	J. LeClair for D. Gardner	1-20-89

When complete, attach this form to the master lesson plan.

I. TRAINING DESCRIPTION

A. Title: N2-OLP-64, Process Computer System

B. Purpose: In a lecture presentation, the instructor shall present information for the student to meet each Student Learning Objectives. Additionally, he shall provide sufficient explanation to facilitate the student's understanding of the information presented.

C. Estimated Duration: Approximately 2 hours

D. Training Methods:

- Classroom Lecture
- Assign the Student Learning Objectives as review problems with the students obtaining answers from the text, writing them down and handing them in for grading.

E. References:

1. Technical Specifications

   None

2. Procedures

   a. N2-OP-91A, "Process Computer"

3. NMP-2 FSAR

   None

II. REQUIREMENTS AND PREREQUISITES

A. Requirements for Class:

1. AP-9, Rev. 2, "Administration of Training"
2. NTP-10, Rev. 4, "Training of Licensed Operator Candidates"
3. NTP-11, Rev. 5, "Licensed Operator Retraining and Continuing Training"
4. NTP-12, Rev. 3, "Unlicensed Operator Training"

B. Prerequisites:

1. Instructor

   a. Demonstrated knowledge and skills in the subject, at or above the level to be achieved by the trainees as evidenced by previous training or education, or

b. SRO license for Nine Mile Point Unit Two or a similar plant, or successful completion of SRO training including simulator certification at the SRO level for Nine Mile Point Unit Two.

c. Qualified in instructional skills as certified by the Training Analyst Supervisor.

2. Students

a. Meet eligibility requirements per 10CFR55, or

b. Be recommended for this training by the Operations Superintendent or his designee or the Training Superintendent.

III. TRAINING MATERIALS

A. Teaching Materials:

1. Transparency Package
2. Overhead Projector
3. Whiteboard and Felt Tip Markers
4. N2-OLP-64
5. N2-OLT-64
6. See Section I.E.1
7. See Section I.E.2

B. Student Materials

1. N2-OLT-64
2. See Section I.E.1
3. See Section I.E.2

IV. EXAMINATIONS, QUIZZES AND ANSWER KEYS

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

V. STUDENT LEARNING OBJECTIVES FOR PROCESS COMPUTER SYSTEM

Upon completion of this chapter, mastery of the required system knowledge will be demonstrated by performing the Enabling Objectives listed below.

64-1 State the purpose of the Process Computer System (PCS).

64-2 State the objectives of the P-1 Program.

64-3 State the objectives of the Operator Demandable (OD) programs in general and OD-3 specifically.

64-4 State the function of each alarm and video display color.

64-5 State how the PCS system interfaces with the control room operator, including what data may be displayed and how.

64-6 Given N2-OP-91A, "Process Computer", identify the appropriate actions and/or locate information related to:

a. Start-Up
b. Normal Operations
c. Shutdown
d. Off Normal Operations
e. Procedures for Correcting Alarm Conditions

VI. LESSON CONTENT

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
I. INTRODUCTION			
Student Learning Objectives	i		
A. System Purpose	1		1
1. Provides monitoring of various inputs called plant process variables and issues appropriate alarms and messages if limits are exceeded or trip signals are received.			
2. Performs calculations using selected inputs to provide the operator with essential plant performance information through a variety of logs, trends, summaries, and data displays.			
B. General Description			
1. The PCS is a digital computer system that:			
a. Receives process inputs from the plant.			
b. Converts the inputs to meaningful form for display on video monitors and typers.			
c. Performs calculations on these inputs.			
d. Provides information that is necessary for the effective operation of the plant.			
2. The PCS interfaces with various plant instrumentation and performs the following functions:			
a. scans process variables			
b. commits data to memory			
c. transfers data			
d. generates information displays			
e. initiates self-monitoring.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
II. DETAILED DESCRIPTION			
A. Process Interface System	2		5
1. PCS interfaces with control room operator by:			
a. two keyboards			
b. five CRT's			
c. three types (utility, log, and alarm)			
2. PCS has the ability to provide the operator with a multitude of information including:			
a. specific parameter display			
b. trend recordings			
c. logs			
d. alarm listings			
e. summaries			
B. Video Demand Services			
1. NSS Periodic and On-Demand Programs (NSS Function).			
a. These programs calculate and edit the periodic, daily, and monthly core performance logs.			
b. They also provide a variety of operator-demandable data arrays related to nuclear boiler performance.			3
c. Four periodic (P1-P4) and 21 on-demand (OD1-OD21)			
2. NSS MENU - is used to:			
a. Initiate NSS functions			
b. Review NSS function program status			
c. Review NSS function button status			
d. Review the NSS function ID (identification) summary.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
3. NSS Periodic Programs	3		
a. Periodic Core Evaluation P1			
1) Runs automatically at intervals during the day.			
2) Can be demanded from the CRT keyboards.			
3) Can also be initiatied automatically by program OD-11, PCIOMR Monitor (discussed later).			
4) P1 Objective: Calculate core power distribution, thermal limits, and other data needed for the periodic core performance log and for the operation of other programs.			2
b. Core Performance Summary (P2-P4)			
1) Programs P2, P3, and P4 are used to calculate daily and monthly core performance summaries (P2 and P3 respectively) and to update the computer memory records with the cummulative reactor core and generator energy produced since the last P1 (P4).			
2) P4 runs every 10 minutes.			
3) All four periodic programs run automatically.			
4) P1 and P3 can be manually initiated.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
4. Operator Demandable Programs (OD)	3		3
a. Whole-Core LPRM Calibration and Base Distributions (OD-1).			
1) OD-1 determines LPRM calibration constants which, when multiplied by the actual LPRM readings, produce calibrated LPRM readings that are proportional to radially cross-calibrated TIP signals read at the LPRM locations.			
2) OD-1 monitors the TIP, LPRM, and all other accumulated data required to perform the calibration calculations and to edit the results of these calculations.	4		
b. Specified LPRM Substitute Value and Base Distribution (OD-2).			
1) OD-2 uses the TIP system to:			
a) Determine the accurate substitute LPRM readings (calibrated and full power adjusted) for any failed LPRM sensor, and/or			3
b) Determine an updated BASE distribution (an axial distribution of calibrated, full power adjusted TIP readings) in any in-core ion chamber string for which the axial difference distribution used in P1 has become excessively large.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
c. Core Thermal Power and APRM Calibration (OD-3).	4		
1) OD-3 calculates the core thermal power by solving an energy balance on the Rx vessel.			3
2) OD-3 also determines the core flow rate.			
3) It also calculates the updated APRM calibration constants, gain adjustment factors (AGAF), and trip levels for the LPRM fast scan control function (OD-19), all based upon present APRM readings and the newly calculated core thermal power.			
4) AGAF's are required to compensate for loss of LPRM detector sensitivity with exposure, or for APRM amplifier output changes which may occur after substantial shifts in the core power distribution.			
d. Thermal Data in a Specified Fuel Bundle (OD-6).	5		3
1) OD-6 Objectives - To calculate and edit detailed thermodynamic data in any operator-specified fuel bundle in the core.			
2) The calculations are based on the results of the previous P1.			
3) OD-6 also calculates limits based on the two critical bundle criteria, and upon certain ECCS criteria.			
4) Has 4 options:			
a) Options 1 and 2 are short and long edits.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
b) Option 3 - Critical Bundle Power Calculations	5		
e. Present Control Rod Positions (OD-7)			3
1) OD-7 Objectives:			
a) Option 1 displays the most recent values in the rod position array (core-map presentation) which is continuously updated only during movement of a selected rod. The array is stored in the computer core.			
b) Option 2 forces the updating of the array by calling for a new scan of all rods, and displays the resulting array.			
2) Option 2 should be used when the operator believes that any previously failed rod position equipment has been repaired and is now operative. Additionally the operator may employ Option 2 when any doubt exists with regard to the stored rod position array. (eg: half scram testing, scrammed rod)			
f. Present LPRM Readings (OD-8)			
1) OD-8 Objective: to calculate and edit the present LPRM readings.			3
2) When OD-8 is initiated:	6		
a) A rapid (6 seconds) scan of all LPRM's is run.			
b) Calibration constants are applied to the readings.			
c) Tests are made to show whether the LPRM readings are within "reasonable" high and low limits. If they are not, the last good value is stored instead of the "failed" reading.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
g. Edit Specified Data (OD-10)	6		3
1) OD-10 makes available any one of a number of data arrays which have been stored by other programs.			
2) It can read or write the Security Log, used to restart the computer after an outage or accidental destruction of data.			
3) It may also allow reloading only the TIP and LPRM calibration data contained on a previously saved Security Log.			
h. PCIOMR Monitoring Program (OD-11)			
1) Preconditioning is performed at the beginning of each fuel reload cycle and is also required when predefined fuel exposure increments have been reached.			3
2) Preconditioning consists of maintaining a gradual increase in core power while monitoring the LHGR in each node of the fuel bundles assigned to the PCIOMR function.			
3) OD-11 Objectives:			
a) To calculate and edit data pertinent to the monitoring of PCIOMR.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
i. Isotopic Composition of In-Core Fuel (OD-12)	7		
1) Can be set to automatically operate following each P3 edit.			
2) OD-12 Objectives: To calculate and write the isotopic composition of the fuel in the core for fuel accounting purposes.			
j. Substitute and Unknown Control Rod Positions (OD-14).			
1) OD-14 Objectives:			3
a) To update and/or edit the stored list of substitute notch positions for rods whose position monitoring equipment has failed, or			
b) To edit the coordinates of rods whose positions are not known, or			
c) To update the stored control rod quadrant symmetry flag, or			
d) To block automatic initiation of P1 until it is next demanded, or			
e) To reinitialize logic in P5, or			
f) To block or unblock the automatic initiation of P1, if the LPRM filtering is incomplete.			
k. Computer Shutdown and Outage Recovery Monitor (OD-15)			
1) OD-15 Objectives:			3
a) To assist the operator in performing an orderly, planned shutdown of the PCS,			
b) To monitor the processes and values involved in returning the computer to normal operation following a computer shutdown, and			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
c) To load data required to restart P1 following a P1 or P2 abort.	7		

C. Miscellaneous Services

1. Several other services are available from the PCS, but are accessed only from the Computer Room.
   a. Most concern testing and maintenance of the computer, programs, and various peripherals.

D. RWM Program — 8

1. The Rod Worth Minimizer program assures the maintenance of low control rod worths, thereby minimizing the consequences of a control rod drop accident and optimizing the utilization of fuel.
2. The program employs the discrete and periodic monitoring of the positions of all control rods, and compares these positions to a predefined control rod sequence stored in the computer's memory.
3. The RWM gives alarms and rod blocks to ensure adherence to the stored sequence when operating below the LPSP of 30% Rx power.

NOTE: See the Reactor Manual Control System chapter for details of RWM operation.

E. Control Rod Interface Programs

1. Control rod interface programs perform the scanning, alarming, and data updating necessary for monotoring control rod movements.
   a. The Control Rod Driver program monitors the Rod Position Information System (RPIS) and the RWM for any change in control rod status.

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
1) If either of these services indicates rod movement or a control rod scan, the Control Rod Driver turns on the Control Rod Processing Program.	8		
b. The Control Rod Processing Program maintains and updates internal control rod position tables.			
1) This data is used to:			
a) Initiate the Control Rod Scan Program.			
b) Set up alarm messages for printout by the Control Rod Alarm program.			
c. The Control Rod Alarm program types out control rod alarm messages as required by the Control Rod Processing Program (discussed further in Abnormal Operations).			
III. INSTRUMENTATION, CONTROLS AND INTERLOCKS	9		
A. Keyboard Functions			
1. All functions are available from the Operator's CRT keyboard (C91-K600) or the Utility CRT keyboard (C91-K601).			
B. Trend Pens			
1. Three trend recorders can be used to record trends of selected ID values.			
a. Vertical section of panel 603			
b. Vertical section of panel 601 left side			
c. Vertical section of panel 851 right side.			
C. Digital Displays			
1. There are four digital displays associated with The BOP digital cabinet.			
a. Located in the P603 vertical section			
b. On the left-side are:			
1) A digital clock (HH:MM)			
2) A 4-digit selectable display			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
c. On the right-side are two 5-digit selectable displays.	9		
D. Interlocks When one program is being run, another program may be rejected depending on priority.			
IV. SYSTEM OPERATION			
A. Normal Operation	10		5
1. PCS is normally in operation, continuously scanning the various inputs.			
a. All readouts are in the applicable engineering units.			
b. All information is stored in the main memory, and is periodically recorded on magnetic tape ("dumped") for safekeeping.			
2. Operator request for console operation:			
a. Results in a brief interaction with the computer software: concise instructions are displayed which detail the information required and the operator's choices.			
3. A desired function is initiated by:			
a. Depressing			
1) A dedicated function button (e.g., POINT DATA), or			
2) A menu selection function button (i.e., INIT or NSS MENU),			
b. Entering the corresponding function number, and			
c. Depressing the EXEC action key (and ENABLE).			
4. After a function has been selected, a display or response message is displayed on the CRT in use.			
a. This documents the initiation of the selected function and/or provides for the entry of additional data required to operate the function.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
B. Infrequent Operation			
1. Static or Dynamic Program Inhibition	10		
a. If a request to initiate a program is not honored due to static or dynamic priority considerations, an appropriate error message will be written to inform the operator of such.			
1) If the request came from the operator's console,			
a) Further attempts to initiate the desired program would have to be operator initiated.			
2) If PCS demanded the program, the computer will keep trying until it is successful.			
2. TIP Scan	11		
a. PCS has three programs to provide the TIP, LPRM, and APRM readings required for the operation of NSS programs OD-1 and OD-2.			
1) Data is collected during TIP traverses (See TIP chapter for details).			
2) From the point where the TIP probe starts downward through the core from the top of the active fuel, the TIP Scan program will scan:			
a) The TIP probe readings as its traverses the core, and			
b) The APRM and LPRM readings at various points in the traverse.			
b. The TIP alarm program will monitor the traverse, and alarm TIP system errors such as:			
1) Improper speed during traverse			
2) TIP not running in the proper channel			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
c. The Control Rod Processing program will initiate a warning message if a rod movement request is detected, stating that rod movement during a TIP traverse will degrade the accuracy of the core calculations.	11		
C. Abnormal Mode of Operation			
1. Alarms			
a. Are initiated automatically in response to a variable which has reached a specified condition.			
b. A summary of all variables currently in alarm can be demanded by the control room operator.			
c. Provided for information and historical perspective.			
2. When a variable is in alarm state so that its value is not usable.	12		
a. Last good value is used			
b. A code (red asterisk or data in white) accompanies substituted value indicating variable is temporarily deleted from processing.			
c. Updated normally after it returns to a usable condition.			
3. Alarm Categories			4
a. Cat 1: Red -- Equipment trip alarm			
b. Cat 2: Yellow -- Pre-trip alarm			
c. Cat 3: Cyan (Light Blue) -- Trouble and local alarm			
4. Selected NSS signals are scanned once each second to monitor process variable alarms. If they have changed state from previous condition then:			
a. alarm the condition/return to normal			
b. single stroke bell			
c. print description message			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
5. Control Rod Alarm Program	12		4
a. Types out the following alarms associated with rod movement:			
1) Rod Drift Alarm			
2) RPIS Timing Error			
3) RPIS Malfunction			
4) Rod XX-YY. From OO to NN.			
5) OD-1/2 Control Rod Motion Will Degrade Calibration Accuracy			
6. Post Trip Log			
a. A printout on the Utility typer.			
b. Provides an operations log of data history prior to and following a plant trip.			
c. The NSS Post Trip log will aid the operator in establishing the cause of a Rx scram.			
d. The log is initiated:	13		
1) Automatically on receipt of a scram, or			
2) Is demandable through LOG SVCE on the operator's console.			
7. Sequence of "Events" Log			
a. Provides a chronological log on the alarm typer of rapidly occurring plant instrumentation alarm status changes.			
b. Aids the operator in establishing the cause of a Rx scram and identifying events which may or may not allow the Rx to return to normal operations.			
c. Also aids in the verification of the proper operation and assessment of ECCS operation.			

Activity	Text Ref. Page	Text Ref. Fig.	S.L.O.
V. SYSTEM INTERRELATIONS			
A. Rod Worth Minimizer Designed to constrain control rod positioning according to predefined sequences. These sequences are designed to limit the maximum reactivity worth of individual control rods, thus minimizing the consequences of a control rod drop accident.	13		
B. Reactor Manual Rod Control and LPRM RXMC and LPRM send data to the PCS, via the computer interface module.			
C. Plant Electrical Distribution PCS is powered by 120V, 3 phase, 2VBS-PNLC100 which is supplied by UPS bus 2VBB-UPS1G.	14		
VI. DETAILED SYSTEM REFERENCE REVIEW Review the following referenced documents with the class.			
A. Technical Specifications None			
B. Procedures 1. N2-OP-91A Process Computer			
VII. RELATED PLANT EVENTS			
A. Refer to Addendum "A" and review related events with class, (if applicable).			
VIII. SYSTEM HISTORY			
A. Refer to Addendum "B" and review related modifications with class, (if applicable).			
IX. WRAP-UP			
A. Review the Student Learning Objectives.			

NINE MILE POINT NUCLEAR STATION

Φ9-191-91

UNIT II OPERATIONS

LESSON PLAN

PLANT COMMUNICATIONS

02-REQ-ΦΦ1-285-2-91

Prepared By: Unit #2 Training Department

APPROVALS	SIGNATURES	DATE AND INITIALS REVISION 2
Training Supervisor Nuclear - Unit #2 G. L. Weimer	G. L. Weimer	1/16/89
Assistant Training Superintendent - Nuclear R. T. Seifried	R. T. Seifried	RTS 1/19/89
Superintendent of Operations Unit #2 R. Smith	R. Smith	1/23/89 RS

Summary of Pages

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Date	Pages
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NIAGARA MOHAWK POWER CORPORATION

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Attachment "A"

OBJECTIVE APPROVAL

Author: UNIT II OP's TRAINING

Training Dept: Unit II OPS.

Lesson Title: PLANT COMMUNICATIONS SYSTEMS

Lesson Plan #: NZ-OLP-65

Training Setting(s): Classroom

Purpose: Instructor shall present information for the student to meet each Student Learning Objective. Additionally, he shall provide sufficient explanation to facilitate the student's understanding of the information presented.

Trainee Job Title: LICENSED OPERATOR CANDIDATE
NON-LICENSED OPERATOR TRAINING
LICENSED OPERATOR REQUALIFICATION

Approvals/Review	Signatures	Date
Training Supervisor	[signature]	1/16/89
Plant Supervisor	[signature]	1/23/89
Training Analysts Supervisor	[signature]	1-12-89

When complete, attach this form to the master lesson plan.

I. TRAINING DESCRIPTION

A. Title: Plant Communications

B. Purpose:

In a lecture presentation, the instructor shall present information for the student to meet each Student Learning Objective. Additionally, he shall provide sufficient explanation to facilitate the student's understanding of the information presented.

C. Total Time: Approximately 1 hour

D. Teaching Methods:

1. Classroom Lecture
2. Assign the Student Learning Objectives as review problems with the students obtaining answers from the text, writing them down and handing them in for grading.

E. References:

1. Operating Procedures
   a. N2-OP-76, Plant Communications, Rev. 1
2. Technical Specifications
   a. Communications, LCO/SR/Bases 3/4.9.5, October 31, 1986
3. Final Safety Analysis Report (Amendment 27)
   a. Communications Systems, 9.5.2
4. Site Emergency Plan (Revision 17)
   a. Communications Systems, 7.2
5. Emergency Plan Implementing Procedures
   a. EPP-17, Communications Procedures, Rev. 8

II. REQUIREMENTS AND PREREQUISITES

A. Requirements for Class

1. AP-9, Rev. 2, Administration of Training
2. NTP-10, Rev. 4, Training of Licensed Operator Candidates
3. NTP-11, Rev. 5, Licensed Operator Retraining and Continuing Training
4. NTP-12, Rev. 3, Unlicensed Operator Training

B. Prerequisites:

1. Instructor
   a. Demonstrated knowledge and skills in the subject, at or above the level to be achieved by the trainees, as evidenced by previous training or education, or

b. SRO license for Nine Mile Point Unit II or a similar plant, or successful completion of SRO training including simulator certification at the SRO level for Nine Mile Point Unit II, and

c. Qualified in instructional skills as certified by the Training Analyst Supervisor.

2. Students

a. Meet eligibility requirements per 10CFR55, or

b. Be recommended for this training by Operations Superintendent, his designee, or Training Superintendent.

III. TRAINING MATERIALS

A. Teaching Materials:

1. Transparency Package
2. Overhead Projector
3. Whiteboard and Felt Tip Markers
4. N2-OLP-65
5. N2-OLT-65
6. See Section I.E.1
7. See Section I.E.2

B. Student Materials:

1. Text: N2-OLT-65; Plant Communications
2. See Section I.E.1
3. See Section I.E.2

IV. QUIZZES, TESTS, EXAMS AND ANSWER KEYS

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

V. STUDENT LEARNING OBJECTIVES FOR THE PLANT COMMUNICATIONS SYSTEMS

Upon completion of this chapter, mastery of the required system knowledge will be demonstrated by performing the Enabling Objectives listed below.

65-1 State the purpose of the plant communications systems.

65-2 Given N2-OP-76, Plant Communications, use the procedure to identify the appropriate actions and/or locate information related to:

- a. Startup
- b. Normal Operation
- c. Shutdown
- d. Off-Normal Procedures

65-3 SRO ONLY: Given Technical Specifications, identify the appropriate actions and/or locate information relating to limiting conditions for operation, bases and surveillance requirements for the plant communications system.

VI. LESSON CONTENT	Text Ref. Page.	Text Ref. Fig.	SLO
I. INTRODUCTION			
Student Learning Objectives	i		
A. System Purpose	1		1
The plant communication systems provide reliable communications within the plant, with Nine Mile Point Unit 1, and with offsite locations under normal, abnormal, and emergency conditions.			
B. Design Bases			
Plant Communications System is not safety related but some of the systems are required to transmit and receive information as part of the site emergency plan.			
C. System Overview/General Description	1	1	
Plant communication systems are divided into two groups.			
1. The Inplant Communications systems provide voice communications between the control room personnel and personnel in the plant. (They can also be used to communicate between Units 1 and 2.) These consist of:			2
a. Page Party/Public Address (PP/PA)			
b. Dial Telephone System (NMPC Telephone System)			
c. Maintenance and Calibration Communication System	2		
d. Sound Powered Communication System			
e. Portable Radio Communication System			

ACTIVITY	Text Ref. Page.	Text Ref. Fig.	SLO
2. Out of Plant Communication Systems	2		2
a. Dial Telephone System ties to NMPC Telephone System			
b. Dedicated Telephone Lines			
c. Plant-to-Offsite Radio Console			
II. DETAILED DESCRIPTION	3		
A. Page Party/Public Address (PP/PA) System			
1. The system has a public address channel and 5 channels for party communications.			
2. The system also provides station alarms.			
3. It is a solid state system consisting of hand set stations, unit speaker amplifiers, loudspeaker stations, cables, terminal boxes, and muting facilities.			
4. The loudspeaker stations are grouped into two separate paths of communication and the signal lines of each group are physically separated to improve reliability.			
a. Muting feature prevents system feedback by not powering speakers in the area of the handset in use.			
b. Two multitone generators are provided			
1) Generates alarm signals			

ACTIVITY		Text Ref. Page.	Text Ref. Fig.	SLO
	2) Alarms can only be generated from the control room or remote shutdown room.	3		2
	3) An alarm overrides any page			
	c. Telephone code call tone generator is used as a backup for generating alarm signals.			
5.	The page lines are electrically supervised for continuity. (a small amount of current is sent through the lines to ensure a complete circuit exists).			
6.	The Unit 1 and Unit 2 PP/PA systems can be operated either isolated or merged (as separate systems or as a single combined system).			
7.	The PP/PA system is powered from 2VBB-UPS1C and 2VBB-UPS1D via transfer switch			
B.	Maintenance and Calibration Communication System (M/CC)	4		
1.	The system consists of plug in jack outlets near major equipment, control panels, relay panels, and instrument jacks.			

ACTIVITY	Text Ref. Page.	Text Ref. Fig.	SLO
2. There are 11 system channels with 10 channels used for M/CC communications and the other channel reserved for the sound powered system.	4		2
3. Each jack station has a corresponding selector switch in the auxiliary relay room. The selector switches are used to connect a jack to a selected channel. The jacks selected to the same channel can communicate. The channels are also provided with selector switches which can be used to join channels together into a larger system.			
4. The system receives power from normal 120 VAC (2 LAC PNL NO4 CKT 4) through a DC power supply cabinet with a 6VDC outlet.			
5. Portable head sets, with built in amplifiers are plugged into each jack to establish communications.			
C. Sound Powered Communication System			
1. One channel of M/CC is reserved for sound powered communications			
2. Sound powered head sets use the same jacks as the M/CC system.			
3. The system is used on loss of plant electrical power			
4. The dc power supply must be disconnected from the M/CC ckt prior to use of the SPC headsets or damage could result to the headsets.			

ACTIVITY	Text Ref. Page.	Text Ref. Fig.	SLO
D. Dial Telephone System			
1. The system consists of dial telephone sets throughout the plant and is part of the NMPC tie line system.	4		2
2. Connection to outside lines is accomplished by the station telephone operator.			
3. Code calling is performed using the dial telephone.	5		
a. Management/supervisory personnel are each assigned a two digit code.			
b. To code call, a person must dial:			
1) Access number 54			
2) Two digit code			
c. Tones broadcast over PP/PA are in two groups, representing the two digit code number.			
d. The person paged answers the page by dialing 55, the code call page then stops.			
E. Portable Radio Communication System			
1. Battery operated walkie-talkies using VHF frequencies.			
2. A leaky wire antenna system is distributed throughout the plant, with repeaters fed from an UPS.			
3. Radios normally provide communication for maintenance, operating and security personnel.			
4. The radio console in the control room can be used to communicate with the hand-held units.			

ACTIVITY	Text Ref. Page.	Text Ref. Fig.	SLO
F. Dedicated Telephone Lines These lines provide independent and reliable paths for transferring information: 1. A dedicated phone line is provided from the load dispatcher to the control room so that the unit load on the grid can be rapidly ordered during normal operations. 2. For emergencies they ensure reliable transmission of information and ensures no single line is overloaded with too much information.	5		2
G. Plant-to-Office Radio Communication System 1. Consoles are provided at the following locations: a. Control Rooms (I & II) b. Technical Support Center c. Emergency Operations Facility 2. The consoles provide communication through the various repeaters and base stations on all channels in use at NMPNS. 3. Consoles also allow communication with the following: a. Oswego County Fire Control b. Offsite Radiation Protection and Administration channels c. Power Control Center (Load Dispatcher) d. Personal beepers - Selective call or group call (Beepers are available to notify personnel in the event of an emergency).	6		

ACTIVITY	Text Ref. Page.	Text Ref. Fig.	SLO
III. INSTRUMENTATION, CONTROLS AND INTERLOCKS	6		2

A. Controls

1. PP/PA Control Console is the primary control station for the PP/PA system and is located in the control room. The console consists of:
   a. Handset
   b. ON-OFF Selector Switch for the outdoor loudspeakers
   c. ISOLATE-MERGE selector switch for the Unit 1/Unit 2 PP/PA tie
   d. ISOLATE-MERGE selector switch for the Unit 2/Administration Building PP/PA tie
   e. Station alarm override switch
   f. Indicating lights for
      1) Outdoor speaker status
      2) ISOLATE/MERGE status of NMP1/ NMP2 systems
      3) ISOLATE/MERGE status of NMP2/ administration building systems
      4) DC power supply in use
   g. Momentary contact toggle switches for station alarms

2. Each PP/PA Handset has
   a. A 5 position switch (1-5) for party lines
   b. A pushbutton for paging throughout plant

3. Two Relay and Control Cabinets are associated with the PP/PA system. 7
   a. Provides switching functions (relays) for alarms and pages.

ACTIVITY		Text Ref. Page.	Text Ref. Fig.	SLO
	b. Tone generators that create the emergency alarms.	7		2
	c. Main Relay and Control Cabinet located in the Aux. Relay Room, northwall.			
	d. Backup Relay and Control Cabinet located in Turbine Building, 250 ft. elevation, east side.			
	4. The Auxiliary Relay Room contains the jack control switches for M/CC system jacks.			
	B. Interlocks			
	1. Plant Emergency Alarm			
	a. Overrides any page which is being broadcast over the PP/PA system.			
	b. Alarms are prioritized such that a higher priority alarm will override an alarm of lower priority.			
	1) Only one alarm tone may be produced at any one time.			
	2) Evacuation alarm - priority one Fire alarm - priority two Station alarm - priority three			
	c. Activation of an alarm tone will automatically merge all the page line			
	2. NRC Emergency Notification System Picking up the dedicated telephone rings NRC Emergency Operations Center in Bethesda, Maryland.			

ACTIVITY	Text Ref. Page.	Text Ref. Fig.	SLO
IV. SYSTEM OPERATION	7		2

A. Startup

1. Perform power supply line up
2. Phone check
3. Loudspeaker check

B. Normal Operation

Under normal conditions all communications systems are available.

C. Shutdown

1. In the event one communication system is inoperable, other communication systems can perform the same functions. Multiple lines for emergency communications are provided.
2. If the dial telephone is required to be shutdown, the NRC must be notified (see NRC Bulletin 85-79).

D. Off-Normal

Redundant and independent communication systems are available. Direct, single purpose telephone lines are provided to ensure a smooth flow of information and guarantee that no line is overloaded. Emergency communications are conducted in accordance with site emergency plan.

V. SYSTEM INTERRELATIONS

A. Plant Electrical System

Provides the required AC & DC electrical power for the inplant communications systems.

ACTIVITY	Text Ref. Page.	Text Ref. Fig.	SLO
VI. DETAILED SYSTEM REFERENCE REVIEW Review each of the following referenced documents with the class.			
A. Technical Specifications Review	8		3
1. LCO 3/4.9.5 Communications Procedure Review			
B. Procedures Review			
1. N2-OP-76, Plant Communications			
VII. RELATED PLANT EVENTS			
A. Refer to Addendum "A" and review related events with class (if applicable).			
VIII. SYSTEM HISTORY			
A. Refer to Addendum "B" and review related events with class (if applicable).			
IX. WRAP-UP			
A. Review the Student Learning Objectives.			