USERS COPY

GEORGIA POWER
POWER GENERATION DEPARTMENT
VOGTLE ELECTRIC GENERATING PLANT

1 of 2

TRAINING LESSON PLAN

TITLE:	LOSS OF RESIDUAL HEAT REMOVAL	NUMBER:	LO-LP-60315-04-C
PROGRAM:	LICENSED OPERATOR TRAINING	REVISION:	4
AUTHOR:	L. FITZWATER	DATE:	8/9/89
APPROVED:	Lloyd a Fitzwater	DATE:	9/1/89

INSTRUCTOR GUIDELINES:

I. Lesson Format:

A. Lecture With Visual Aids

II. Materials:

A. Overhead Projector

B. Transparencies

C. White Board With Markers

III. Evaluation:

A. Written or Oral exam in conjunction with other Lesson Plans

IV. Remarks

A. Performance-based instructional units (IUs) are attached to the lesson plan as student handouts. After the lecture on Loss of Residual Heat Removal, the student should be given adequate self-study time for the IUs. The instructor should direct self-study activities and be available to answer questions that may arise concerning the IU material. After self-study, the student will perform, simulate, observe, or discuss (as identified on the cluster signoff criteria list) the task covered in the instructional unit in the presence of an evaluator.

MASTER COPY

9202190482 920116
PDR ADOCK 05000424
S PDR

I. PURPOSE STATEMENT:

FOLLOWING COMPLETION OF THIS LESSON, THE STUDENT WILL POSSESS THOSE KNOWLEDGES SYSTEMATICALLY IDENTIFIED FOR THE PERFORMANCE OF LOSS OF RESIDUAL HEAT REMOVAL TASKS

II. LIST OF OBJECTIVES:

1. Describe factors that can lead to a loss of RHR.
2. State the possible consequences of a sustained loss of RHR.

REFERENCES:

1. Plant Vogtle Procedures

   -18019, "Loss of Residual Heat Removal"

2. Technical Specifications: None

3. Vogtle Training Text: None

4. Plant Manual: None

5. Design Manual: None

6. P&IDs, Logics, and other Drawings: None

7. Vendor Manuals and other References: None

8. FSAR: None

9. Commitments and other Requirements:

   IEN-87.023 Diablo Canyon Loss of RHR
   IEN-86.101 Loss of RHR due to Loss of Fluid Levels in RCS
   OMR 3.4 CCW Inventory Losses Resulting in Loss of RHR
   GL-88.017 NRC Concerns and Actions on Loss of RHR
   SOER 88.003 Losses of RHR with reduced water level at PWRs

10. Transparencies

    LO-TP-60315-001, Objectives

11. Instructional Units

    LO-IU-60315-001 Respond to Loss of RHR

12. Handouts

    LO-HO-60315-001 Industry Event Summaries
    (SOER 88.003)

III. LESSON OUTLINE:

NOTES

I. INTRODUCTION

A. The loss of Residual Heat Removal Procedure AOP-18019-C is to identify and correct a loss of RHR capability

B. Procedure covers Loss of RHR in:

1. Modes 4 and 5

2. Mode 6 (head removed)

C. Present Lesson Objectives LO-TP-60315-001

II. PRESENTATION

A. Symptoms:

1. Unexplained decrease in RHR flow or discharge pressure AOP-18019

2. Detected RHR system excessive leakage while RHR in operation AOP-18019

3. Any unexplained raise in RCS temperature while RHR in operation AOP-18019

4. Any observed loss of RHR capability while RHR in operation AOP-18019

5. GL 88.014 lists the following conditions in which entry to Loss of RHR Procedures may be required

a. Accidental loss of a system that is operating to cool the RCS

b. Unsuccessful attempt to start a system when the system was to be used for RCS cooling and the RCS was not being actively cooled by another DHR system

c. Uncontrolled and significant loss of RCS inventory

d. Uncontrolled and significant break in the RCS coolant boundary

e. Any valid symptom of loss of control of the state of the RCS, such as uncontrolled temperature increase, uncontrolled pressurization, or the attainment of values of these

parameters which are sufficiently high that action is required that is not contained within normal procedures

f. Significant core damage expected

g. Any valid symptom of significant core damage observed

B. Factors that can lead to a loss of RHR

1. Improper valve lineups

a. Many projects/evolutions occurring simultaneously

b. Loss of control

c. Personnel in plant not keeping control or informed of changing conditions

d. Lack of coordination

2. System leakage

a. Improperly seated valves

b. Improper valve lineups

c. Operator not familiar with valve position verification methods for reach rod operated valves

d. Loss of control of evolutions

e. Inadequate tagging orders

f. Normal system leakage not considered

3. Deficient procedures

a. Infrequently or first time used procedures - untested

b. Abnormal conditions requiring special procedures or temporary procedures

4. Opening RCS or related systems

a. SG manway removal

b. Reactor vessel head removal

III. LESSON OUTLINE: NOTES

c. Reactor coolant pump seal replacement

d. Installation of local reactor vessel level standpipe

e. Venting CRDM's

5. Starting idle RHR loop

a. Idle loop partially drains while shutdown due to gas coming out of solution and accumulating in unvented high points

b. Gas pocket shifts to pump suction - pump cavitation results

c. Gas pocket shifts to reactor vessel with subsequent de rease in level

d. Gas pockets shift to atmosphere through open reactor vessel or other system components, with a subsequent decrease reactor vessel level to fill the void left by the gases

6. Poor communications

a. Inadequate/incomplete shift turn over

b. Information on phone system not clear, no repeat backs, misunderstood/wrong interruptions

c. Distracting activities in control room and/or other critical areas

d. Inadequate/improper documentation of problems or evolution during shift

7. Changing plant conditions

a. Pressure reduction

1) Gases coming out of solution

b. Lowering reactor vessel level for reactor head removal/other maintenance

c. Opening reactor cavity refueling transfer gate valve

d. Surveillance is in progress

III. LESSON OUTLINE: NOTES

e. Pressurization of RCS

1) Caused by steam formation in unvented reactor vessel

2) Inappropriate use of SG nozzle dam can lead to core voiding within 15-20 minutes following loss of RHR

3) Cold leg opening can allow water to be ejected from vessel following loss of RHR until sufficient water is lost that

4) Steam is relieved by clearing the crossover pipes

5) Pressure difference within RCS may prevent water from reaching the RV

6) Rapid RCS pressurization may prevent gravity feed from tanks anticipated to be available

7) Rapid pressurization may cause instruments to malfunction or provide misleading indications

8) Rapid pressurization may cause the RCS to respond in unanticipated ways

9) Small RCS openings (vents and drains) may lead to instrument malfunctions or unanticipated RCS responses

10) Large RCS pressure boundary openings (SG manway, RCP seals, pressurizer manways) may lead to instrument malfunction or unanticipated RCS responses

11) SG secondary side inventory and opening may influence RCS behavior

f. Vortexing

1) Small amount of air into RHR pump suction may lad to subtle changes that occur over a time of minute to an hour or more

2) Large amounts of air may cause immediate loss of RHR

3) Vortexing may occur at levels higher than anticipated

4) Vortexing may not be reflected by pump current and flow rate instruments until it is sufficiently severe to cause a loss of RHR

5) Vortexing may cause RCS level indication errors

g. SG tube draining

1) Draining SG U-tube is frequently done by draining the RCS to the point where vortexing could occur

h. RCS level differences

1) Critical level parameter is in hot leg where RHR takes suction

2) Level instruments connected at other points

3) Level differences exist between level indicator and hot leg RHR connection point (may be several inches difference)

i. RHR system effects

1) Shifting from one train to another may cause level changes due to differences in actual size etc.

2) Starting one size while another is running can increase total flow thus increase vortexing

3) Operator response to loss of one RHR pump by starting the second pump may result in the loss of the second pump also if started without correcting the cause of the loss of the first pump

4) Stopping or starting RHR may cause RCS level change due to partially filled system or air induction into the RHR system

j. Instrumentation

III. LESSON OUTLINE:

NOTES

1) May be in error by half a foot or more without detection of inaccuracies

2) Flow dynamics, entrapped air, and pressurization may affect level indication, individually or all indicators simultaneously

3) Many normal instruments disconnected during RV head removal etc.

4) Remaining instruments may be inadequate

8. Loss of CCW

Begin OMR 324

a. Loss could be from improper clearance on one RHR heat exchanger that comprises the operable heat exchanger

b. Loss of CCW to heat exchanger prevents heat removal from RCS

c. Care should be taken when tagging one heat exchanger so as not to compromise remaining heat exchanger

End OMR 324

C. Consequences of Loss of RHR

1. Core damage

a. Loss of core cooling

2. Radioactive releases to the environment

a. Open RCS with containment open to atmosphere

3. RCS overpressurization due to heat up from decay heat

4. Contamination of personnel

5. Activation of emergency plan

D. Loss of RHR in Modes 4 or 5

1. Use AOP 18019 to discuss this event

a. Ensure students pay particular attention to:

1) Caution statement at beginning of

III. LESSON OUTLINE: | NOTES

Section A

2) The statement that steps A1 thru A3 are to be performed continuously until exit from this procedure

3) Note before Step A1 — Discuss each of these figures with the class

4) Note statement before step A3

5) Indications of RHR pump cavitation — Quiz selected student to ensure the class has an understanding

6) Note statement before step A5

7) Note statement before step A6

8) Note statement before step A7

b. The procedure establishes the priorities as:

1) Monitor/Maintaining core cooling

2) Monitor/Reestablishing adequate RCS inventory

3) Restore RHR

4) Determine/establish alternate RCS cooling

5) Fix problems

6) Return to normal ops

E. Loss of RHR - Modes 6

1. Use AOP 18019 to discuss this event

a. This procedure provides the following priorities

1) RCS level above Rx vessel flange

2) Suspend boron reduction

3) Verify RHR pump flow path

4) Level greater than 23 feet above Rx

III. LESSON OUTLINE:

NOTES

vessel flange

5) No loss of inventory has occurred (If it has must return to Section A of 18019)

6) Repair problems

7) Be prepared to secure the RHR train that may be subsequently lost

8) Restore RHR

9) Initiate alternate cooling

F. Industry Events

IEN 87.023
IEN 87.101
GL 88.017
Event included in LO-HC-60315-0C1
SOER 88.003

1. Diablo Canyon

a. Loss of both RHR trains while in Mode 5

b. RHR out for 1 - 5 hours

c. Containment equipment hatch was removed

d. S/G manway removal was in progress with RCS inv. at mid-loop level of Th

e. RCS temp increased from 87°F to boiling (212°F)

f. Steam was vented from Rx vessel head

g. Water spilled from partially removed manway to containment floor

h. Containment radiogas level begins to increase

i. RHR restored

j. Potential problems

1) Core damage due to boiling out RCS inv.

2) Rad release to evir.

III. SUMMARY

A. Review Objectives

III. LESSON OUTLINE:

NOTES

1. DESCRIBE FACTORS THAT CAN LEAD TO A LOSS OF RHR

   a. Improper valve lineup

   b. System leakage

   c. Deficient procedures

   d. Opening RCS or related systems

   e. Starting Idle RHR loop

   f. Poor communication

   g. Changing plant conditions

Refer to LP Section II.3 for examples and discussion

2. STATE THE POSSIBLE CONSEQUENCES OF A SUSTAINED LOSS OF RHR

   a. Core damage

   b. Radioactive release to environment

   c. RCS overpressurization

   d. Personnel contamination

   e. Activation of the emergency plan