NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

UNIT II OPERATIONS

02-REQ-007-353-2-24 Revision 0

Ø7-191-91

TITLE: SPECIAL TESTS AND PROCEDURAL COMPLIANCE

	SIGNATURE	DATE
PREPARER	[signature]	7/12/90
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Summary of Pages

(Effective Date: 7/16/90)

Number of Pages: 14

Date	Pages
July 1990	1 - 14

TRAINING DEPARTMENT RECORDS ADMINISTRATION ONLY:

VERIFICATION: _____ _____

DATA ENTRY: _____ _____

RECORDS: _____ _____

I. TRAINING DESCRIPTION

A. Title of Lesson: Special Tests and Procedural Compliance

B. Lesson Description: Discussion of the Chernobyl event and lessons learned with a review of existing NMP2 guidance on testing and use of procedures.

C. Estimate of the Duration of the Lesson: 2 hours

D. Method of Evaluation, Grade Format, and Standard of Evaluation: Weekly open reference written examination with minimum passing grade of 80%.

E. Method and Setting of Instruction: Classroom lecture and facilitated discussion.

F. Prerequisites:

1. Instructor:
   a. Qualified for the material being delivered in accordance with NTP-16, Attachment A.
   b. Qualified in instructional skills as certified by NTP-16.
2. Trainee:
   a. Qualified for the course in accordance with NTP-11.

G. References:

1. SOER 87-01
2. SGO 89-03
3. SGO 89-02

II. REQUIREMENTS

1. SOER 87-01 Recommendations

III. TRAINING MATERIALS

A. Instructor Materials:

1. Transparencies and projector
2. Whiteboard and markers
3. Copy of lesson plan
4. References listed in G

B. Trainee Materials:

1. Copy of objectives
2. Copy of references listed in G

IV. EXAM AND MASTER ANSWER KEYS

Exam and master answer key(s) filed with the official records.

V. LEARNING OBJECTIVES

A. Terminal Objectives:

At the conclusion of this lesson the operators will have gained the necessary knowledge to:

TO-1 Perform normal operations as well as special tests within the bounds of design limitations and in accordance with approved procedures.

B. Enabling Objectives:

EO-1.1 Discuss an event involving multiple serious procedural and design limit violations that resulted in complete reactor destruction.

EO-1.2 Describe the difference between the event reactor and NMP2's.

EO-1.3 Identify the instances of procedural violation that occurred during the event.

GIVEN A COPY OF SGO 89-03:

EO-1.4 Identify the requirements that determine procedure adequacy.

EO-1.5 Describe when procedures must be used during performance of activities.

EO-1.6 Describe allowances for procedural sign-offs when working in contaminated areas.

EO-1.7 Describe how jobs using multiple persons remote from each other are procedurally organized.

EO-1.8 Define "Independent" as it applies to independent verification.

EO-1.9 Describe the verifier requirements and verification actions that make up an independent verification.

EO-1.10 Describe the guidance towards use of "Verbatim Compliance" to procedures at NMP2.

EO-1.11 Describe the guidance towards "meeting the intent" of procedural steps at NMP2.

EO-1.12 Describe the guidance towards "adherence" to procedures and exception(s) to procedural adherence.

EO-1.13 Identify the correct response when procedural inaccuracy precluding adherence exists.

EO-1.14 Describe the difference between publication changes and temporary changes.

EO-1.15 Identify the alternatives that can be utilized when conditions specified in surveillance tests cannot be met.

EO-1.16 Describe the guidance concerning performance of test steps.

EO-1.17 State the requirements that must be met to allow a portion of a test to meet Tech Spec credit if another portion does not.

EO-1.18 Describe the guidance to follow when a test cannot be completed.

GIVEN A COPY OF SGO 89-02:

EO-1.19 Define "Special Tests and Experiments".

EO-1.20 Describe how procedural adherence will be maintained when "Special Tests" or "Experiments" become necessary.

GIVEN A COPY OF TECHNICAL SPECIFICATIONS:

EO-1.21 State the three assurances that are given by maintaining a sufficient shutdown margin.

EO-1.22 State the three assurances that are given by meeting control rod specifications.

EO-1.23 Describe why the number of inoperative control rods is limited to eight(8).

EO-1.24 Describe the bases for the rate at which the Control Rod System brings the reactor subcritical.

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
I. OPENING		
A. Greet Class		
B. Lesson Administration	Direct: Operators to initial TR remind them of course evaluation.	
C. Lead-in	Show: TP#1 (SOER TALLY)	
1. Significance	- Review TP	
Special tests are performed at power reactors for a variety of reasons. Such tests can result in higher risks unless controlled by tighter restrictions on the plant's operation. In this event, the operators did not maintain tighter controls but instead disabled various protection and safety systems and operated outside the prescribed bounds of operation.	State: Chernobyl 4, April 26, 1986	
Though this specific accident could only occur in reactors of the same design, any power reactor can be subject to core damage by a combination of improper operation and the disablement of protection and safety systems.		
D. Objectives	Review: Objectives	

II. SOER 87-01

A. Event Summary

EO-1.1

During the performance of a turbine-generator coastdown test. Unit 4 experienced a severe reactivity excursion at 0123 that, with the accompanying pressure surge and fire, destroyed the reactor and breached the surrounding building. The test procedure had not been adequately reviewed from a safety standpoint. Management control of the evolution was not maintained; the test procedure was not followed; several safety functions were bypassed; and control rods were misoperated. Operators lost control of the reactor during the performance of the test.

B. Plant Description

1. General

Chernobyl 4 was a Soviet RBMK-1000 type reactor rated at 3200 MW thermal power and 1000 MW electric output. The RBMK-1000 is a graphite-moderated boiling water reactor. Reactor water flow is provided by six of eight installed main circulation pumps; two pumps are installed spares. The flow through each of the fuel channels is adjusted using regulating valves on the inlet of each channel to control heat flux margins. The water-steam mixture leaving the top of the fuel channels flows into four horizontal steam drums with moisture separators. The dry steam drives two 500 MWe turbine generators. Feedwater is fed directly to the steam drums, bypassing the reactor, to control water level.

Show: TP#2 (Fig. 1)

- refer to components as mentioned during description
- indicate overall flowpaths

2. Reactor

The core is large, 23 feet in height and 39 feet in diameter. The reactor exhibits a reactivity increase as water density in the core decreases (positive void coefficient and reactivity). The fuel temperature coefficient of reactivity is negative. In normal operation, the overall core power coefficient is negative at and near full power but becomes positive at lower power levels. The minimum permitted power level for steady state operation is 700 MW(th) (22 percent of full power).

Discuss: Positive void coefficient due to graphite moderation, water for heat removal only, acts as a neutron poison due to absorption. EO-1.2

3. Reactor Protection

The system for control and protection of the reactor is based primarily on movement of 211 boron carbide absorber rods in vertical channels adjacent to the fuel channels. The rods have graphite followers attached to displace water in the rod channels.

However, the followers are apparently not full core length, so that when a rod is fully withdrawn from the core, about one meter of water remains in the rod channel below the follower. In a normal configuration, the protection system can quickly reduce power by partial rod insertions; automatic scram is the ultimate response. The time to fully insert rods for a scram is 20 seconds.

Discuss: Water in rod channel acts as a poison. Displacing water with Graphite (moderator) on an insertion adds positive reactivity.

4. Scram Worth

A minimum "operating reactivity margin" is specified. This margin is referred to by the Soviets as the equivalent of 30 inserted regulating rods. Control rods are required to be partially inserted into the core during operation to enhance the initial negative reactivity insertion rate on scram. In addition, insertion of control rods reduces the positive void coefficient.

(IT is our understanding that the procedural requirements for 30 equivalent rods minimum reactivity margin is a means of specifying an overall rod configuration that ensures a certain initial negative reactivity rate on scram. It also apparently prevents an initial positive reactivity insertion that can occur when rods enter the core from the top, displacing water in the rod channels near the bottom of the core.)

C. Event Description

1. Review event description section of SOER 87-01.

Direct: Operators to event description SOER 87-01 pg's 3-6.

EO-1.1

D. Procedural Violations

1. Discussion

The design of the plant placed a heavy dependence on adherence to administrative controls and procedures for safe operation. However, the plant operators did not demonstrate an adequate understanding of the safety implications of their actions.

Direct: Operators to causes of the event, cause H pg. 7.

2. Violations

a. Review Table 1.

Direct: Operators to Table 1.

EO-1.3

E. Analysis

1. Errors were made by personnel believed to be properly trained and operating a plant that was reported to have an excellent performance record. The accident reinforces the need for strict adherence to safety requirements in procedures and operating rules regardless of experience or past performance.

Furthermore, the sequence of events demonstrates that the operators did not understand the potential behavior of the reactor or the safety implications associated with their departure from procedures.

Discuss: We have seen how procedural non compliance and poor understanding of reactivity control bases has led to the worst nuclear accident in history, now lets look at NMP2 guidance on procedure use and bases for reactivity controls.

III. Station General Order 89-03 EO-1.4

A. Procedural Adequacy

1. - Review Sec. A

B. Use of Procedures

1. - Sec B

Q: When must procedures be used (on hand) during job performance? EO-1.5

A: Sec B.1 pg. 3

2. Procedures in contaminated areas - Sec B.4

Q: When working in contaminated areas how is procedural sign off accomplished? EO-1.6

A: Sec B.4 pg. 4

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
3. Multiple persons activities	Q: How would jobs requiring multiple persons remote from one another be directed?	EO-1.7
a. Sec B.5	A: Sec B.5 pg 4	
b. Sec B.6		
4. Independent verification	Q: Is physical separation necessary to ensure independent verification?	EO-1.8
a. Sec B.9.a	A: No (Sec B.9.a pg 5)	
b. Sec B.9.b and B.9.c	Q: What requirements must verifiers meet?	EO-1.9
	A: Sec B.9.c	
	Q: And how is verification accomplished?	EO-1.9
	A: Sec B.9.b	
C. Adherence to Procedures		
1. Verbatim compliance	Q: Is "Verbatim Compliance" with all procedures at NMP2 required?	EO-1.10
a. Sec C.1	A: Not possible (Sec C.1 pg 5)	
2. Meeting intent	Q: Can actions not in adherence to exact, explicit direction be taken to "meet the intent" of a procedure?	EO-1.11
a. Sec C.1.a	A: No (Sec C.1.a pg 5)	
3. Procedural adherence		EO-1.12
a. Review C.2		
4. Procedure inaccuracy	Q: Can a job be performed if procedural inaccuracies prevent adherence to procedural direction?	EO-1.13
a. Sec C.3	A: Sec C.3	

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
D. Changes to Procedures		
1. Publication changes	Q: When are publication changes used?	EO-1.14
	A: Sec D.1.a pg 7	
2. Temporary changes	Q: When are temporary changes used?	
	A: Sec D.2.a pg 7	
E. Surveillance Tests		
1. Specified conditions	Q: What are the alternatives when plant or system conditions for a surveillance can't be met?	EO-1.15
	A: E.2 pg 8	
2. Test performance a. E.3 b. E.4	Review: Sections E.3 and E.4 (pg 8)	EO-1.16
3. Partial acceptance a. Sec E.5	Q: What requirements must be met to allow acceptance of a portion of a surveillance?	EO-1.17
	A: Sec E.5	
4. "No tests"	Q: Under what conditions can a "No-test" be declared?	EO-1.18
	A: Sec E.6 pg 9	
IV. STATION GENERAL ORDER 89-02		
A. Discussion		
1. Definition	Q: What is the definition of a "special test or experiment"?	EO-1.19
	A: Discussion 3 pg 2	

LESSON CONTENT	DELIVERY NOTES	OBJECTIVES/ NOTES
B. Action		
1. Procedures		
a. Special test procedures will be developed to ensure safety and compliance with Technical Specifications.	(Action 3 pg 2)	EO-1.20
V. TECHNICAL SPECIFICATION BASES		
A. Shutdown Margin		
1. T.S. Bases 3/4.1.1	Q: What three assurances are given by maintaining specified shutdown margin?	EO-1.21
	A: T.S. bases 3/4.1.1	
B. Control Rod System		
1. T.S. 3/4.1.3	Q: What three assurances are given by maintaining the Control Rod System within specifications?	EO-1.22
	A: T:S. bases 3/4.1.3	
	Q: Why is the number or inoperative rods limited to eight?	EO-1.23
	A: Indicates possible generic problem (T.S. bases 3/4.1.3)	
	Q: Why is the rate at which the control rods bring the reactor subcritical controlled?	EO-1.24
	A: T.S. bases 3/4.1.3	
VI. CLOSING		
A. Review Objectives		
B. Ask/Answer Any Questions		