METROPOLITAN EDISON COMPANY Subsidiary of General Public Utilities Corporation

Subject: Training Programs - TMI Staff

Location: TMI Nuclear Station, Middletown, Penna.
Date: August 1, 1973

From: R. W. Zechman

To: J. G. Herbein

Enclosed is an outline of the various training programs conducted for the TMI Staff to date. It should be noted that not all personnel in a particular classification received each program listed because all were not on site at the same time or required each course. However, in general, each classification received the courses listed.

R. W. Zechman
Training Specialist

RWZ:nll

~~Pltf's~~ Ex. B&W 556 For ID
~~Deft's~~ 3-10-82 J.R. Danyo

INTER-OFFICE MEMORANDUM

Training Programs conducted for TMI Staff vary according to the past experience or the need of the individuals in various classifications. In general, the training programs presented to the following groups will be outlined in this report.

1. Operations Staff

   A. Supervisory Staff: Includes Shift Foremen and Shift Supervisors

   B. Non-Supervisory Staff: Includes Control Room Operators and Auxiliary Operations.

2. Technical Staff (Radiation Protection and Chemistry Personnel)

   A. Supervisory Staff: Includes Staff Chemist and Radiation Protection Supervisory

   B. Non-Supervisory Staff: Includes Analyst and Radiation Protection Technicians.

3. Maintenance Staff

   A. Supervisory Staff: Includes Instrument Foremen, Electrical Foremen, and Mechanical Foremen.

   B. Non-Supervisory Staff: Includes Instrument Technician, Mechanical and Electrical personnel.

4. Engineering Staff

   Includes both mechanical and electrical engineers.

I. Operations Staff Training Programs

A. Supervisory Staff:

1. "Nuclear Reactor Training Program" (12 weeks) 3/1968 - 5/1968 at the Pennsylvania State University, University Park, Pa.

2. "Operations Experience and Observation Training Program" (6 mo.) 6/1968 - 12/1968 at the Saxton Reactor Facility, Saxton, Penna.

3. "Pressurized Water Reactor Technology Program" (8 weeks) conducted by Babcock and Wilcox Corp., Lynchburg, Virginia.

4. "General Electric Turbine Course" (20 hours) 7/15/71 - 7/20/71 conducted at TMI by General Electric personnel.

5. "Nuclear Power Preparatory Training Program" (154 hours) 10/3/72 - Present. A video lecture series conducted at TMI utilizing the Nuclear Utilities Service Corp. video package program.

6. "Foremen Review Seminar Program" (2 hr/week) 11/24/71 - present. A theory and systems review program conducted by Shift Supervisor and Shift Foremen at TMI.

7. "Red Cross First Aid Training Program" (8 hours) 11/20/72. Conducted by Metropolitan EdisonCompany Safety Division.

8. "Pressurized Water Reactor Simulator Orientation Program" (32 hours) 4/23/73 - 4/26/73. Conducted at TMI by the Babcock & Wilcox Corp. personnel.

9. "Pressurized Water Reactor Simulator Training Program" (2 weeks). Conducted by the Babcock & Wilcox Corp. at Lynchburg, Virginia (June-July 1973).

10. "On-the-job Training Programs including vendor lectures and customer familiarization programs."

11. "Condenser Vacuum Pump Course" (6 hours) 4/12/73. Conducted by the Ingersoll Rand Engineering Staff at TMI.

(Operations Staff Training Programs, Continued)

B. Non-Supervisory Staff:

1. Control Room Operators:

(a) "Reactor Operator Training Program" (48 weeks) 10/20/69 - 9/18/70 conducted at TMI by Staff personnel.

(b) "Reactor Operations Familiarization Program" (1 week), 9/13/71 - 9/31/71 conducted at the Pennsylvania State University, University Park, Pa.

(c) "Radiation Protection Course" (2 weeks) included as part of the 48 week "Reactor Operators Training Program".

(d) "General Electric Turbine Course" (20 hours) conducted at TMI by General Electric personnel.

(e) "Sub-Station Training Program" (3 hours) 2/3/73 conducted at TMI by Staff Engineers and Foremen.

(f) "Pre-Audit Training Program (5 weeks) 1/29/73 - 3/2/73 conducted at TMI by Staff Engineers and Foremen.

(g) "Mock AEC Examination" (1 week) consisting of a written and oral operators examination 3/26/73 - 3/30/73. Conducted at TMI by the General Physics Corp.

(h) "Pressurized Water Reactor Simulator Orientation Course" (1 week) July 31 - August 3, 1973, Conducted by the Babock & Wilcox Corp. personnel at TMI.

(i) "Pressurized Water Reactor Simulator Training Program" (2 weeks) conducted by the Babcock & Wilcox Corp. at Lynchburg, Virginia. (August 1973)

(j) "On-the-job Training Program" including various vendor lectures and familiarization programs.

2. Auxiliary Operators:

(a) "Auxiliary Operators Nuclear Training Program" (26 weeks) 4/5/71 - 10/8/71 conducted at TMI by Staff personnel.

(Operations Staff Training Programs, Continued)

(b) "Plant System Training Program" (26 weeks) 10/8/71 - 4/72 conducted at TMI by Auxiliary Operators on a rotation assignment basis.

(c) "Sub-Station Training Program" (8 weeks) conducted at TMI by staff personnel 2/3/73.

(d) "Red Cross First Aid Course" (8 hours) conducted at TMI by Safety Department personnel.

(e) "Radiation Protection Course" (2 weeks) included as part of the "Auxiliary-Operator Nuclear Training Program".

(f) "On-the-job training program" including various vendor lectures and familiarization programs.

II. Technical Staff

A. Supervisory Staff:

1. Radiation Protection Supervisor:

(a) "Pressurized Water Reactor Technology Course" (160 hours) 10/1/69 - 10/28/69 conducted by Babcock and Wilcox Corp. at Lynchburg, Virginia.

(b) "Gamma Spectroscopy Course" (80 hours) 1/24/72 - 2/4/72 conducted by the Environmental Protection Agency at Las Vegas, Nevada.

(c) "Supervisor Development Course (120 hours) 3/20/72 - 5/5/72 conducted by Metropolitan Edison Company management personnel at Reading, Penna.

(d) "Radiation Monitoring [illegible] Course" (40 hours) 3/27/72 - 3/31/72 conducted by the [illegible] Inst. Co. at Cleveland, Ohio.

(e) "Red Cross First Aid Course" (8 hours) 11/27/72 conducted at TMI by Safety Department personnel.

(f) "Nuclear Power Preparatory Training Program" Sec. 5 (Rad. Prot.) and Sec. C (Plant Chemistry) (32 hours). Consists of a video

lecture series prepared by the Nuclear Utility Service Corp.

2. Staff Chemist:

(a) "Basic Radiological Health Course" (80 hours) 7/10/67 - 7/21/67 conducted by the Public Health Service at Winchester, Mass.

(b) "Radionuclide Analysis by Gamma Spectroscopy Course" (80 hours) 10/14/68 - 10/25/68 conducted by the U. S. Public Health Service at Winchester, Mass.

(c) "Chemical Analysis of Environmental Radionuclides" (80 hours) 12/9/68 - 12/20/68 conducted by the U. S. Public Health Service at Winchester, Mass.

(d) "Occupational Radiation Protection Course" (80 hours) 6/2/69 - 6/13/69 conducted by the U. S. Public Health Service at Winchester, Mass.

(e) "Pressurized Water Technology Course" (320 hours- 2/69 - 4/69 conducted by the Babcock & Wilcox Corp. at Lynchburg, Virginia.

(f) "Atomic Absorption Spectrosopy Course" (16 hours) 3/19/71 - 3/20/71 conducted by the American Chemical Society at New York, N.Y.

(g) "General Electric Turbine Course" (40 hours) 7/71 conducted by the General Electric personnal at TMI.

(h) "Nuclear Power Preparatory Training Program" Section 5 (Radiation Protection) and Section 6 (Plant Chemistry) (32 hours). A video lecture series prepared by the Nuclear Utility Services Corp.

(i) "Red Cross First Aid Course" (8 hours) 11/16/72 conducted by the Metropolitan Edison Company Safety Department personnel.

B. Non-Supervisory Personnel:

1. Radiation Protection Technicians:

(a) "Basic Radiological Health Course" (2 weeks) October 12, 1970 - October 23, 1970. Conducted by the U. S. Public Health Service at Rockville, Maryland.

(b) "Observation Training Program" (1 week and 3 days) (1971-72 various times) conducted at the Saxton Reactor Facility, Saxton, Penna. by Saxton Personnel.

(c) "Victoreen Radiation Monitor Calibration Course" (1 week) April 3 - April 7, 1972 conducted by the Victoreen Corp. at Cleveland, Ohio.

(d) "Victoreen Radiation Monitoring Checkout Course" (1 week) April 10 - April 14, 1972 conducted by the Victoreen Corp. at Cleveland, Ohio.

(e) "Occupational Radiation Hazards Course" (2 weeks) July 10, 1972 - July 21, 1972. Conducted by the U. S. Public Health Service at Montgomery, Alabama.

(f) "On-the-job Experience and Training" (1 week) October 16 - October 20, 1972 conducted at the Saxton Reactor Facility, Saxton, Penna. by the Saxton Facility Health Physics Staff.

(g) "Red Cross First Aid Course" (8 hours) 12/4/72 conducted at TMI by Metropolitan Edison Company Safety Department Personnel.

(h) "Health Physics Course" (4 1/2 months) 1970, conducted by the TMI Radiation Protection Supervisor at TMI.

(i) "On-the-job Training Program" various vendor and familiarization programs.

2. Chemical Analyst:

(a) "Basic Math and Atomic Physics Course" (11 months) 11/20/69 - 9/18/70 conducted at TMI by Metropolitan Edison Company Staff.

(b) "Basic Radiological Health Course" (2 weeks) March 1971 conducted by the U. S. Public Health Service at Rockville, Maryland.

(c) "Chemistry Lab. Orientation Course" (9 days) 11/71 - 12/71 conducted by Saxton Reactor Facility personnel at Saxton, Pa.

(d) "Treatment and Discharge of Pre-Operational Waste" (2hours) 12/21/72 conducted at TMI by Plant Staff.

(e) "Red Cross First Aid Course" (8 hours) Metropolitan Edison Company Safety Department Staff.

(f) "Radiation Protection Course" (6 weeks) conducted by the Radiation Protection Supervisor at TMI.

(g) "On-the-job Training" various vendor lectures and familiarization programs.

III. Maintenance Staff

A. Supervisory Staff:

1. Instrument Foremen:

(a) "Electronic Instrumentation Course" (40 hours) 8/4/62 - 8/8/62, conducted by the Foxboro Company at Foxboro, Mass.

(b) "Fundamentals of Instrumentation" (120 hours) 6/13/66 - 7/1/66 conducted by the Foxboro Company at Foxboro, Mass.

(c) "Radiation Detector Course" (24 hours) 9/6/67 - 9/8/67 conducted by the Westinghouse Corp. at Elmira, New York.

(d) "Bailey Meter Company Courses":

(1) Fundamentals of Analog Control (1 week) October 14 - October 18, 1968.

(2) 721 Analog Computer Familiarization Course (2 weeks) October 21, 1968 - November 1, 1968.

(3) "Programming Fundamentals (1 Week) Jan. 19 - Jan. 23, 1970.

(4) "880 & 881 System Training Course" (2 weeks) February 2 - February 13, 1970.

(5) "855 Computer Hardware Course" (3 weeks) March 16 - April 3, 1970.

(6) "Pneumatic Control Course" (1 week) June 8 - June 13, 1970.

(7) "855 Computer Peripherals Course" (3 weeks) May 10 - May 28, 1971.

(e) "Pressurized Water Reactor Technology Course" (6 weeks) conducted by the Babcock and Wilcox Corp. at Lynchburg, Va.

(f) "Fisher Control Course" (1 week) September 15 - September 19, 1970 conducted by the Fisher Control Corp. at Marshalltown, Iowa.

(g) "Red Cross First Aid Course" (8 hours) conducted at TMI by the Metropolitan Edison Company Safety Department personnel.

(h) "Pressurized Water Reactor Simulator Orientation Course" (1 week) conducted at TMI by the Babcock and Wilcox Corp. personnel.

(i) "Production Department Training Program" (60 hours) October '72 - July '72. Consisted of a film cartridge program titled "Power Plant Primer Program" and shown at TMI prepared by Resource, Inc.

2. Electrical Maintenance Foremen:

(a) "Nuclear Plant Familiarization Program " (160 hours) Oct. 1968 - November 1968 conducted by the Indianpoint Maintenance Staff at Consolidated Edison Indianpoint Generating Station.

(b) "Pressurized Water Reactor Technology Program" (320 hours) February 1969 - March 1969, conducted by the Babcock and Wilcox Corp. at Lynchburg, Virginia.

(c) "IRD Customer Training Program" (16 hours) June 17, 1969 - July 18, 1969 conducted by the IRD Engineering Staff at Philadelphia, Penna.

(d) "General Electric Alterrex Excitation System Course" (32 hours) conducted by the General Electric Engineering Staff at Waynesboro, Virginia.

(Maintenance Staff Program - Supervisory Program, Continued)

(e) "IRD Customer Training Program" (20 hours) August 6, 1969 - August 8, 1969 conducted by the IRD Engineering Staff at Worthington, Ohio.

(f) "General Electric Turbine Course" (72 hours) July 1971, conducted by the General Electric Engineering Staff at TMI.

(g) "Red Cross First Aid Course" (8 hours) December 4, 1972 conducted by the Metropolitan Edison Safety Department personnel.

(h) "Supervisory Development Course" (20 hours) conducted by the Metropolitan Edison Company management at Lebanon, Penna.

3. Mechanical Maintenance Department:

(a) "Red Cross First Aid Course" (8 hours) November 27, 1973 conducted by the Metropolitan Edison Company Safety Department personnel.

(b) "Condenser Vacuum Pump Course" (6 hours) April 12, 1973 conducted by the Ingersoll-Rand Engineering Staff at TMI.

(c) "Production Department Training Program" (60 hours) October 1972 - July 1972, consisted of a film cartridge program titled "Power Plant Primer Program" and shown at TMI. Prepared by the Resource, Inc.

B. Non-Supervisory Staff:

1. Instrument Technicians:

(a) "Nuclear Preparatory Program" October 1969 - February 1970 conducted by the TMI Staff.

(b) "General Electric Turbine Course (72 hours) July 1971 conducted by the General Electric Engineering Staff at TMI.

(c) "Bailey Meter Company Courses":

(1) 721 Analog Control System (80 hours) July 1970.

(2) Programming Fundamentals (40 hours) September 1970.

(3) 855 Computer (120 hours) October 1970.

(4) 855 Computer Peripherals (120 hours) May 1971.

(d) "Foxboro Electronics Course" (80 hours) conducted by the Foxboro Corp. at Foxboro, Mass.

(e) "Foxboro Pneumatic Course" (80 hours) conducted by the Foxboro Corp. at Foxboro, Mass.

(f) "Red Cross First Aid Course" (8 hours) November 27, 1973 conducted by the Metropolitan Edison Company Safety Department personnel at TMI.

2. Electrical Maintenance Personnel:

(a) "ICS Switchgear Course" (10 hours) August 2, 1971 - August 6, 1971 conducted at TMI by Maintenance Staff Supervisors.

(b) "Dupont Courses" conducted at TMI by Maintenance Staff Supervisors:

(1) Blue print reading (10 hours) August 2, 1971 - September 3, 1971.

(2) Measurements Course (10 hours) August 6, 1971 - September 3, 1971.

(3) Measuring Tools & Calipers (4 hours) September 23, 1971 - September 27, 1971.

(4) Vernier Scales (8 hours) September 28, 1971 - October 1, 1971.

(c) "Maintenance Training, Phase I & II (70 hours) February - March 1971 conducted at TMI by Maintenance Staff Foremen.

(d) "Additional Dupont Courses":

(1) Journal Bearings (14 hours) April 1972 - May 1972.

(2) Anti-Friction Bearings (12 hours) April 1972 - May 1972.

(3) Coupling Alignment (28 hours) April 1972 - May 1972.

(e) "Red Cross First Aid Course" (8 hours) November 16, 1972 conducted at TMI by Metropolitan Edison Company Safety Department Personnel.

(Maintenance Staff Programs - Non-Supervisory Program, Continued)

3. Mechanical Maintenance Personnel:

(a) "Dupont Courses" conducted by TMI Maintenance Staff:

(1) Basic Nuclear Theory (8 hours) 1/11/72 - 1/14/72.

(2) Measurements (3 hours) 1/18 - 1/19/72.

(3) Blue Print Reading (8 hours) 1/25 - 1/28/72.

(4) Verniers (2 hours) 1/31/72.

(5) Calipers (2 hours) 2/1/72.

(6) Pipe Fitting (5hours) 2/10/72 - 2/14/72.

(7) Interpretation of Piping Drawings (6 hours) 2/16/72 - 2/21/72.

(8) Offsets (6 hours) 2/23/72 - 2/28/72.

(9) Drills (4 hours) 3/1/72 - 3/6/72.

(10) Reamers (6 hours) 3/8/72 - 3/13/72.

(11) Centrifugal Pumps (10 hours) 3/20/72 - 3/24/72.

(12) Mechanical Seals (8 hours) 4/3/72 - 4/7/72.

(13) Bearings (12 hours) 4/17/72 - 5/8/72.

(14) Tolerance and Clearance and Plain Bearings (19 hours) 5/9/72 - 6/15/72.

(b) "Red Cross First Aid Course" (8 hours) conducted at TMI by Metropolitan Edison Company Safety Department personnel.

IV. Engineering Staff Program

1. "Pressurized Water Reactor Technology Program? (120 hours) February 1971 conducted at the Crawford Generating Station by Babcock and Wilcox Corp.

2. "Nuclear Training Program" (480 hours) April - June 1971 conducted by the Pennsylvania State University Nuclear Engineering Staff, University Park, Pa.

3. "General Electric Turbine Course" (80 hours) August 1971 conducted by General Electric Engineers at TMI.

(Engineers Staff Program, Continued)

4. "Welding QA and Non-Destructive Test Course" (40 hours) March 20 - March 31, 1971 conducted by the Con-Am. Corp. at Hershey, Pa.
5. "Stationary Diesel - Generator Power Plant Maintenance and Operations Course" (40 hours) November 5, 1972 - November 10, 1972 conducted by the Staff of the University of Wisconsin.
6. "Integrated Control System Course" (8 hours) April 21 1972 conducted by Bailey Meter Company personnel at TMI.
7. "Nuclear Power Preparatory Program" (154 hours) November 20, 1972 - present. A video lecture series conducted at TMI utilizing the Nuclear Utilities Services Corp. video package program.
8. "Condenser Vacuum Pump Course" (8 hours) 4/12/72 conducted by the Ingersoll-Rand Corp. personnel at TMI.
9. "Pressurized Water Reactor Simulator Orientation Program" (32 hours) 4/23/73 - 4/26/73 conducted at TMI by the Babcock & Wilcox Corp. personnel.
10. "Pressurized Water Reactor Simulator Course" (2 weeks) August 1973. Conducted by the Babcock and Wilcox Corp. at Lynchburg, Virginia.

TRAINING & CERTIFICATION OF METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT 2 LICENSED PERSONNEL

The following is a summary description of the training and certification relevant to Three Mile Island Unit II operation for personnel in the following job classifications:

Classification		License Requirement
I.	Control Room Operator	- Reactor Operator (RO)
II.	Shift Foreman	- Senior Reactor Operator (SRO)
III.	Shift Supervisor	- Dual Unit Senior Reactor Operator (SRO)
IV.	Supervisor of Operations	- Senior Reactor Operator (SRO)
V.	Unit Superintendent	- *Senior Reactor Operator (SRO)

The information provided is based on documentation retained by the TMI Training Department. The extent of an individual's participation in the various programs outlined may vary according to the individual's previous experience, prior academic/technical training, and date of selection or appointment to a particular job classification.

Prop's Ex. B&W557 For ID
Deft's 3-10-82 J.R. Danyo

*Unit Superintendents are not required by regulation to hold SRO Licenses, however, it is Company Policy for individuals assigned to this position to obtain an SRO License.

INDEX

I. Control Room Operator (CRO) Training and Certification

Certification of CRO qualification is achieved through NRC examinations, successful completion of which results in operator licensing by the NRC.

Training to ensure operator qualification prior to application for operator licensing will include Auxiliary Operator training and either "Cold" (prior to initial core fuel load) or "Hot" (subsequent to initial criticality) operator licensing programs. Replacement operator training is also accomplished using the "Hot" license training program.

Operator proficiency and certification are maintained through the licensed operator requalification program and periodic (annual) requalification examinations.

I.A Auxiliary Operator Training

With but 1 exception, all of the initial Control Room Operator staff at TMI-2 were graduates of the U. S. Navy nuclear training program with several years of operating experience on naval nuclear propulsion plants. All were initially employed as Auxiliary Operators-A-Nuclear. In this classification they participated in a tranining program which typically included the following:

1. Mathematics (160 hours)
2. General Science (80 hours)
3. Atomic & Nuclear Physics (240 hours)
4. Reactor Physics (200 hours)
5. Radiation Protection (160 hours)
6. Core Performance (80 hours) including:
   a. Thermodynamics
   b. Fluid Flow
   c. Core Thermal Performance
   d. Reactor Materials
7. Plant Chemistry (80 hours)
8. Instrumentation and Control (40 hours)
9. Plant Operation (80 hours)

This training was conducted using the "Nuclear Power Preparatory Training" program developed by NUS Corporation of Rockvill, Md. Initial Auxiliary Operator training also included approximately 200 hours of training on TMI-1 systems.

I.B "Cold" License Training

The content of a "cold" license training program is defined by (formerly ANS 18.1) with additional guidance and classification provided in section 13.2 of the TMI-2 FSAR. The initial TMI-2 staff "cold" RO license traning program was reviewed with and approved by the Operator Licensing branch of the NRC with respect to compliance with the established standards. The requirements were met by participation in the following programs:

1. Unit II CRO Training Program
   a. Math Review (24 hours) conducted by TMI Training Department.
   b. Reactor Theory (104 hours) conducted by TMI Training Department.
   c. TMI-2 Systems (144 hours) conducted by TMI Training Department and TMI-2 Shift Foremen.
   d. TMI-1 Control Room Observation (160 hours)

2. Penn State University Training Program
   a. Console experience, startup experience and experimentation at the PSU TRIGA research reactor facility (40 hours).

3. TMI-2 Cross-License Training
   a. TMI-2 Systems (75 hours)

4. TMI-2 On-the-Job Training for CRO Candidates

   Guided self-study on TMI-2 systems and their respective sections of:
   a. Burns & Roe System Descriptions
   b. TMI-2 FSAR
   c. TMI-2 Standard Technical Specifications

d. TMI-2 Procedures

e. Burns & Roe Drawings & Prints

(Totaling 300 hours per individual)

5. Babcock & Wilcox Simulator "Cold" License Training

a. Classroom instruction (180 hours)

(1) Plant fluid systems and components

(2) Heat transfer

(3) Reactor physics

(4) Control/protective systems

(5) Instrumentation

(6) Normal and emergency procedures

b. Simulator Operation (100 hours)

(1) Plant startup/shutdown

(2) Power operation including load changes

(3) Abnormal and emergency procedures

(4) Plant operation with unannounced casualties

c. Examinations (40 hours)

(1) Start-up exams

(2) Operating and oral exams

(3) Simulated NRC written exam

6. Technical Specification Review Program (40 hours)

a. Review of updated TMI-2 Standard Technical Specifications

b. Abnormal/Emergency procedures

c. Instrument/Control review

d. Case History of other plants

7. Babcock & Wilcox Simulator Refresher Training

   a. Classroom instruction (20 hours)

      (1) Plant control and response

   b. Simulator Operation (20 hours)

      (1) Start-up

      (2) Turbine/Reactor Trip

      (3) Power Operation with unannounced casualties

8. Independent Audit of Operator Qualification

   General Physics Corporation, Columbia, Maryland was contracted to perform an independent audit of potential licensed operator weaknesses through in-depth oral examination on an individual basis. Any weak areas identified could then be emphasized in the Pre-License Review Program.

9. Pre-License Review Program (80 hours)

   a. Reactor Theory

   b. Instrumentation and Control

   c. Standard Technical Specifications

   d. Fuel Handling

   e. Normal/Emergency Procedures

   f. Environmental Technical Specifications

   g. Safety/Emergency systems

   h. RCS chemistry

   i. Health Physics review

   j. Radiation Emergency Plan

10. Additional In-Plant Experience

In addition to the formal classroom and On-the-Job training programs already discussed, TMI-2 operations personnel have received significant experience through participation in the following:

a. System testing and turnover to Metropolitan Edison Company from General Public Utilities Service Corporation.

b. TMI-2 Hot Functional Testing

c. TMI-2 Low Power Core Physics Testing

d. TMI-2 Escalation to Power

11. Company Administration Examinations

These included both oral and written comprehensive examinations similar in nature to those administered by the NRC. The results of this final check of operator qualification were used in recommending individuals to the NRC for examination and licensing.

I.C "Hot" License (Replacement Operator) Training

1. "Hot" license training and experience requirements are also specified in ANS 3.1 (formerly ANS 18.1) and the TMI-2 FSAR. Candidates for "Hot" licensing programs are selected either from the fully qualified Auxiliary Operators-A-Nuclear at the station or from off-site applicants with the requisite experience and qualifications. In either case, the "Hot" license replacement operator candidate will have a minimum of two (2) years of operating experience at a nuclear reactor facility.

   Once designated as a "Hot" license candidate and assigned to the position of Control Room Operator (CRO), the individual enters a training program. This program consists of:

   a. Specific self-study assignments
   b. Oral checkouts in which the individual actually performs or simulates performing certain evolutions
   c. Written examinations
   d. Oral examinations and
   e. Classroom sessions

2. The replacement operator program provides in-depth coverage of all areas specified in ANS 3.1 and the TMI-2 FSAR over a nine (9) month period. (Note: This program is comparable to the TMI-1 Replacement Operator Program). These areas include:

   a. Reactor Theory
   b. Features of Facility Design
   c. General Operating Characteristics

d. Instrumentation and Control

e. Safety and Emergency Systems

f. Standard and Emergency Operating Procedures

g. Radiation Control and Safety

3. Adminsitrative guidelines for the conduct of this program to ensure operator profitiency prior to application for NRC licensing are as follows:

a. Upon being advanced to CRO, the individual will fall immediately into the Shift organization as it exists at the time. Two (2) hours, as a minimum, of each day on shift will be specifically devoted to training. The individual will be provided with a desk or other suitable place to study in the Control Room area. The two (2) hour period will occur at a definite time of each day on shift insofar as practical.

b. While on shift, the individual receives a series of preprogrammed written assignments. The individual is administered written and oral examinations every 3 and 6 weeks respectively. The written tests will be corrected and returned. Errors and weak areas will be covered with the individual, and reassigned. Weak areas on written and oral examinations will be covered with the individual. Failure of a written exam or oral exam will be discussed with the individual and a retest will be administered on the material.

c. Additionally, the CRO will be required to complete a Practical Evolutions Sheet. This sheet will be completed either during the individuals' daily training period, or during other times

while on shift as situations dictate. Most of the items involve performing evolutions, simulating performing evolutions, and understanding and being able to explain while simulating or performing. The individual's Shift Supervisor, Shift Foreman, an SRO Licensed individual, or (in specifically designated cases) the licensed Training Coordinator may sign the practical evolution sheet. Assignments detailed in paragraph b. above, on which written and oral tests will be given, will come largely from items on the Practical Evolution Sheet, with some assignments specifically intended to obtain signatures on this form. Checkouts for items on the Practical Evolution Sheet which must be simulated will be conducted in front of the Control Room Consoles and Panels, with the individual being required to point to specific items and controls. The checkout must be satisfactory prior to a signature for the evolution. The evolutions are assigned a point value to track the progress of an individual through the nine (9) month program.

d. To aid the individual in the training assignment completion, the CRO may come off shift to attend lectures on specific topics, listed below, as determined by the Supervisor of the Training Department and the Supervisor of Operations.

(1)	Reactor Theory	-	1 day - 1 week
(2)	ICS Review	-	1 day - 1 week
(3)	Simulator	-	1 week - 2 weeks
(4)	Health Physics Review	-	1 day - 1 week
(5)	Refueling Review	-	1 day - 1 week

These off shift lectures should aid the individual in obtaining signatures on the Practical Evolution Sheet.

e. The first 90 days of the CRO Training Program are designated as a Probationary Period during which the individual will be evaluated. At the end of this 90 day period, the Shift Supervisor, Supervisor of Operations and the Supervisor of Training will recommend whether or not the individual should continue in the program.

f. Prior to the completion of the 9 month time period for the program, the CRO will be given a comprehensive written examination approved by the Supervisor of Operations and the Supervisor of Training. The results will be available for review by the CRO. Additionally, within the Training Program time period, the CRO will be given a comprehensive oral examination by an SRO licensed individual designated by the Supervisor of Operations. Any examination failed, written or oral, will be reviewed with the CRO.

g. If the CRO has not successfully completed the program within 9 months, and fails either the written and/or the oral examination, the individual will be returned to the position held prior to being advanced to CRO. If the individual successfully completes the training program within 9 months, and fails either the written or oral examination, a re-exam will be considered based upon an evaluation by the Supervisor of Operations and the Supervisor of Training. If the individual successfully completes the training program within the nine (9) months and passes the final comprehensive written and oral examinations, that individual may be recommended for examination by the NRC and subsequent RO licensing.

I.D Control Room Operator Certification

The NRC's issuing of Reactor Operator Licenses constitutes official certification of Control Room Operator personnel to operate the reactor facility on which the RO license was achieved.

I.E Reactor Operator Requalification

The philosophy, content and conduct of the training program designed to maintain licensed operator qualification and proficiency is described by the TMI-2 FSAR, Chapter 13, Section 13.2.2 "Metropolitan Edison Operator Requalification Program". This is provided as Attachment 1.

II. Shift Foreman Training and Certification

As with the reactor operator level training and certification discussed in Section I of this report, certification at the senior reactor operator (SRO) level is also achieved through satisfactory completion of NRC examinations. Certification is maintained by participation in the operator requalification program and satisfactory completion of the annual evaluation examination.

Training to ensure SRO qualification prior to application for operator licensing is accomplished through the administration of programs which comply with the requirements of ANS 3.1 and the TMI-2 FSAR, and which have been approved by the NRC.

Personnel selected who currently fill shift foreman positions for TMI-2 can be classified as having come from any of three slightly different backgroumds.

A. Individuals who had achieved and maintained SRO licenses on TMI-1

B. Individuals who had achieved SRO licenses on other reactor facilities

C. Individuals selected from the initial group of TMI-2 Control Room Operator trainee's

The training, qualification and certification of each of these groups is discussed in this section.

II.A Previous TMI-1 SRO Licensees

1. These individuals were typically graduates of the U. S. Navy nuclear program. They had been initially employed by Met-Ed as Auxiliary Operators-A-Nuclear and as such had received training as outlined in section I.A of this report.

2. They had been promoted to shift foremen on TMI-1 and had all achieved and maintained SRO licenses on that unit.

3. Upon assignment to TMI-2, they participated in the following portions of the "Cold" license training program:

   a. Unit II CRO Training Program (270 hours) (participated as systems instructors - program as described in section I.B.1 of this report)

   b. TMI-2 Cross-License Lectures (75 hours) (as described in section I.B.3 of this report)

   c. TMI-2 On-the-Job Training for SRO Candidates (300 hours) (essentially as described in I.B.4 but modified to SRO level)

   d. Technical Specification Review Program (40 hours) (as described in I.B.6 of this report)

   e. Babcock & Wilcox Simulator Refresher Training (40 hours) (as described in I.B.7 of this report)

   f. Pre-Licensed Review Program (98 hours) as described in section I.B.9 of this report with the following additional training (18 hours) for SRO candidates:

      (1) Departure from Nucleate Boiling (DNB), DNB Ratio (DNBR) and hot channel factors

      (2) Soluble poison control

(3) Liquid and gaseous radioactive releases

(4) Administrative procedures

(5) Standard Technical Specifications

g. Additional In-Plant Experience

(1) Development of TMI-2 normal, abnormal and emergency procedures

(2) TMI-2 system testing and turnover

(3) TMI-2 hot functional testing

(4) TMI-2 low power core physics testing

(5) TMI-2 escalaction to power

h. Company Administered Examinations

(1) Both oral and written examinations at the SRO level, similar in nature to those administered by the NRC but emphasizing comparisons and differences between TMI-1 and TMI-2.

(2) Results of these examinations were used in recommending individuals for final examination and subsequent cross-licensing by the NRC.

4. Certification

a. Accomplished by Company administered examinations as outlined below:

(1) Comprehensive written examinations developed, administered and graded by the Company. These were SRO level examinations similar to those administered by the NRC which emphasized comparisons and differences between TMI Units 1 and 2.

(2) The examinations, grading of the exams, and final results were reviewed and approved by the NRC.

(3) NRC ammended their SRO licenses to include Unit 2

b. Certification is maintained by participation in the licensed operator requalification program and satisfactory completion of the annual evaluation examinations as discussed in Attachment 1.

II.B SRO Licensees from Other Reactor Facilities

1. These individuals were typically graduates of the U. S. Navy nuclear program.

2. Subsequent to naval service and experience they had achieved SRO level certification (licensing) at other commercial power reactors.

3. Upon selection and assignment to TMI-2 they participated in the following training programs:

   a. Unit II cold license pre-simulator training (80 hours) including formal classroom instruction in the following areas:

      (1) Integrated Control System

      (2) Control Rod Drive

      (3) Non-Nuclear Instrumentation

      (4) Reactor Theory

      (5) Electrical Distribution

      (6) Reactor Protection System

      (7) Standard and Technical Specifications

      (8) TMI-2 Fluid Systems

   b. Babcock & Wilcox Simulator Training (80 hours)

      (1) Classroom instruction

         (a) Reactor Theory

         (b) Instrumentation/Control systems

      (2) Simulator operation

         (a) Plant start-up/shutdown

         (b) Power operation with unannounced casualties

      (3) Start-up Certification

c. TMI-2 Cross-License Training (75 hours)

(1) TMI-2 systems classroom instruction

d. TMI-2 On-the-Job Training for SRO Candidates (500 hours)

(1) Essentially as described in I.B.4 but modified to SRO level

e. TMI-2 Standardized Technical Specifications (40 hours)

(1) As described in I.B.6 of this report

f. Babcock & Wilcox Simulator Refresher Training (40 hours)

(1) As described in I.B.7 of this report

g. Pre-License Review Program (98 hours)

(1) As described in II.A.3.f. of this report

h. Additional In-Plant Experience

(1) TMI-2 normal, abnormal and emergency procedure development and review

(2) TMI-2 system testing and turnover

(3) TMI-2 hot functional testing

(4) TMI-2 low power core physics testing

(5) TMI-2 escalation to power

i. Company Administered Examinations

(1) Oral and written examinations at the SRO level similar to those administered by the NRC.

(2) Results of these examinations were used in determining whether individuals would be recommended for NRC licensing examinations.

4. Certification

a. Certification was achieved through successful completion of

NRC licensing examinations and subsequent issuing of SRO licenses to operate TMI-2.

b. Certification is maintained through participation in the licensed operator requalification program and successful completion of the annual evaluation examination as described in Attachment 1.

II.C Selectees From Initial TMI-2 CRO staff

1. These individuals had completed the following training previously outlined in this report:

   a. Section I.A. - Auxiliary Operator Training

   b. Section I.B. - "Cold" License Training

2. Typically, they had been certified to operate the plant by successful completion of NRC licensing examinations at the RO level.

3. They had maintained this certification through participation in the licensed operation requalification program as described in Attachment 1.

4. These individuals also attended a Senior Operator Review Program which provided additional training at the SRO level in the following areas:

   a. Procedure Review (40 hours)

   b. Health Physics Review (40 hours)

   c. Plant Characteristics (40 hours)

   d. Pland Design Review (40 hours)

   e. Reactor Theory Review (40 hours)

   This program was administered primarily through guided self-study augmented by classroom instruction as necessary to achieve SRO level qualification.

5. SRO level qualification was checked by Company administered examinations as discussed in Section II.B.3.i. of this report.

6. Certification was achieved through satisfactory completion of SRO level examinations administered by the NRC and subsequent issuing of SRO licenses to operate TMI-2.

7. SRO qualification and certification are maintained through participation in the licensed operator requalification program as described in Attachment 1.

III. Shift Supervisor Training and Certification

Shift Supervisor must be certified at the Senior Reactor Operator (SRO) level for both TMI-1 and TMI-2. This is achieved through satisfactory completion of NRC approved examinations. Certification is maintained by participation in the operator requalification program and satisfactory completion of the annual evaluation examination (Attachment 1).

Personnel selected for the position of Shift Supervisor held SRO licenses for Unti I or Unit II or in the case of one individual, held a current dual SRO license. In addition, many of these individuals had graduated from the U.S. Navy Nuclear Power Program, and in all cases their experience met or exceeded the requirements of ANS 3.1.

For initial dual unit staffing, a cross License Training Program was administered to obtain Unit II SRO licenses. The Shift Supervisors received the following training or the equivalent:

1. One hundred (100) hours of Cross License Training
2. One (1) week of Unit II Standardized Technical Specifications Training
3. Twenty (20) hours of Turbine Controls Training given by Westinghouse Electric Corp.
4. One (1) week of Unit II Simulator Training at B&W's Training Center in Lynchburg, Virginia.
5. Two (2) weeks of Pre-License Review Training
6. Unit II OJT Program
7. Unit I Requalification Training Program (67 hours).

Periodic tests were given throughout the program to monitor the students' level of knowledge. At the conclusion of the program, a mock NRC examination was administered with emphasis on Unit II Systems and differences between the Unit I and Unit II Nuclear Steam Supply Systems (NSSS), Secondary and Balance of Plant Systems. Following successful completion

of the above program and tests, a final company prepared qualification exam was administered. The program documentation, exam and exam results were forwarded to the NRC for approval.

This culminated in those applicants already SRO licensed in Unit I having their license amended to include an SRO on Unit II.

Subsequent to "Cold" Licensing, a "Hot" Cross License training program was developed by the Training Department to cross qualify SRO License holders from either unit.

This program is approximately 400 hours in length and is predominantly a self-study course with periodic written and oral exams to monitor the individual's progress. Listed below are the major topics contained in the program.

1. Technical Specification Training
2. Unit Systems with emphasis in unit differences
   a) Turbine Generator & Auxiliaries
   b) Solid, Liquid & Gaseous Waste System
   c) Steam Systems (Main, Auxiliary, & Bleed)
   d) Cooling Water Systems (Primary and Secondary)
   e) Electrical Systems (Balance of Plant, Vital Power, and Diesel Generator).
   f) Emergency Safeguards Systems
   g) Reactor Coolant System
   h) Primary Volume Control Systems
   i) Secondary Water Systems
3. On-the-job training (oral checkouts by a Shift Supervisor of various plant evolutions).
4. Administrative controls.

5. Operator Requalification Program (Attachment 1)

The program culminates with the individual taking a written exam administered by the Training Department. The exam and results are reviewed and approved by the NRC. Approval by the NRC will then result in the individual's SRO license being ammended to include the other unit.

IV. Supervisor of Operations - Unit II

This individual is a graduate of the Navy Nuclear Power School. Following his service obligation, he graduated from college as a Chemical Engineer.

His commercial power plant experience commenced as a Staff Engineer at the Saxton Experimental Corporation. During his tenure there he was awarded a Senior Reactor Operators license.

After transfer to TMI, he initially held the position of Nuclear Engineer-Unit 1. His next appointment was that of Supervisor of Operations Unit 1. He participated in a Cold License program and achieved an SRO license on Unit 1. The general outline of this training program was as follows:

1. Pressurized Water Reactor Technology Course by Babcock and Wilcox Co. - 1969 - (320 hrs.)
2. Shift Foremen Review Seminar - 11/24/71 (2 hrs/wk)
3. Pressurized Water Reactor Simulator Orientation Course by Babcock and Wilcox - 1973 - (32 hrs.)
4. PWR Simulator Training Program by Babcock and Wilcox Co., - 1973 - (80 hrs.)
5. Pre-licensing Review Program by Babcock and Wilcox Co., General Physics and NUS Corp. - 1973 - (204 hrs.)
6. Various vendor familiarization programs (38 hrs.)

He was then appointed to his present position of Supervisor of Operations Unit II. In this position he participated in the Startup and Test Program and achieved a "Cold" SRO license on Unit II by participating in training similar in scope to that detailed in Sections II and III.

This person's total nuclear power plant experience is in excess of fifteen years.

V. A. Unit Superintendent: Certification and Training

This individual's experience greatly exceeds the requirements of ANS 3.1. He is a U.S. Naval Academy graduate with twenty years in the Navy Nuclear Power Program. This service included command of a nuclear submarine.

Certification of the Unit Superintendent position was achieved through successful completion of NRC examinations which culminated in the receipt of a Senior Reactor Operator License.

This training program was a modified "Hot" License Training Program. The program was specially tailored to the needs of the individual, with special emphasis on those areas in which the individual did not have prior experience, or expertise.

Specific areas of the program included but were not limited to:

a. Specific self-study assignments
    1) Systems Training
    2) Reactor Theory
    3) Integrated Control Systems
    4) Radiation Protection
    5) Fuel Handling Training
    6) Technical Specifications
b. Simulator Training (230 hrs.)
c. Oral checkouts within the plant performing or simulating performance of the evolution
d. Written examinations
e. Classroom lectures

Approximately 900 hours were spent in formalized training in the above program.

V. B. Unit II Superintendent - Technical Support: Certification and Training

This individual has been an employee of Met-Ed for a period of ten years. He is a graduate Mechanical Engineer and a registered Professional Engineer. He has ten years power plant experience and has been involved in various engineering duties at TMI over the past nine years. Previous positions held at TMI include Operations Engineer, Supervisor of Operations and Unit 1 Superintendent - Technical Support.

During the period of his assignment as Operations Engineer, he achieved a "Hot" SRO license in Unit 1. This was accomplished through a training program similar to that described in Sections I and II of this document. He has maintained his license current by meeting the requirements of the Requalification Program (Attachment 1).

During his assignment as Unit I Superintendent - Technical Support he served as chairman for the Unit 1 Plant Operations Review Committee. Following his appointment to Unit II Superintendent - Technical Support, he entered a program to achieve a dual unit SRO license.