NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

LESSON PLAN

Φ7-187-91

INSTRUMENTATION AND CONTROL

SYSTEM INSTRUMENTS

02-LOT-ΦΦ2-3Φ9-2-Φ2

Prepared By: Unit #2 Training Department

APPROVALS	SIGNATURES	DATE AND INITIALS REVISION 0
Training Supervisor Unit #2 G. L. Weimer		5/11/88
Assistant Superintendent Training - Nuclear R. T. Seifried	R. T. Seifried	RTS 5/13/88
Superintendent Operations Unit #2 R. G. Smith		6/16/88

Summary of Pages

Revision: 0 (Effective Date: 6/16/88)

Number of Pages: 5

Date	Pages
April 1988	1 5

5/13/226

I. TRAINING DESCRIPTION

A. Title: Instrumentation and Control, System Instruments

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. Estimated Duration: Approximately 1 hour

D. Training Methods:

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

E. References:

1. GE BWR Academic Series, Instrumentation and Control Rev. 1, Chapter Two.

II. REQUIREMENTS AND PREREQUISITES

A. Requirements for Class:

1. AP-9, Rev. 2, Administration of Training
2. NTP-10, Rev. 3, Training of Licensed Operator Candidates

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 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. GE BWR Academic Series, Instrumentation and Control, Instructor Guide, Chapter Two
5. OLP-ICB

B. Student Materials

1. GE BWR Academic Series, Instrumentation and Control, Text

IV. EXAMINATIONS, QUIZZES AND ANSWER KEYS

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

V. OBJECTIVES

Upon completion of this chapter, mastery of required topical knowledge will be demonstrated by performing Enabling Objectives listed beneath each topic title.

1. Pressure Sensors and Instruments
    1. Identify the basic components of manometers, diaphragm pressure gauges, bellows pressure gauges, and a Bourdon tube pressure gauges.
    2. Explain the operating principle of each of the four types of pressure gauges.
    3. Distinguish between an open manometer, a differential manometer, and a barometer.
    4. Explain the operating principle of basic differential pressure cells.

2. Temperature Sensors and Instruments
    2. Explain the principle of operation of filled thermal systems, thermocouples, and resistance temperature detector.
    3. Describe the advantages and disadvantages of thermocouples and RTDs.

3. Flow Sensors and Instruments
    2. Explain the principle of operation of pitot-static tubes, a venturi tubes, flow nozzles, orifice meters, elbow meters, and rotameters.
    3. Describe the relationship between volume flow rate and differential pressure of a fluid passing through a restriction.
    4. Describe the advantages and disadvantages of flow nozzles, orifices, venturis, and elbows for measuring flow.

4. Liquid Level Measurement
    1. Identify the basic components of the following level measuring instruments.
        1. Open-tank
        2. Closed-tank (non-saturated system)
        3. Closed-tank (saturated system)

2. Explain the principle of operation of the level measuring instruments listed in objective 4.1.
3. Describe the effect of the following factors on level indication.
    1. System and environmental temperature changes
    2. System pressure changes
    3. Reference leg leaks

5. Signal Transmission and Indication
    1. Describe the three modes of signal transmission.
    2. Describe the functions of the following indication devices:
        1. Meters
        2. Recorders
        3. Indicating Lights
        4. Annunciators
        5. Computer Printouts

VI. LESSON CONTENT

A. GE BWR Academic Series, Instrumentation and Control, Instructor Guide, Chapter Two.

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

LESSON PLAN

Ø7-187-91

INSTRUMENTATION AND CONTROL

NUCLEAR INSTRUMENTS

02-LOT-ØØ2-3Ø9-2-Ø3-

Prepared By: Unit #2 Training Department

APPROVALS	SIGNATURES	DATE AND INITIALS REVISION 0
Training Supervisor Unit #2 G. L. Weimer	G L Weimer	5/11/88
Assistant Superintendent Training - Nuclear R. T. Seifried	R T Seifried	RTS 5/12/88
Superintendent Operations Unit #2 R. G. Smith	R G Smith	6/17/88

Summary of Pages

Revision: 0 (Effective Date: 6/17/88)

Number of Pages: 4

Date	Pages
April 1988	1 - 4

NIAGARA MOHAWK POWER CORPORATION

I. TRAINING DESCRIPTION

A. Title: Instrumentation and Control, Nuclear Instruments

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. Estimated Duration: Approximately 1 hour

D. Training Methods:

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

E. References:

1. GE BWR Academic Series, Instrumentation and Control Rev. 1, Chapter Three.

II. REQUIREMENTS AND PREREQUISITES

A. Requirements for Class:

1. AP-9, Rev. 2, Administration of Training
2. NTP-10, Rev. 3, Training of Licensed Operator Candidates

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 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. GE BWR Academic Series, Instrumentation and Control, Instructor Guide, Chapter Three
   5. OLP-ICC

B. Student Materials
   1. GE BWR Academic Series, Instrumentation and Control, Text

IV. EXAMINATIONS, QUIZZES AND ANSWER KEYS

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

V. OBJECTIVES

Upon completion of this chapter, mastery of required topical knowledge will be demonstrated by performing Enabling Objectives listed beneath each topic title.

1. Radiation Detection Principles
    1. Identify components of a basic radiation measuring instrument at block-diagram level.
    2. Label components of a basic gas-filled radiation detector.
    3. Describe principles of operation of gas-filled radiation detectors.
    4. Define secondary ionization, gas amplification, and saturation.
    5. Explain effects on radiation detector operation of varying voltage potential.

2. Neutron Flux Detection
    1. Explain the reason neutron detection is used to measure reactor power level.
    2. Identify the region of the six-region curve in which neutron detectors are operated.
    4. Describe two neutron interactions used to create charged particles in a neutron detector.

3. Fission Chamber Neutron Detectors
    1. Identify components of typical fission-chamber neutron detectors.
    2. Describe principles of operation for a fission-chamber neutron detector operating as a proportional counter (pulse mode).
    3. Describe principles of operation for a fission-chamber neutron detector operating as an ion chamber (current node).

4. Gamma Discrimination
    1. Describe the purpose of gamma discrimination.
    2. Explain pulse-height discrimination and the "mean square root" process.
    3. Explain reasons gamma discrimination is not needed in the power range.

VI. LESSON CONTENT

A. GE BWR Academic Series, Instrumentation and Control, Instructor Guide, Chapter Three.