Serial No. 1242
Attachment 2

LESSON PLAN REVISION/REVIEW HISTORY
ED 7351

LESSON PLAN TITLE: RAPID FEEDWATER REDUCTION			LESSON PLAN NUMBER: RES - OPS-002.00
REVISION NUMBER	DATE	BY	SIGNATURE
00	8512	GARY L. CASPERSEN	

Program Title: OPERATOR TRAINING

Course Title: 1985-1986 Restart Training

Lesson Title: RAPID FEEDWATER REDUCTION

Approx. Time: 1 Revision No.: 00 Date: 8512

Resource Materials for the Instructor

Job Aids:

N/A

Audio/Visual Equipment Needed:

OVERHEAD PROJECTOR

List of Transparancies:

RES-OPS-002 1 THRU RES-OPS-002.4

Tools / Equipment:

N/A

Safety Requirements:

N/A

Instructional Setting:

CLASSROOM

Student Materials:

PEN OR PENCIL, PAPER, HANDOUTS

Special Considerations:

N/A

Instructor References:

SP 1105.05, USAR - SECTION 7.7, INSTRUCTIONS BOOK FOR INTEGRATED CONTROL SYSTEM, TOLEDO EDISON DRAWINGS 26206-26228, FCR-200 REV. A

Student References:

SP 1105.04, USAR - SECTION 7.7

OBJECTIVE. NUMBER	OBJECTIVE TEXT.....
0	OPERATE AND MONITOR THE RAPID FEEDWATER REDUCTION PORTION OF THE INTEGRATED CONTROL SYSTEM.
00	THE FOLLOWING ENABLING OBJECTIVES ASSOCIATED WITH THIS LESSON PLAN ARE DESIGNED TO SUPPORT THE "KNOWLEDGE" REQUIREMENTS FOR THE ABOVE TERMINAL OBJECTIVE.
000	THE STUDENT, WITHOUT REFERENCES UNLESS OTHERWISE SPECIFIED), ACCORDING TO APPROVED PROCEDURES, WILL BE ABLE TO:
01	STATE THE PURPOSE OF RAPID FEEDWATER REDUCTION.
02	IDENTIFY THE CONDITIONS THAT WOULD RESULT IN A RAPID FEEDWATER REDUCTION ACTUATION.
03	DESCRIBE THE FEEDWATER RESPONSE DURING A RAPID FEEDWATER REDUCTION ACTUATION.
04	DESCRIBE HOW A RAPID FEEDWATER REDUCTION ACTUATION IS TERMINATED.

1.0 INTRODUCTION

A. The Rapid Feedwater Reduction portion of the Integrated Control System is responsible for ensuring proper feedwater response during a reactor trip from power.

2.0 PRESENTATION

A. The Rapid Feedwater Reduction (RFR) controls the speed of the Main Feedwater Pumps and the position of the Main and Startup Feedwater Control Valves following a reactor trip from power, to ensure proper Feedwater response.

B. Description

1. Conditions necessary to initiate a rapid feedwater reduction

a. At least one MFP not tripped

b. All control valves in auto

c. RFR defeat switch in "on" position

d. Reactor Trip

2. Initiation Circuitry TP 2

a. When #1 or #2 MFP are reset then either contact 86-1/AFWPT or 86-1/BFWPT will be closed.

b. When the RFR defeat switch is on then switch RFR/DEF will be closed.

c. When all four (4) Feedwater Control valves are in auto then contacts 62X/AFWM, 62X/AFWS, 62X/BFWS, and 62X/BFWM are closed.

d. A reactor trip then closes contacts 86/RT and 86-1/RT.

e. When the above contacts are closed the

following relays are energized 86/RFR, 86/RFR-1, 86/RFR-2, and 86/RFR-3.

f. When 86/RFR-2 is energized it closes contact 86/RFR-2 which seals in the actuation signal even if the valves are then taken out of auto.

3. Main and SU control valve actuating circuitry TP 3

a. When 86/RFR is energized it closes contact 86/RFR

b. As long as no OTSG low level exists and <2.5 minutes have elapsed since the trip, relays 86/OLCA, 86/OLCA-1, 86/OLCB, and OLCB-1 will be energized

1) This causes contacts to position such that the transfer devices T15 and T14 select a target position for their input

2) This provides a closed signal to the main control valves and about a 17% open signal to the startup control valves. TP 4

4. Main Feed pump actuating circuitry

a. When 86/RFR and 86/RFR-2 are energized it causes contacts to position such that the transfer device T-11 is selected to a target speed of about 4600 RPM. TP 4

b. It also selects a zero modifying signal instead of valve D/P as long as no low level limit exists.

5. Low Level Control Circuitry

a. Once low level limits are reached the 27RR/LLA and 27RR/LLB contacts change position. TP 3

1) This deenergizes relays 86/OLCA, 86/OLCA-1, 86/OLCB, and 86/OLCB-1

which causes transfer devices T14 and T15 to transfer back to the feedwater demand signal which is on level control

2) This also energizes relays 86/ALCP, and 86/BLCP which cause T13 to select level control instead of a zero error signal. TP 4

a) This results in feedpumps being targeted at ~ 4600 rpm and then that signal being modified by level control error

6. 2.5 minute time control circuit

a. If no low level has occurred before 2.5 minutes has elapsed then Relay 62/LLTB will open the ~~62/LLTB will open the~~ contacts deenergizing relays 86/OLCA, 86/OLCB, and 86/OLCB-1 TP 3

1) This causes transfer device T14 and T15 to transfer back to the feedwater demand signal. TP 4

2) This results in the valves being once again controlled by feedwater demand.

3) This time delay has no effect on the main feedwater pumps.

7. Signal Lag Modules

a. Main Feed Pumps

1) A signal lag module set at a time constant of ~ 18 seconds exists in the RFR feed pump circuit.

2) When RFR is actuated instead of a step change in MFPT speed to its target position the time lag module filters the signal to provide a TP 4

speed change in a smooth controlled fashion.

b. FW Control Valves

1) A signal lag module set at a time constant of ~ 4.5 seconds exists in the RFR control valve circuit.

2) When RFR is actuated the Main and Startup control valves change position in a smooth, controlled fashion from their pretrip position to their post-trip, target position. TP 4

3.0 SUMMARY

A. Proper actuation of RFR is indicated by both main FW valves going shut and both startup FW valves closing to about 17%. The MFP's will target their speed to ~ 4600 rpm.

B. RFR will remain activated for ~ 2.5 minutes or until low level limits have been reached, which ever occurs first.

1. If low level limits have been reached on one (1) loop and not the other while RFR is still activated, the loop reaching low level limits will go on level control and the other will remain on RFR until low level limits have been obtained or 2.5 minutes have expired at which time it will go on level control.

4.0 EVALUATION

5.0 ASSIGNMENT

A. None required for this lesson.