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2-15-8A

2 of 2

GEORGIA POWER
POWER GENERATION DEPARTMENT
VOGTLE ELECTRIC GENERATING PLANT

TRAINING LESSON PLAN

TITLE:	LOSS OF CLASS 1E ELECTRICAL SYSTEM	NUMBER:	LO-LP-60323-01
PROGRAM:	LICENSED OPERATOR TRAINING	REVISION:	1
AUTHOR:	L. FITZWATER	DATE:	8/10/89
APPROVED:	Lloyd a [signature]	DATE:	8/21/89

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 Class 1E Electrical System, 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.

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I. PURPOSE STATEMENT:

Following completion of this lesson, the student will possess those knowledges systematically identified for the performance of Loss of Class 1E Electric System tasks.

II. LIST OF OBJECTIVES:

1. State the immediate operator action required on loss of 1E electrical systems, AOP-18031. Include RNO and substeps of the immediate action.

2. Describe why the affected train diesel generator must be tripped following a loss of one train of 1E electrical systems.

REFERENCES:

1. PLANT VOGTLE PROCEDURES

   18031 LOSS OF CLASS 1E ELECTRICAL SYSTEMS

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

10. TRANSPARENCIES

    LO-TP-60323-001 LESSON OBJECTIVES

11. INSTRUCTIONAL UNITS

    LO-IU-60323-001 RESPOND TO LOSS OF CLASS 1E ELECTRICAL SYSTEM

12. HANDOUTS: NONE

III. LESSON OUTLINE: | NOTES

I. INTRODUCTION

A. AOP-18031-C, Loss of Class 1E Electrical Systems, addresses the loss of one train of either 4160VAC or 480VAC Class 1E electrical system

B. Present Lesson Objectives — LO-TP-60323-001

II. PRESENTATION

A. Symptoms

1. Loss of off-site power to one train of 1E electrical system (1AA02 or 1BA03) concurrent with diesel failure to tie on same train — (2AA02 or 2BA03)

2. Electric fault on 1AA02 or 1BA03 — (2AA02 or 2BA03)

3. Loss of one train of 480V Class 1E power

B. Immediate Operator Actions — Objective 1

If loss of a 4160V AC Bus, then:

1. Trip the affected train diesel generator

a. RNO

1) Dispatch a PEO to shut down the DC

b. DG will be operating without cooling unless power is restored to 1E bus which supplies NSCW pump. DG will be damaged if operated without cooling water — Objective 2

c. This step assumes that the diesel generator in the affected train is operating without NSCW cooling due to lack of power to NSCW pumps

d. The step also assumes there is no means of readily restoring NSCW in a timely manner

e. The purpose of this step is to prevent damage to the diesel generator due to overheating

C. Subsequent Operator Actions

1. Verify running or start the following components

- Two NSCW pumps

III. LESSON OUTLINE: NOTES

- Two CCW pumps
- One CCP if PDP is inoperable
- One ACCW pump
- MDAFW pump if AFW is initiated
- ESF chiller

a. Depending on plant conditions at time of loss of 1E, some or all of these components will be operating in the non-affected train

b. The purpose of this step is to ensure adequate system and component cooling for continued plant operation

c. If the listed components are not running and cannot be started, the RNO actions direct the operator to procedures or to take actions which will compensate for the deficiency

d. RNO: Initiate appropriate AOP

2. Verify the unaffected train Class 1E 480V switch gear (listed n procedure) is energized

   a. The purpose of this step is to ensure the unaffected bus is fully energized

      1) The load centers may have tripped from perturbations generated by the loss of the Class 1E train

   b. RNO

      1) If any load center on the unaffected train has tripped, attempt to restore power to it

3. Verify the listed MCC's in the non-affected train energized

   a. The MCC centers in the unaffected train may have tripped from perturbations generated by the loss of the 1E train

      1) If 1ABB is de-energized emergency boration valve HV-[illegible] will be inoperable from the control room

III. LESSON OUTLINE: NOTES

2) Question - Are you under an LCO?

Refer: T.S. 3.1.2.2

Answer:

No, as long as still have other 2 paths

- RWST to CCP

- Normal boration path

b. RNO

1) Dispatch an operator to restore power to the MCC

4. Verify 125VDC battery loads less than listed limits

a. The four batteries listed in this step are components of the 125VDC ESF systems

1) The systems provide source of continuous power for control instrumentation and DC motors

2) The battery chargers in the affected train will be inoperable and the batteries subject to discharge

3) The 125VDC batteries are the only supply to the 125VDC loads and 120VAC instrument power

b. RNO

1) SS determine selective stripping

5. Start one boric acid transfer pump

a. This is a conservative measure designed to ensure that boration capability is present

b. RNO

1) No boric acid pump operable and boration is required then borate from RWST

6. Start one reactor makeup water pump

a. This is a conservative measure designed to ensure makeup capability exists

b. RNO

1) If Rx makeup water pump is inoperable ensure chg pump suction shifts to RWST when VCT level falls to the low-low level setpoint

7. Initiate applicable Tech. Specs.

8. Repair faulty equipment

9. Verify fault condition is cleared and restore the affected bus

10. Restore the affected buses

a. This step will result in a CVI, FHBI, and CRI actuation

11. Restore DG for auto start

a. If DG output breaker did not close on undervoltage bus and offsite power is available, the sequencer will need to be reset

12. Restore affected train components

13. Return to procedure in effect

III. SUMMARY

A. Review Objectives

1. STATE THE IMMEDIATE OPERATOR ACTION REQUIRED ON LOSS OF 1E ELECTRICAL SYSTEMS, AOP-18031. INCLUDE RNO AND SUBSTEPS OF THE IMMEDIATE ACTION.

Trip the affected train diesel generator

2. DESCRIBE WHY THE AFFECTED TRAIN DIESEL GENERATOR MUST BE TRIPPED FOLLOWING A LOSS OF ONE TRAIN OF 1E ELECTRICAL SYSTEMS.

The diesel may be damaged if operated without cooling water.

2-158B

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VOGTLE ELECTRIC GENERATING PLANT

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INSTRUCTIONAL UNIT

TITLE:	RESPOND TO LOSS OF CLASS 1E ELECTRIC SYSTEMS	NUMBER:	LO-IU-60323-001-01
PROGRAM:	LICENSED OPERATOR TRAINING	REVISION:	1
AUTHOR:	FITZWATER	DATE:	8/10/89
APPROVED:	Lloyd a [signature]	DATE:	8/21/89

REFERENCES:

VEGP PROCEDURE 18031-C, REV 6, LOSS OF CLASS 1E ELECTRICAL SYSTEMS

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PERFORMANCE OBJECTIVE

Given a loss of Class 1E Electrical Systems, respond to loss of Class 1E Electrical Systems.

The diesel generator must be tripped. Unaffected train components must be verified running or started. A boric acid transfer pump and a reactor makeup water pump must be started. Required Technical Specifications must be met. The affected bus must be restored and power must be restored to the affected train components as plant conditions allow. When Class 1E Electrical Systems are restored, the diesel generator must be aligned for automatic starting. All communication and activities must be performed in accordance with current, approved procedures.

INFORMATION

Possible causes of a loss of one train of Class 1E electrical power include:

1. Fault on 4160V AC Class 1E bus 1AA02 or 1BA03
2. Bus feeder breaker failure with subsequent loss or failure of the respective diesel generator
3. Loss of a reserve auxiliary transformer (RAT) with subsequent loss or failure of the respective diesel generator

This instructional unit addresses the first cause only. Failure of a bus feeder breaker or loss of a RAT should not result in a loss of a 1E bus because the diesel generator should re-energize the bus. For a fault on a Class 1E bus, the feeder breaker will trip and lock out, and the diesel generator breaker will be locked out because of the bus fault.

SYMPTOMS OF A LOSS OF ONE TRAIN OF CLASS 1E ELECTRICAL POWER AS A RESULT OF A FAULT ON 4160V AC CLASS 1E BUS

Symptoms include:

1. 4160V SWGR 1AA02 (1BA03) TROUBLE annunciator
2. Bus 1AA02 (1BA03) voltmeters, ammeters, and phase potential lights indicate that the bus is de-energized
3. SEQ A (B) TROUBLE annunciator
4. DG1A (B) GENERATOR TROUBLE annunciator
5. DG1A (B) HI TEMP JACKET WATER OUT annunciator
6. DG1A (B) HI TEMP LUBE OIL-IN annunciator
7. Train A (B) inverter and battery charger trouble alarms

Symptoms 1 and 2 should be present with a loss of one train of Class 1E electrical power. Symptoms 5 and 6 indicate that the diesel generator in the affected train is operating without NSCW cooling due to overcurrent lockout of its generator breaker. These symptoms will probably not appear immediately.

Plant Vogtle Procedure 18031, "Loss of Class 1E Electrical Systems," is entered when the symptoms of a loss of one train of Class 1E electrical power as a result of a fault on 4160V AC Class 1E bus 1AA02 or 1BA03 are present. The goals of this procedure are to protect the plant and equipment, verify that the fault has been cleared, and restore the affected equipment as required by current plant conditions. Note that this procedure addresses only one possible cause of a loss of a Class 1E train. Other events may not result in overcurrent lockout of the diesel generator breaker. Also note Plant Vogtle Procedure addresses a loss of one train of Class 1E electrical power only; Plant Vogtle Procedure 19100, "Loss of All AC Power," provides actions to respond to a loss of both trains of Class 1E electrical power.

NOTE: If 120V AC vital instrument panel 1AY2A (1BY2B) is being powered by its associated 480/120V AC regulated transformer, the ESF sequencer for that train A (B) will be inoperable.

NOTE: Step 1 of Plant Vogtle Procedure 18031 is an immediate operator action.

RESPOND TO LOSS OF CLASS 1E ELECTRICAL SYSTEMS

Trip the diesel generator in the affected train.
Trip the diesel generator in the affected train by depressing both EMERGENCY STOP pushbuttons.

This procedure step assumes that:

-- The diesel generator in the affected train is operating without NSCW cooling due to lack of power because of the lockout of its generator breaker (automatic closure).
-- No means of readily restoring NSCW is available.

The intent of this procedure step is to prevent damage to the diesel generator due to overheating. If depressing both EMERGENCY STOP buttons fails to trip the diesel generator in the affected train, dispatch a PEO to locally shutdown the diesel at the engine control panel.

NOTE: A trip (or fault) of the [illegible] incoming feeder breaker from a RAT will result in the blocking [illegible] closure of the respective diesel generator output breake[illegible] the breaker manually;

you will have no means of insuring that the fault that caused the normal incoming feeder breaker to trip has been cleared.

Ensure the appropriate equipment is running on the non-affected train.
Verify running or start the following components in the non-affected train:
1. Two NSCW pumps
2. Two CCW pumps
3. One CCP, if PD pump is inoperable
4. One ACCW pump
5. Motor-driven AFW pump, if the AFW system is initiated
6. ESF chiller

Depending on plant conditions at the time of the loss of the train of Class 1E power, some or all of the non-affected train components listed above may be running. The purpose of this step is insure adequate system and component cooling for continued plant operation.

If two NSCW pumps in the unaffected train cannot be started, inadequate cooling of the ACCW is possible; initiate Plant Vogtle Procedure 18021, "Loss of Nuclear Service Cooling Water."

If two CCW pumps cannot be started, initiate Plant Vogtle Procedure 18020, "Loss of Component Cooling Water." The availability of CCW pumps is of particular concern if an RHR cooldown is being conducted and the spent fuel pool has heavy cooling requirements.

If the PD pump is inoperable and a CCP cannot be started, charging flow to the regenerative heat exchanger and the RCP seals will be lost. Initiate Plant Vogtle Procedure 18007, "Chemical and Volume Control System Malfunction," Section B, "Loss of Charging Flow."

If an ACCW pump cannot be started, initiate Plant Vogtle Procedure 18022, "Loss of Auxiliary Component Cooling Water."

If the AFW system is initiated and the motor-driven pump in the affected train cannot be started, verify that the turbine-driven AFW pump is operating.

If the ESF chiller in the non-affected train is out of service, containment cooling could become a concern. Restore the chiller to operation.

Verify the non-affected train is fully energized.
Verify that the Class 1E 480V load centers in the NON-AFFECTED train are energized:

Train B	Train A
-- 1BB06	-- 1AB04
-- 1BB07	-- 1AB05

-- 1BB16 -- 1AB15
-- 1NB10 -- 1NB01

The purpose of this procedure step is to insure that the non-affected bus is fully energized. Load centers in the non-affected train may have tripped from perturbations generated by the loss of the Class 1E train. If a load center on the non-affected train has tripped, attempt to restore power to it:

1. Check the load center overcurrent relays reset.
2. Check the load center overcurrent lock-out relay reset.
3. Attempt one manual reclosing of the load center 480V AC feeder breaker.

Verify that the MCCs in the NON-AFFECTED train are energized (no trouble alarms are present on the QEAH):

Train B	Train A
-- 1BBA	-- 1ABA
-- 1BBB	-- 1ABB
-- 1BBC	-- 1ABC
-- 1BBD	-- 1ABD
-- 1BBE	-- 1ABE
-- 1BBF	-- 1ABF

As with the load centers, the motor control centers in the non-affected train may have tripped from perturbations generated by the loss of the Class 1E train. Dispatch an operator to attempt to restore power to any MCC that is not energized. Attempt one reclosure of the 480V feeder breaker from the respective 480V load center.

<u>Check battery discharge rates.</u>
Verify that 125V DC Battery Loads are less than the following limits:
-- 1AD1B: 290 amps (Train A)
-- 1BD1B: 290 amps (Train B)
-- 1CD1B: 100 amps (Train A)
-- 1DD1B: 80 amps (Train B)

The four batteries listed in this procedure step are components of the 125V DC ESF systems. These systems provide a source of continuous power for control, instrumentation, and DC motors. The battery chargers in the affected train will be inoperable, and the batteries will be subject to rapid discharge. This is of particular concern because the 125V DC batteries are the only components supplying 125V DC loads and 120 VAC instrument power. If the loads on the batteries exceed the limits established above, notify the shift supervisor. The shift supervisor will determine whether loads can be stripped from the overloaded batteries and which loads will be stripped.

The basis for the limits on each battery is a 2.75 hour-discharge rate: if each battery is discharged at the limiting rate, it should maintain voltage at or above the minimum design voltage limit of 106.2 volts for equal to or greater than 2.75 hours. The relationship between battery capacity and discharge rate is not directly proportional: if the discharge rate increases by 50 percent, the time that the battery can supply the minimum design voltage will be significantly less than 1.375 hours (50 percent of 2.75 hours).

The battery chargers/inverters for the batteries in the non-affected train should be operable; the loads on these batteries should be less than the limits listed above.

NOTE: Emergency boration valve HV-8104 will be inoperable from the control room if MCC 1ABB is de-energized. If, during this procedure, MCC 1ABB is inoperable and emergency boration is required, dispatch an operator to manually open the valve locally.

Ensure makeup capacity.

Start one boric acid transfer pump.

Starting one boric acid pump is a conservative measure designed to insure that boration capability is present. If boration IS required AND no boric acid transfer pump is operable, open RWST to charging pump suction valve LV-0112E(D).

Start one reactor make-up water pump.

Like procedure step 6, the action taken in this step is a conservative measure designed to insure that make-up capability is present. If a reactor makeup water pump cannot be started, verify that charging pump suction transfers to RWST on VCT low-low level.

Restore systems and components as required by current plant conditions.

Initiate Technical Specifications as required.

Initiate Maintenance to repair faulty equipment, if necessary.

Verify that the fault condition has been cleared and then restore the affected busses by initiating the applicable steps of Plant Vogtle Procedures:

-- 13427, "4160V AC 1E Electrical Distribution"
-- 13429, "480V AC 1E Electrical Distribution"

Before restoring the affected busses, determine the cause of the trip and locate and isolate the fault. More than likely, the fault will be on one load of the affected bus. The load breaker should have tripped to protect the bus and load. The breaker may not have acted fast enough, or the breaker may have welded one or more pair of contacts. Another possible cause is failure of a protective device (malfunction of a relay or relay setpoint drift). The remote possibility exists that the buswork contains the fault. If the affected train cannot be restored, initiate the applicable action steps of Technical Specification 3.8.1.1: If in modes 1-4 with one of the trains of AC emergency busses not fully energized, re-energize the train within 8 hours or be in at least hot standby within the next 6 hours and in cold shutdown within the following 30 hours. In modes 5 and 6, only one train is required to be energized.

Initiate Plant Vogtle Procedure 13145, "Diesel Generators," and align the diesel generator in the affected train for automatic starting.

With the fault cleared and the affected busses restored, the associated diesel generator can be returned to normal conditions.

Restore the affected train components as required by current plant conditions.
Depending on equipment currently operating and mode of operation, it may be necessary to manipulate loads and equipment.

Return to the UOP currently in effect.

PERFORMANCE GUIDE

The following steps are required to respond to loss of Class 1E Electrical Systems:

1. Protect the diesel generator in the affected train.
2. Ensure that appropriate equipment is running on the non-affected train.
3. Ensure that the non-affected train is fully energized.
4. Check battery discharge rates.
5. Ensure makeup capability.
6. Restore systems and components as required by current plant conditions.

SELF-TEST

Before proceeding to the Task Practice, answer the following questions as completely as possible.

1. Plant Vogtle Procedure 18031 addresses which of the following causes of a loss of one train of Class 1E electrical power?
   a. Fault on 4160V AC Class 1E bus 1AA02 or 1BA03
   b. Bus feeder breaker failure with subsequent loss or failure of the respective diesel generator
   c. Loss of a reserve auxiliary transformer (RAT) with subsequent loss or failure of the respective diesel generator

2. Why is the diesel generator in the affected train tripped in Plant Vogtle Procedure 18031?

3. With a loss of one train of Class 1E electrical power, load centers and motor control centers in the non-affected train may trip from perturbations generated by the loss.
   a. True
   b. False

4. The relationship between 125 DC battery capacity and discharge rate is directly proportional.
   a. True
   b. False

ANSWERS

1. a. Fault on 4160V AC Class 1E bus 1AA02 or 1BA03

2. The diesel generator in the affected train is operating without NSCW cooling due to lack of power because of the automatic lockout of its generator breaker.

3. a. True

4. b. False. If the discharge rate increases by 50 percent, the time that the battery can supply the minimum design voltage will be significantly less than 1.375 hours (50 percent of 2.75 hours).

TASK PRACTICE

1. Review Procedure 18031-C, "Loss of Class 1E Electrical Systems." Be sure that you understand all precautions, limitations, and steps associated with responding to loss of Class 1E Electrical Systems.

2. Take this instructional unit and Procedure 18031-C, "Loss of Class 1E Electrical Systems" to the control room or simulator. Be sure that you can locate all instrumentation associated with responding to loss of Class 1E Electrical Systems.

3. In the control room or simulator, simulate responding to loss of Class 1E Electrical Systems. If possible, have a fellow trainee evaluate your performance using Procedure 18031-C, "Loss of Class 1E Electrical Systems" and this instructional unit.

FEEDBACK ON TASK PRACTICE

1. If you have any questions about the precautions, limitations, or steps in Procedure 18031-C, "Loss of Class 1E Electrical Systems", ask your instructor.

2. You should have been able to locate all instrumentation associated with responding to loss of Class 1E Electrical Systems. If you had any difficulty, ask your instructor for help.

3. You should have simulated the steps necessary to respond to loss of Class 1E Electrical Systems. If you had any difficulty, re-read the pertinent sections of this instructional unit and the procedure. Resolve any questions with your instructor.

POWER GENERATION DEPARTMENT
VOGTLE ELECTRIC GENERATING PLANT

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TRAINING LESSON PLAN

TITLE:	LOSS OF POWER CASE STUDY	NUMBER:	LO-LP-60991-00
PROGRAM:	LICENSED OPERATOR TRAINING	REVISION:	0
AUTHOR:	L. FITZWATER	DATE:	6/24/88
APPROVED:	Robert J. Brown	DATE:	12/6/88

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

None

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I. PURPOSE STATEMENT:

Following completion of this lesson, the student will possess those knowledges of Loss of Power Case Study systematically identified for the performance of Licensed Operator tasks.

II. LIST OF OBJECTIVES:

1. Describe why a significant decreasing RCS temperature concurrent with a significant increase in RCS pressure is a concern for nuclear power plants.

REFERENCES:

1. INPO SIGNIFICANT EVENT REPORT, SER 6-86, LOSS OF POWER TO THE INTEGRATED CONTROL SYSTEM RESULTING IN OVERCOOLING TRANSIENT

2. NUREG-1195, U.S. NRC, LOSS OF INTEGRATED CONTROL SYSTEM POWER AND OVERCOOLING TRANSIENT AT RANCHO SECO ON DECEMBER 26, 1985

3. INPO 87-012 CASE STUDY

4. TRANSPARENCIES

LO-TP-60991-001	LESSON OBJECTIVES
LO-TP-60991-002	ONCE THROUGH STEAM GENERATOR
LO-TP-60991-003	MAIN STEAM SYSTEM
LO-TP-60991-004	MAIN FEEDWATER SYSTEM
LO-TP-60991-005	AUXILIARY FEEDWATER SYSTEM
LO-TP-60991-006	RCS TEMPERATURE AND PRESSURE DURING TRANSIENT
LO-TP-60991-007	PRESSURE TEMPERATURE LIMITS
LO-TP-60991-008	MAKEUP/HIGH PRESSURE INJECTION SYSTEM

III. LESSON OUTLINE:

NOTES

I. INTRODUCTION

A. This case study focuses on the cooldown transient at Rancho Seco — Dec. 26, 1985

B. Event

1. Control power lost to the integrated control system

a. Reactor was at 76% power

2. Rapid reduction in feed flow

3. Reactor trip on high RCS pressure

4. Auxiliary feedwater actuation

5. Steam atmospheric dump open

6. No integrated control available to

a. Auxiliary feed flow

b. Atmospheric dump valves

c. Etc.

7. Rapid cooldown

8. SI

9. RCS repressurization due to SI flow

10. Uncontrolled cooldown

C. Present Lesson Objectives — LO-TP-60991-001

II. PRESENTATION

A. Plant Description

1. Babcock & Wilcox PWR

a. 967 MW electric

b. 2 loops

1) Once through SGs — LO-TP-60991-002

c. Superheated steam system — LO-TP-60991-003

III. LESSON OUTLINE:

NOTES

d. MFW system similar to Vogtle — LO-TP-60991-000A

e. Auxiliary feedwater system similar to Vogtle — LO-TP-60991-005

2. Integrated control system

a. Automatically coordinates equipment

1) Match power generated to power demand

2) Controls

a) Steam pressure

b) Control rod position

c) Feedwater flow

d) Steam atmospheric dump valve position

e) Turbine bypass valve (steam dumps) position

b. Loss of power to integrated control system

1) Valve fail to mid position

2) Indications go to mid-scale

3) Lose control of certain equipment from the control room

B. Precursor Events

1. Similar events

a. 1978 Rancho Seco

1) Caused by loss of power to non-nuclear instrumentation

b. 1975 Rancho Seco

1) Loss of integrated control system very similar to this event (1985)

c. 1980 Crystal River

1) Loss of non-nuclear instrument power

III. LESSON OUTLINE:

NOTES

2) Many plants implemented mods for independent closing of atmospheric dump valves

a) Rancho Seco did not

C. Initial Plant Conditions

1. Unit at 76% power

2. RCS temperature 582 Tavg

3. RCS pressure 2150 psig

4. Integrate control system in auto

5. Crew

4 SROs

2 ROs

6 NLOs

D. Loss of Control Power in the Integrated Control System — LO-TP-60991-006

1. 0413 loss of 24 VDC control power within integrated control system (ICS)

a. ICS demand signals went to mid-scale

1) Startup and main feedwater control valves closed to 50%

2) Main feedwater block valves closed

3) ICS controlled auxiliary feedwater control valves to mid-position

4) Atmospheric dump valves open to mid-position

5) Steam dump valve open to mid-position

b. Main feedwater pump speeds decrease to minimum speed

c. RCS temperature and pressure increase

d. Reactor scram (tripped) on high pressure at 15 sec. after initiation

III. LESSON OUTLINE:

NOTES

e. Auxiliary feedwater initiated

f. Both main feedwater pumps were manually tripped by operator per procedure

g. Rapid cooldown begin

h. Equipment operators dispatch to manually close steam dump valves (turbine bypass) — Plant has no MSIVs

E. Reactor Cooldown and Repressurization — LD-TP-60991-007

1. SI initiates

2. Safety features control opens AFW valves full open

3. Indicate PRZR water level goes offscale low

4. Operators take manual control of AFW control valves to reduce AFW flow and cooldown effects

5. Steam bubble formed in reactor vessel head

6. SG pressure decreases to below condensate pump shutoff head - cond pumps began feeding SG an additional 1000 gpm — Increases CD

7. Auto feedwater isolation on low steam line pressure

8. RCS pressure increases due to SI flow

9. PTS limits violated (T.S. limits not violated)

10. Atmospheric dump valves and turbine steam dump bypass valves closed

11. Operator error causes AFW valve to A gen to go full open

12. B gen AFW valve closed to 1/2 open

13. "A" AFW manual isolation valve corrode and jammed on full speed position

14. "B" SG AFW control valve manually full closed

15. SG level go above 95% full

III. LESSON OUTLINE:

NOTES

16. TD AFW not stopped as called for by procedure

Difficult to restart

17. "A" SG overflows out steam line

18. MDAFW not stopped

Thought they may may not restart if needed

19. Control room operator restored power to ICS by closing a tripped power supply breaker

20. RCS cooled down 190°F in 24 minutes

21. Operator could have secured the cooldown by using a recent fire protection mod

    a. Allowed closing atmospheric dump valves and turbine bypass valves from control room

F. Other problems

LD-TP-60991-008

1. Suction from MUT closed on safety features actuation as required

2. Borated water storage tank valves opened as required

3. Operator recirc water to MUT to reduce PCS pressure increase

4. MUT overflows

5. Operator close suction from borated water storage tank

They did not realize that the suction from MUT closes on ESF actuation

6. Makeup pump damage, leak occurs in pump room

7. Operators entered "primary water" flooded pump room without protective gear to isolate leak

III. SUMMARY

A. Fundamental Causes

1. Failure to recognize the effects of loss of power to the control room and indicating systems

    a. Resulted in overcooling transient

    b. Delayed recovery

2. Plant and industry experience was not applied

B. Review Lesson Objectives

III. LESSON OUTLINE:

NOTES

1. DESCRIBE WHY A SIGNIFICANT DECREASING RCS TEMPERATURE CONCURRENT WITH A SIGNIFICANT INCREASE IN RCS PRESSURE IS A CONCERN FOR NUCLEAR POWER PLANTS.

   This condition can lead to PTS and/or T.S. pressure temperature violations

LESSON OBJECTIVES

(REPLACE THIS PAGE WITH THE LATEST REVISION OF THE LESSON OBJECTIVES)

VI. FIGURES

Figure 1

Once-through Steam Generator (Schematic)

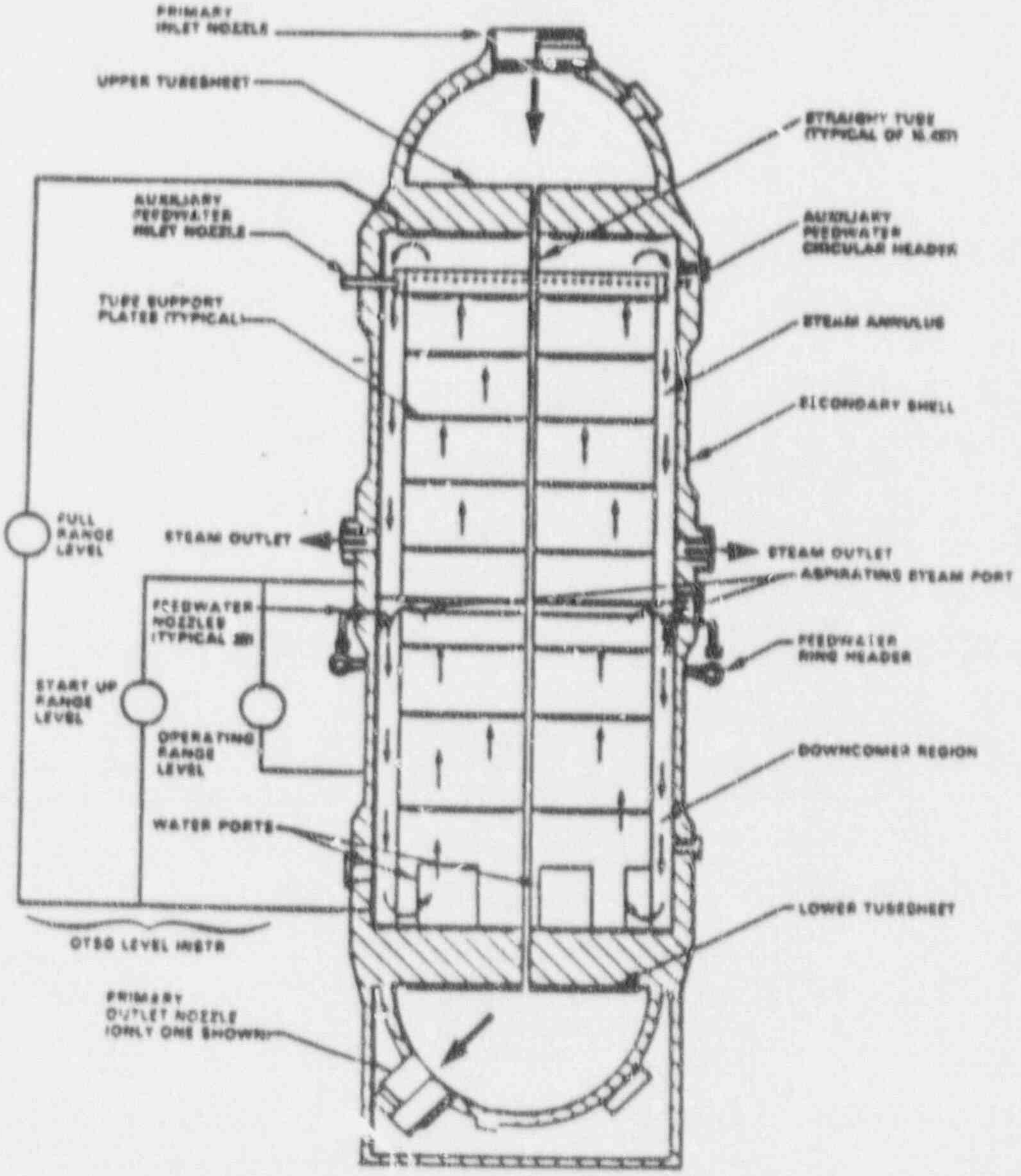

Figure 2
Main Steam System (Schematic)

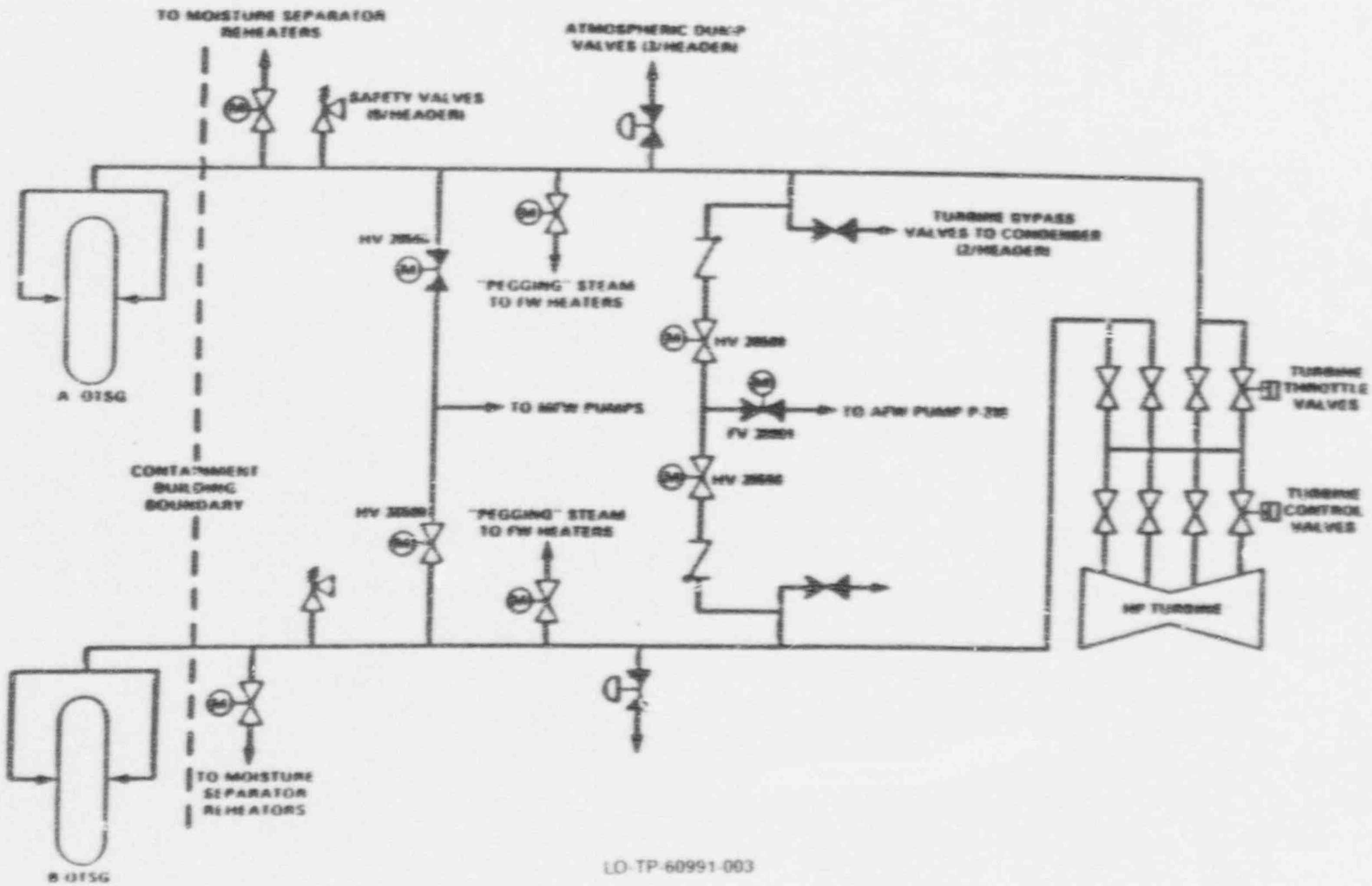

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Figure 3
Main Feedwater System (Simplified)

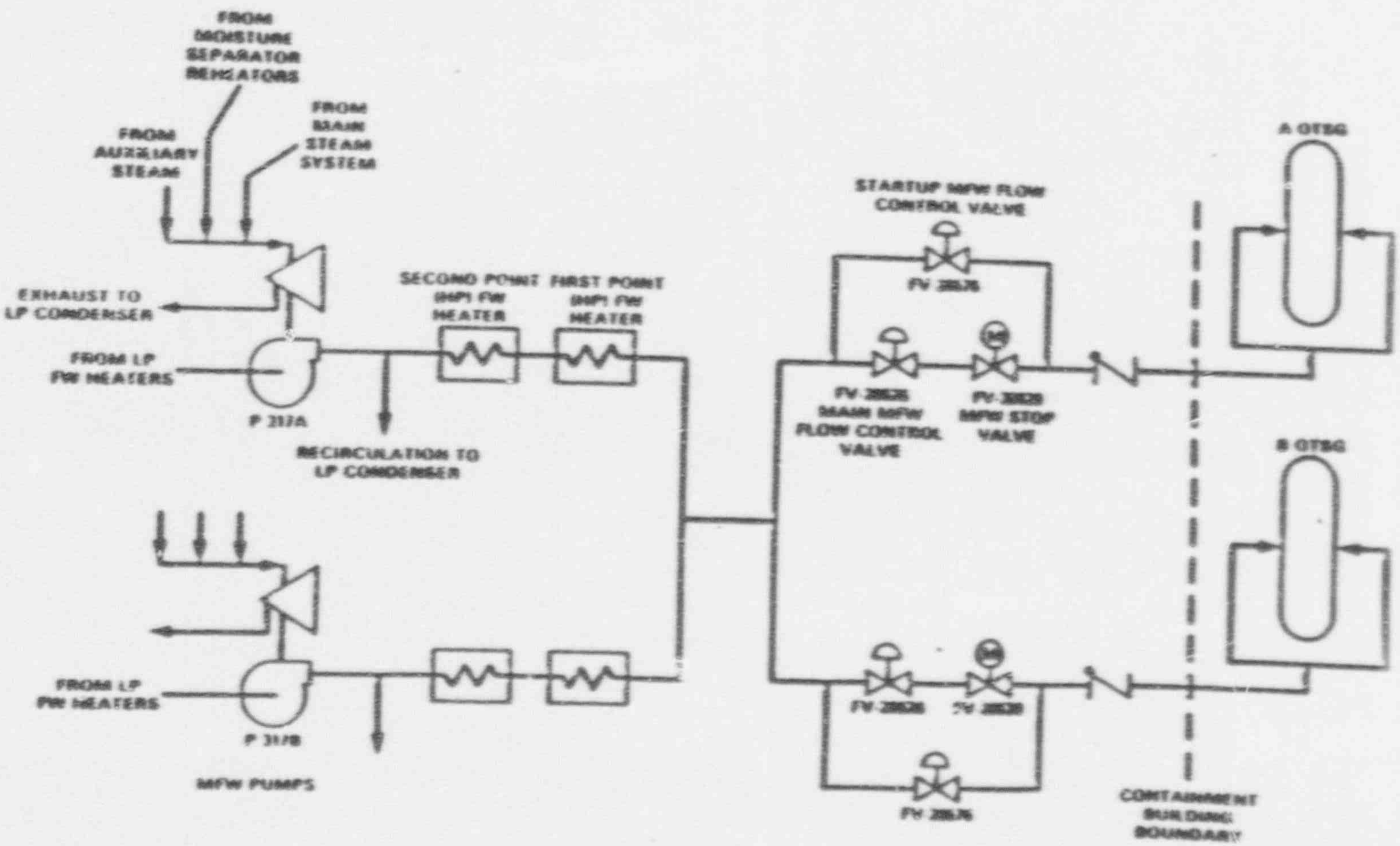

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Figure 4
Auxiliary Feedwater System (Simplified)

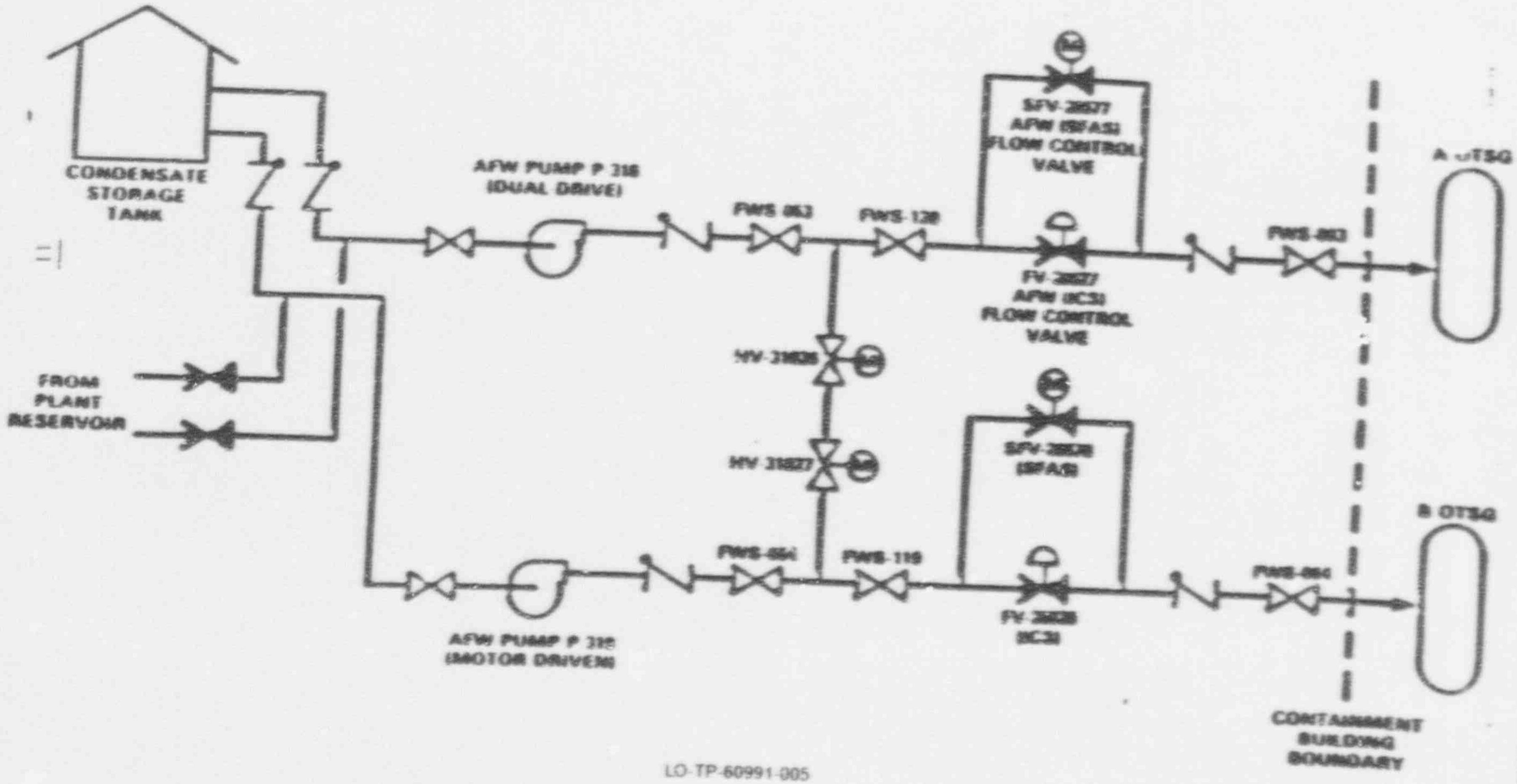

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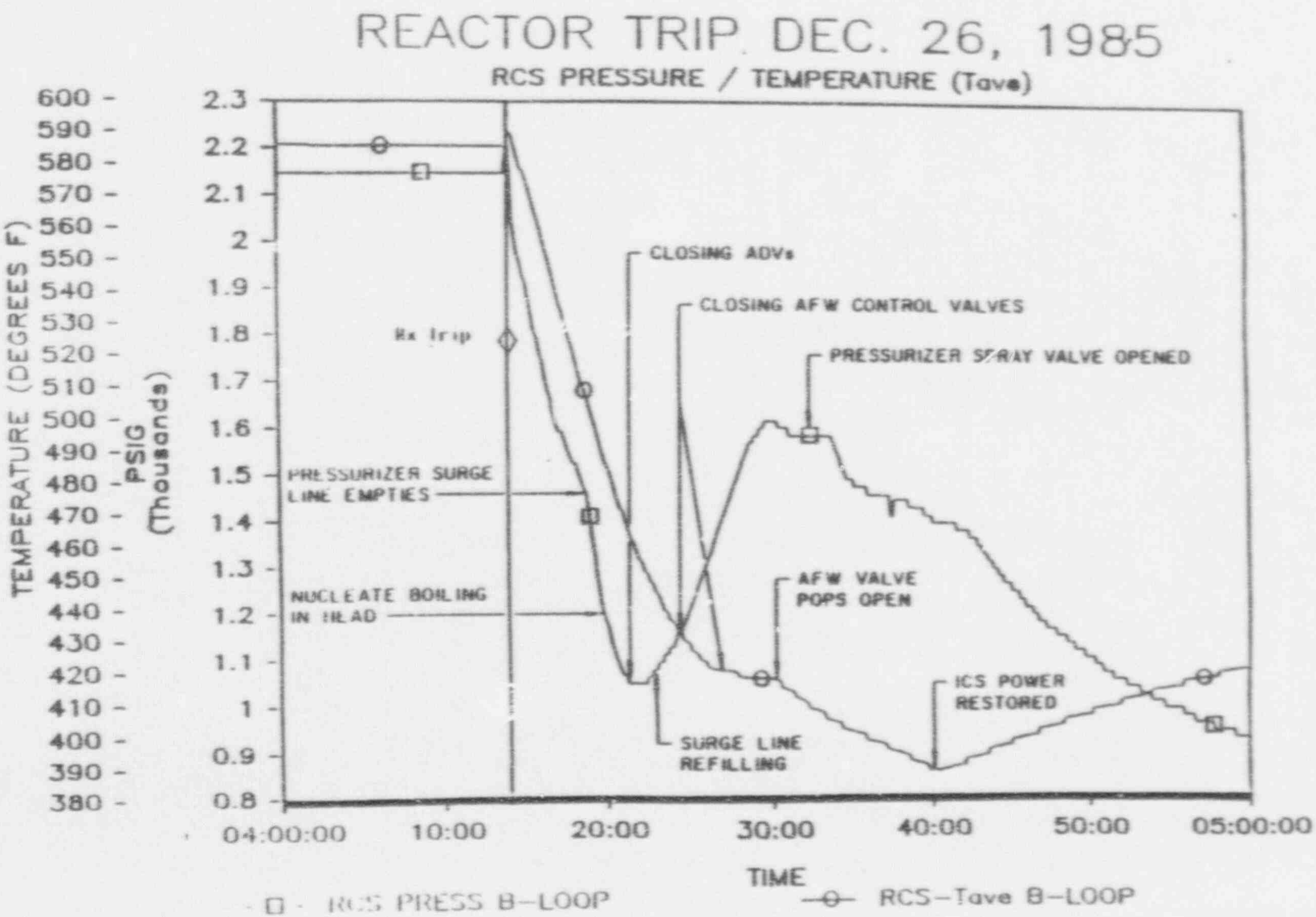
Figure 5
RCS Temperature and Pressure During Transient



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Fi ure 6

Pressure-temperature Limits

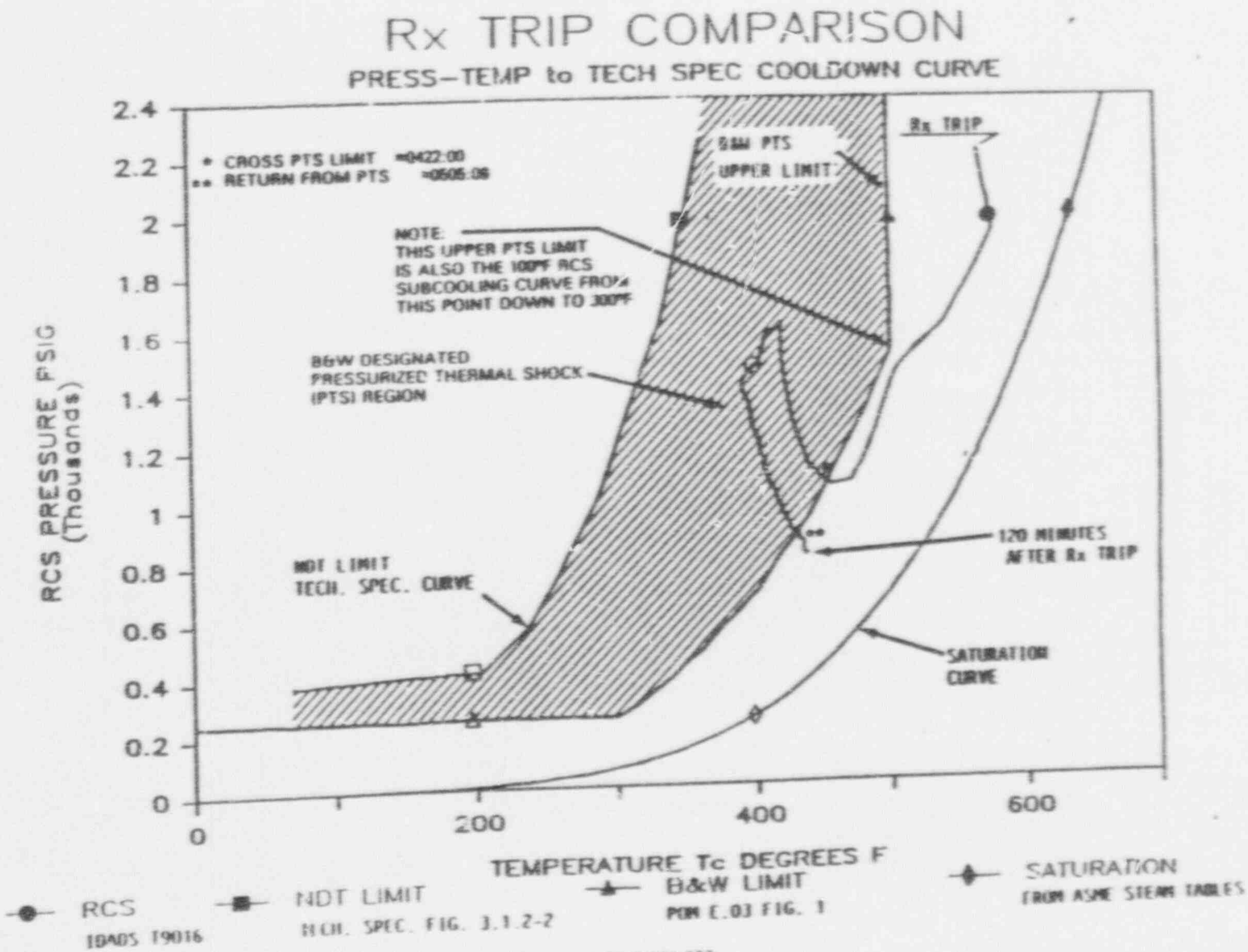

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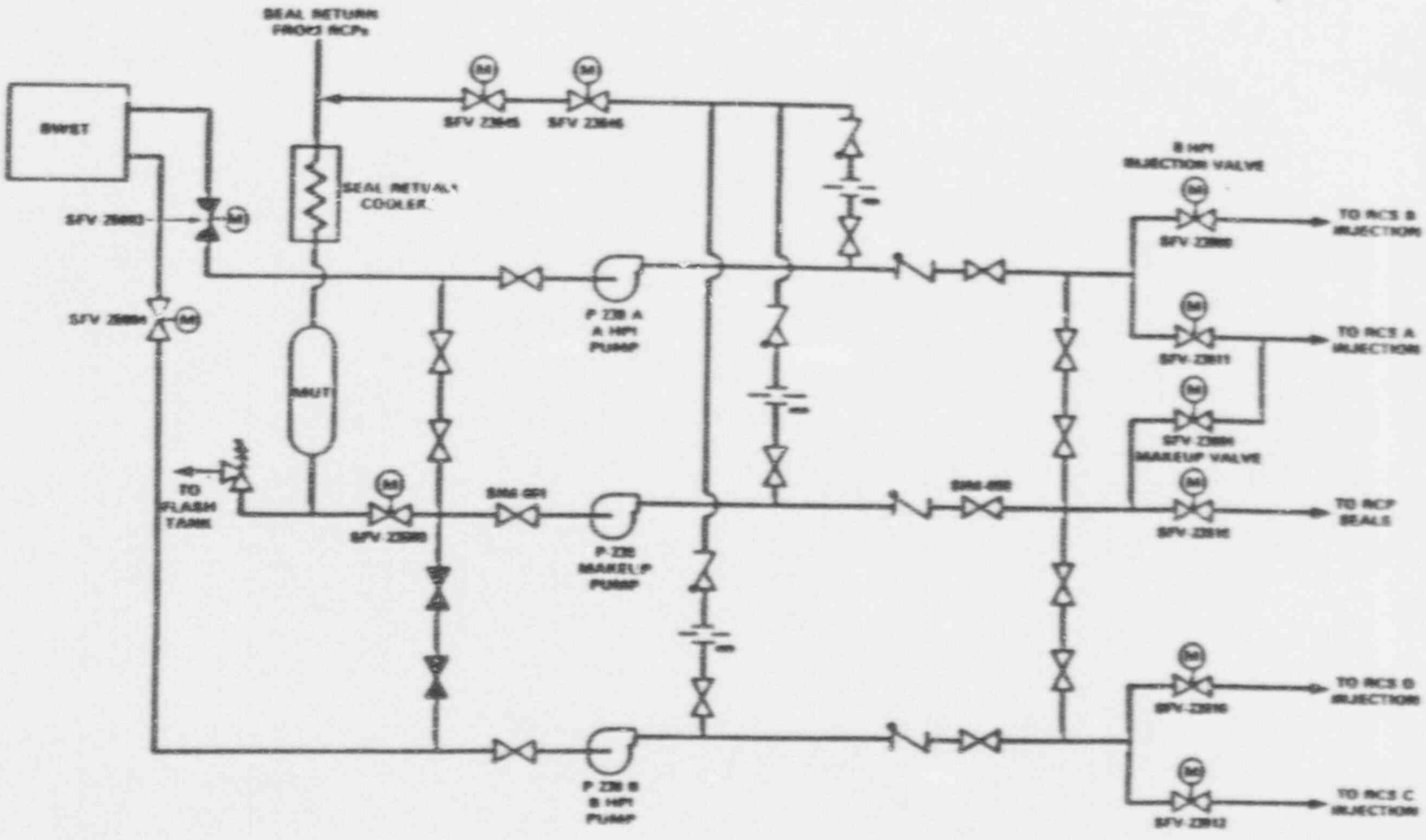
Figure 7

Makeup/High Pressure Injection System (Simplified)



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Georgia Power
POWER GENERATION DEPARTMENT
VOGTLE ELECTRIC GENERATING PLANT

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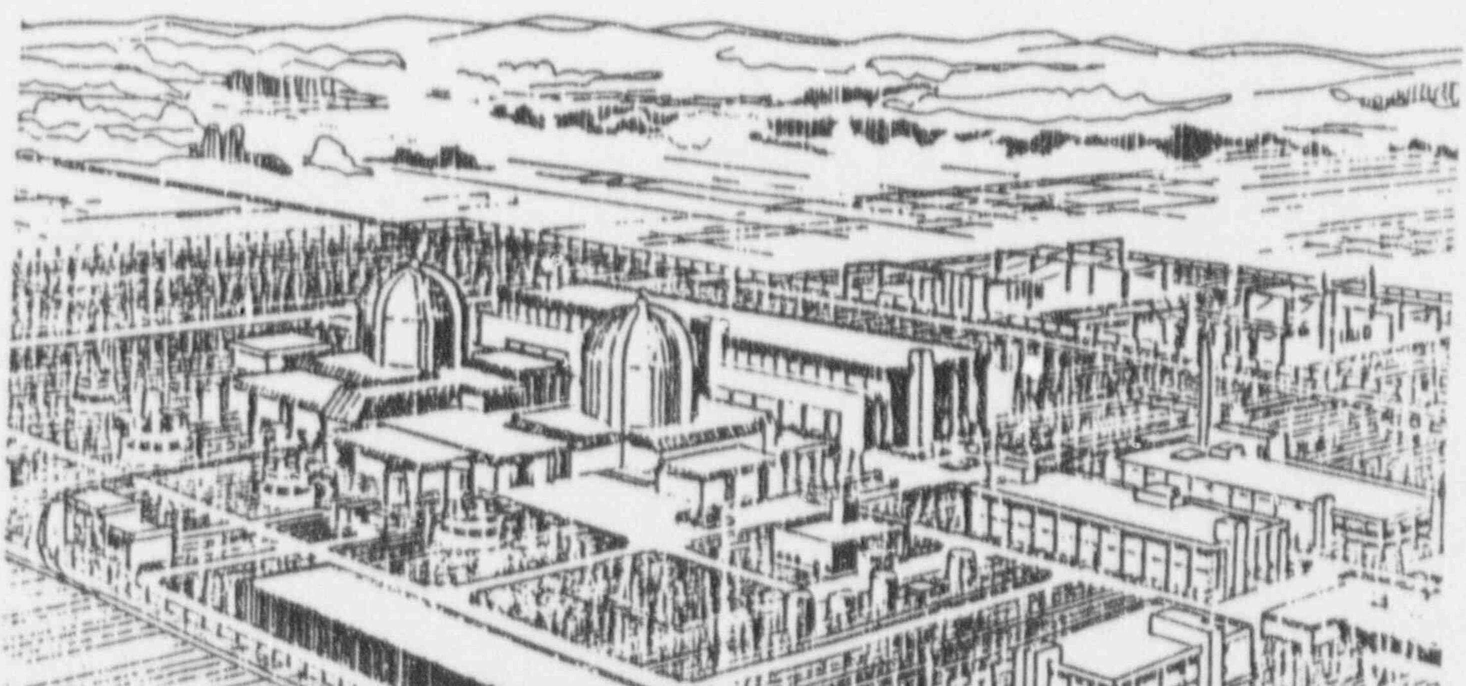
TRAINING STUDENT HANDOUT

TITLE:	LOSS OF POWER CASE STUDY	NUMBER:	LO-HO-60991-00-001
PROGRAM:	LICENSED OPERATOR TRAINING	REVISION:	0
AUTHOR:	L. FITZWATER	DATE:	6/24/88
APPROVED:	Robert J. Brown	DATE:	7/26/88

REFERENCES:

INPO 87-012 CASE STUDY



STUDENT ______________________ DATE ______________

LESSON OBJECTIVES

Describe why a significant decreasing RCS temperature concurrent with a significant increase in RCS pressure is a concern for nuclear power plants.

MATERIAL FOR A CASE STUDY ON

LOSS OF POWER TO THE INTEGRATED CONTROL SYSTEM LEADING TO AN OVERCOOLING TRANSIENT

LIMITED DISTRIBUTION

August 1987
Case Study
INPO 87-012

Institute of Nuclear Power Operations

TABLE OF CONTENTS

I. INTRODUCTION

This case study material includes a description of an actual event in a nuclear plant for use in training. The material is prepared to enable the reader (or instructor) to recognize and analyze the operational aspects (and "feel the reality") of selected events and to personally derive the benefit of analyzing someone else's experience. The overall purpose is to help the readers avoid a similar mishap (or be better prepared if a similar mishap occurs) in their plant.

The case study approach is one method used effectively by other professions to learn from the experience of others. Many different approaches and settings can be used with this method. Examples include individual or group discussions in the classroom and role playing in the simulator setting. The objectives to be achieved during a case study should be tailored to the audience; therefore, the preparation of questions is left for the user since the materials can be used to meet multiple objectives for varying audiences. In preparing a case study, the following key elements should be applied by the presenter:

- *appreciation that the event occurred and has the potential to recur*
- *the sequence of events (scenario)*
- *a complete description of the event and factors affecting the event*
- *an outline to emphasize understanding of the event:*
  - *indications that the event had occurred*
  - *causes(s) of the event*
  - *factors that affected the severity of the event*
  - *lessons learned from the event*
  - *plant-specific corrective actions to prevent recurrence of this or similar events at own plant*
  - *plant-specific actions to mitigate the severity of the event should it occur at own plant*

This case study material focuses on the cooldown transient experienced at Rancho Seco on December 26, 1985. The material includes an event description that covers major operator actions and equipment failures related to the event. In addition, some instructor aids are provided to assist the instructor.

II. SUMMARY

Control power was lost to the integrated control system, a non safety-related system, while the reactor was operating at 76 percent power. This resulted in a rapid reduction of main feedwater flow, followed by a reactor trip on high reactor coolant system pressure and automatic initiation of the auxiliary feedwater system. Additionally, without integrated control system power, auxiliary feedwater flow to the steam generators and steam flow through the atmospheric dump valve and turbine bypass valves could not be controlled from the control room. Auxiliary feedwater flow, together with this steam flow, produced an excessive and rapid reactor coolant system cool-down and depressurization, sufficient to automatically initiate the safety features actuation system. High pressure injection flow resulted in subsequent reactor coolant system repressurization while temperature was still decreasing.

A detailed chronology of the event is presented in Attachment A. Attachment B is a description of the key plant systems that were involved in this event. Attachment C describes earlier events that had lessons appropriate to the December 26, 1985 overcooling event.

III. PLANT BACKGROUND INFORMATION

Plant Description

The Rancho Seco Nuclear Generating Station has a Babcock & Wilcox pressurized water reactor rated at 967 MW electrical. Superheated steam at 925 psig is generated in two once-through steam generators (Figure 1). This steam (Figure 2) powers the high pressure turbine, the two turbine-driven main feedwater pumps and the dual-drive auxiliary feedwater pump. The safety valves that protect the steam generators can accept full power steam flow to accommodate a reactor scram at high power. In addition, turbine bypass valves and atmospheric dump valves are provided. The main feedwater system schematic is shown in Figure 3 and the auxiliary feedwater system in Figure 4. One set of auxiliary feedwater control valves is controlled by the safety features actuation system. A parallel set is controlled by the integrated control system.

The integrated control system automatically coordinates the action of equipment to match power generated to power demand. Its functions include the control of steam header pressure, control rod positioning, feedwater flow, steam dump valve position, and steam bypass valve position. On loss of power to the integrated control system, certain valves and instrument indications go to mid-scale. In addition, operators lose control of certain equipment from the control room.

Detailed descriptions of plant systems that played principal roles in this event are found in Attachment B.

Precursor Events

Events had occurred at Rancho Seco and at similar plants that were precursors to the December 28, 1985 event. On March 20, 1978, a cooldown transient took place in Rancho Seco, caused by a loss of power to the non-nuclear instrumentation, which produced spurious input to the integrated control system. Although the power supplies for the non-nuclear instrumentation and the integrated control system are similar, corrective actions were taken only for the non-nuclear instrumentation.

A loss of integrated control system power occurred at Rancho Seco on January 5, 1975 that initiated an event very similar to that of December 26, 1985. Also in 1975, a B&W study concluded that the power supplies for the non-nuclear instrumentation and the integrated control system were vulnerable to single failures. The plant made no significant changes in equipment or procedures.

A February 26, 1980 failure of non-nuclear instrument power supplies at Crystal River initiated plant transients. As a result, many B&W plants, not including Rancho Seco, implemented a plant modification for independently closing the atmospheric dump valves. Also, Rancho Seco did not install an override control for the auxiliary feedwater system, recommended in studies on the reliability of the non-nuclear instrumentation and integrated control systems.

These precursor events and studies are described more fully in Attachment C.

IV. EVENT DESCRIPTION

Initial Plant Conditions

On December 26, 1985, the unit was operating at a steady-state power of 76 percent (710 MWe). The reactor coolant system average temperature was 582 degrees Fahrenheit and the pressure 2150 psig, both in the normal range. The integrated control system was in full automatic.

The operating crew included four senior reactor operators: the newly qualified shift supervisor, the backup shift supervisor, the shift technical advisor, and the senior control room operator. In addition, there were two reactor operators and six non-licensed operators. The senior control room operator was on a plant tour but returned to the control room within two minutes after the start of the event.

Loss of Control Power in the Integrated Control System

At 0413, the "Loss of ICS or Fan Power" annunciator alarmed. The 24-volt dc control power within the integrated control system was lost, resulting in the following:

- Most integrated control system demand signals went to mid-scale. The immediate effect was that the startup and main feedwater control valves closed to about 50 percent; the main feedwater block valves closed; and the integrated control system-controlled auxiliary feedwater control valves, the atmospheric dump valves, and the turbine bypass valves opened to mid-position.
- Main feedwater pump speeds decreased to minimum speed, resulting in their inability to feed the steam generators.
- The temperature and pressure of the reactor coolant system started to increase. The reactor scrammed on high reactor coolant system pressure about 15 seconds after the loss of integrated control system control power. At the same time, auxiliary feedwater flow initiated. Both main feedwater pumps were manually tripped as required by procedure.

Since the loss of integrated control system control power repositioned the integrated control system-controlled auxiliary feedwater flow control valves, the atmospheric dump valves, and the turbine bypass valves to partially open positions, the unit began a rapid cooldown. Equipment operators were dispatched to manually close the turbine bypass valves and integrated control system-controlled auxiliary feedwater flow control valves. (Rancho Seco does not have main steam isolation valves.)

Reactor Cooldown and Repressurization

The course of the reactor coolant system temperature and pressure during the transient is shown in Figure 5. Reactor coolant system pressure decreased due to the rapid cooldown and the safety features actuation system initiated on low reactor coolant system pressure. As a result, the safety features actuation system-controlled auxiliary feedwater control valves opened fully. The operators took manual control and closed these valves from the control room to reduce the excessive feedwater flow to the steam generators.

The indicated pressurizer water level went off-scale low due to reactor coolant system contraction. The pressurizer emptied and a steam bubble formed in the head of the reactor vessel. Steam generator pressure decreased to the point at which the condensate pumps began feeding each steam generator; this increased flow to the steam generators by an additional 1000 gpm. This condition continued until the main feedwater system was isolated automatically when main steam line pressure dropped below 435 psig. Although the reactor coolant system temperature was still decreasing, its pressure started to rise as the high pressure injection and makeup pumps raised the level in the pressurizer. Reactor coolant system conditions now violated the B&W-designated temperature/pressure limits for pressurized thermal shock of the reactor vessel (Figure 6). The technical specifications limits were not violated.

The equipment operators manually isolated the atmospheric dump valves and turbine bypass valves, but had difficulty closing the auxiliary feedwater flow control valves. An operator partially shut the "B" auxiliary feedwater valve believing it was fully closed. He then operated the "A" auxiliary feedwater valve. Since the "A" valve position indicator showed the valve to still be open, he continued to turn the valve operator with a valve wrench. However, he had not disengaged the automatic controller and applied excessive torque, causing the valve operator to fail in a manner that resulted in the valve reopening. He then tried to shut the manual isolation valve (FWS-063) downstream of the "A" control valve but was unable to move it because it was jammed by corrosion in the open position. A second operator arrived at the "B" auxiliary feedwater valve and shut the valve completely.

In the meanwhile, the level in steam generator "A" exceeded the 95 percent level. The operators did not stop the turbine-driven auxiliary feedwater pump as required by plant procedures because past experience had taught them that they would probably be unable to get the pump restarted. The motor-driven pumps were also not shut down out of concern that they might not restart when needed. The water level continued to rise, and the "A" steam generator overflowed.

While the auxiliary feedwater valves were being manually closed, operators in the control room determined that the power supply breakers for the integrated control system were tripped and restored integrated control system power by reclosing the breakers. The "A" auxiliary feedwater valve was then closed from the control room and the cooldown terminated. The reactor coolant system had cooled down 190 degrees Fahrenheit in 24 minutes.

During the event, the operators did not make use of a plant modification, installed for fire protection purposes, for remotely closing the atmospheric dump valves and the turbine by-pass valves. Use of this system could have terminated the cooldown transient sooner.

Other Problems

The makeup pump can normally take suction from the makeup tank and/or the borated water storage tank (Figure 7). When the safety features actuation system initiated during the transient, the suction valve from the makeup tank closed, and the suction valve from the borated water storage tank opened. The operators later recirculated water from the high pressure injection pumps to the makeup tank to stop the pressure increase in the primary system. As a result, the makeup tank overflowed, and the operators closed the suction from the borated water storage tank so the makeup pump would draw more water from the makeup tank. However, they failed to realize that the suction from the makeup tank had closed on safety features actuation system initiation. As a result, there was no suction to the running makeup pump; it was damaged and leaked primary system water. To isolate the pump, operators entered the flooded makeup pump room without wearing respirators or high top boots.

Post-event Technical Review

The failure of the power supply monitor caused the complete loss of dc power within the integrated control system as determined by a post-event engineering evaluation. The design of the monitor made it susceptible to resistance changes at the input. A defective factory-installed wiring connection in the integrated control system cabinet caused the high resistance. Also, the time delays associated with the automatic tripping of control power switches were only 0.1 seconds, which is significantly less than the expected 0.5 seconds. The shortened delay could have made the system more susceptible to spurious loss of control power.

V. INSTRUCTOR AIDS

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VI. FIGURES

Figure 1

Once-through Steam Generator (Schematic)

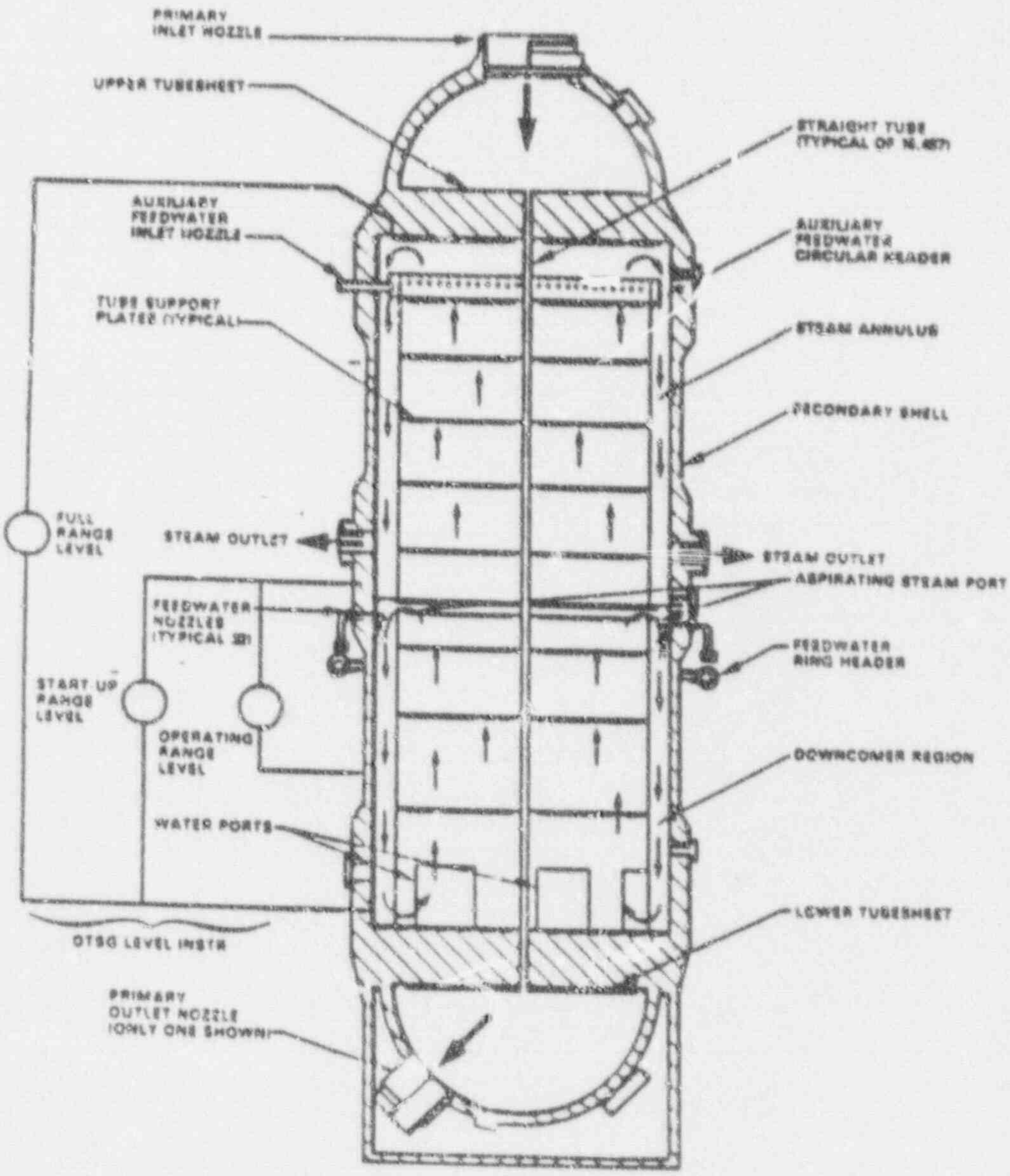

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Figure 2

Main Steam System (Schematic)

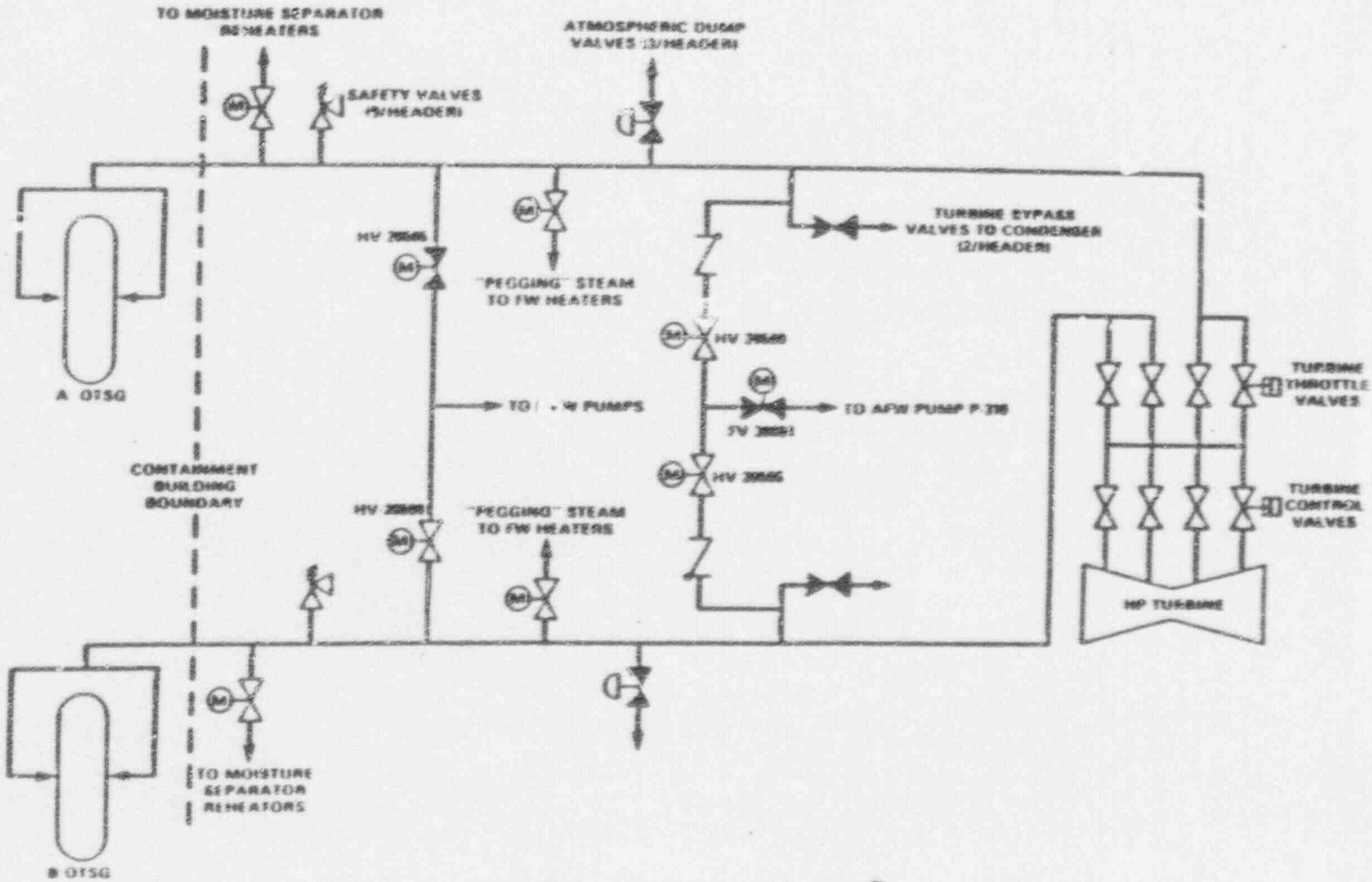

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Figure 3

Main Feedwater System (Simplified)

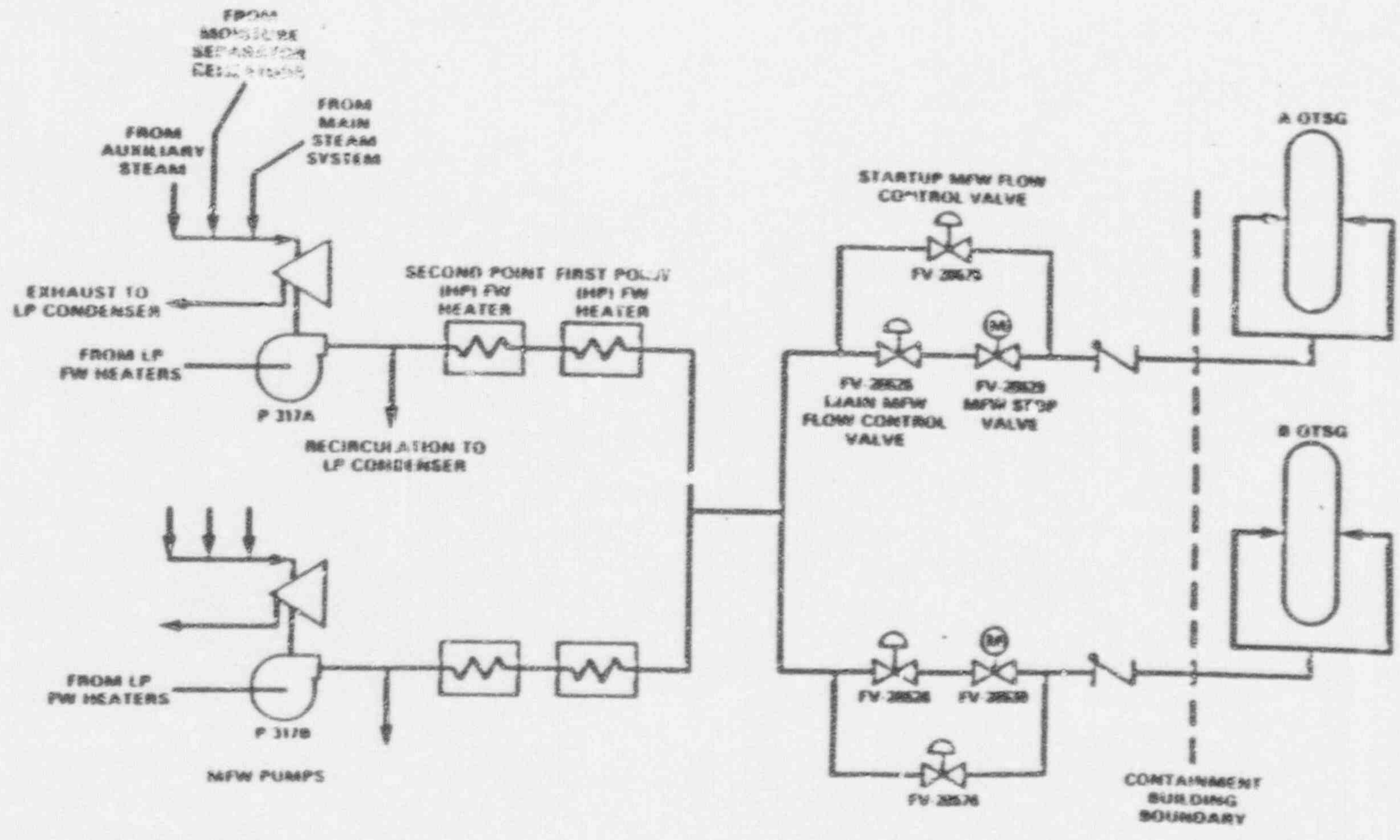

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Figure 4
Auxiliary Feedwater System (Simplified)

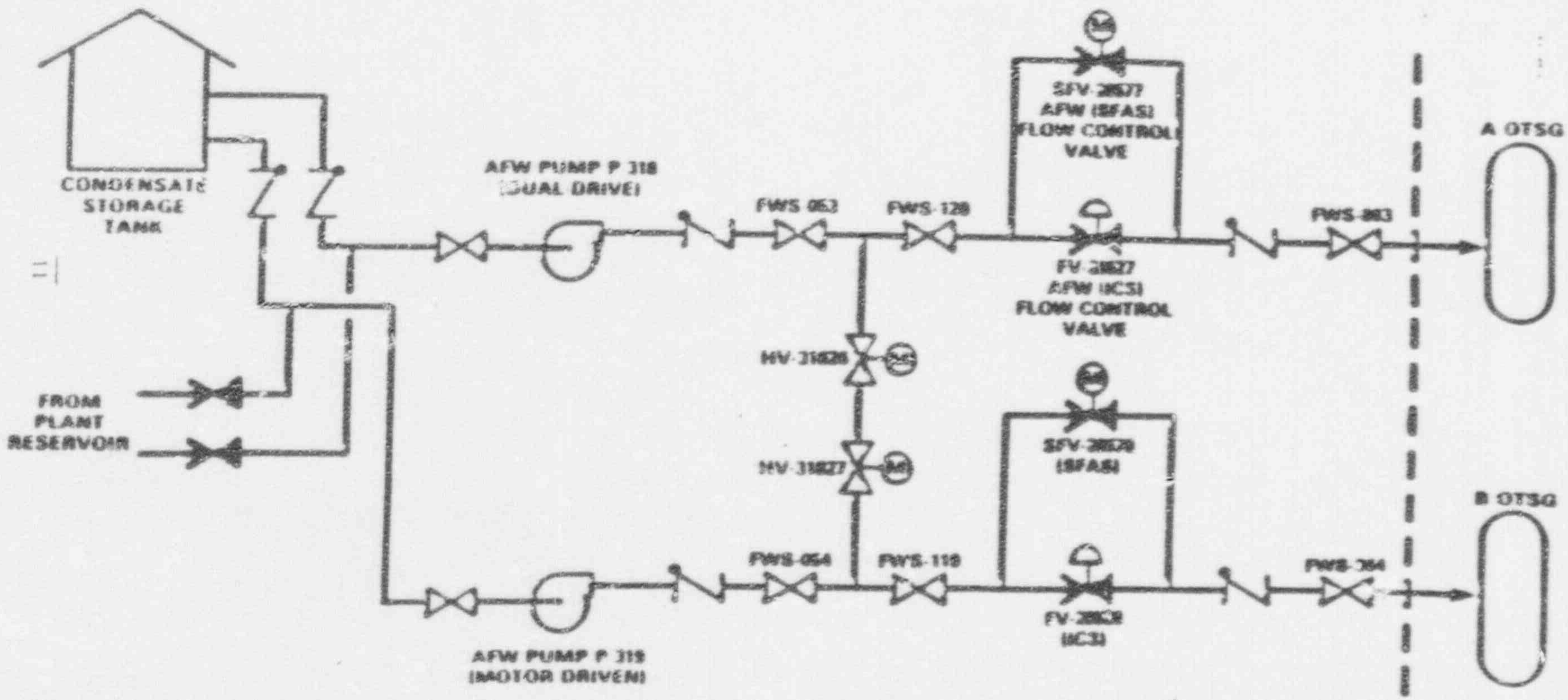

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Figure 5
RCS Temperature and Pressure During Transient

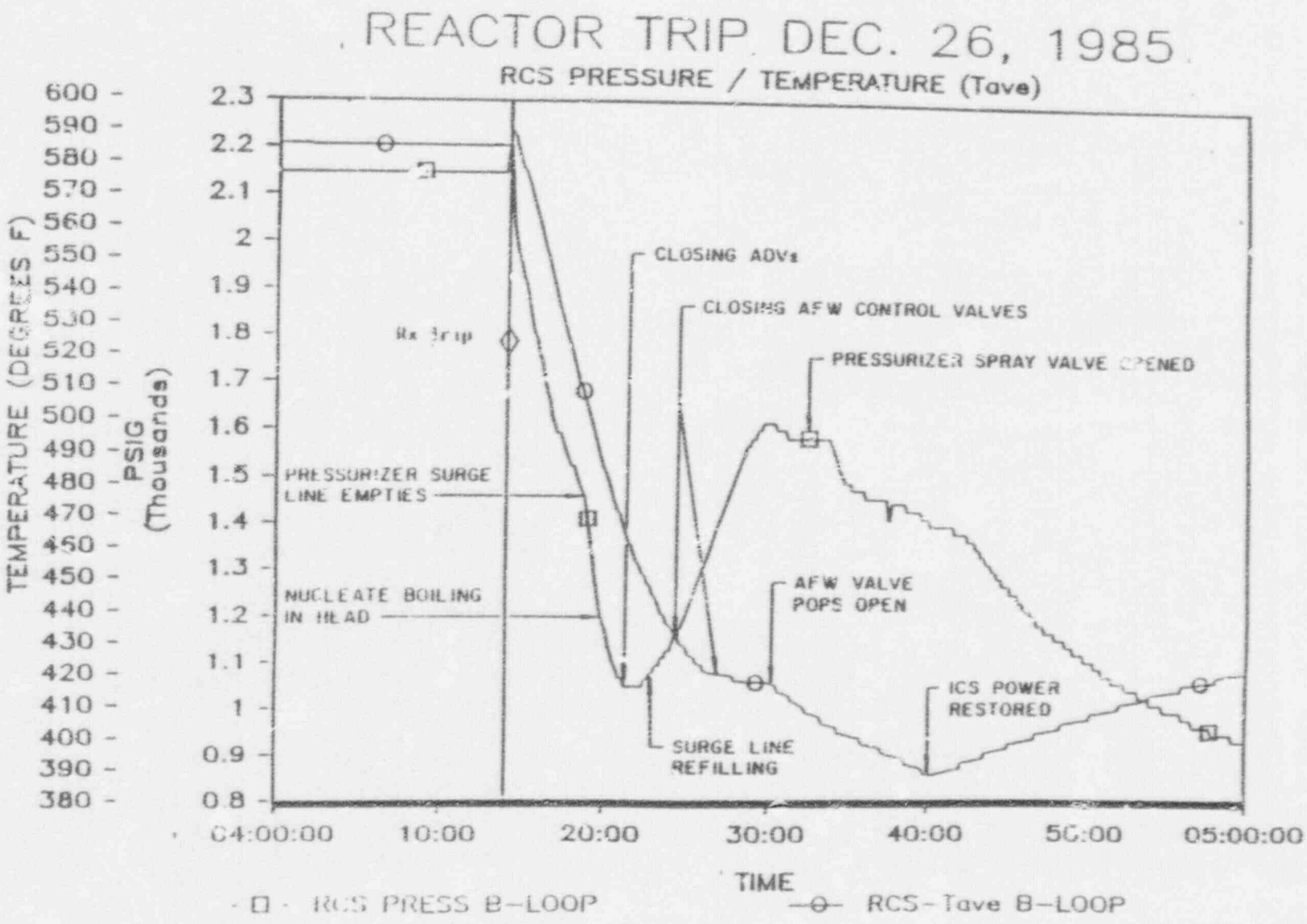

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Figure 6

Pressure-temperature Limits

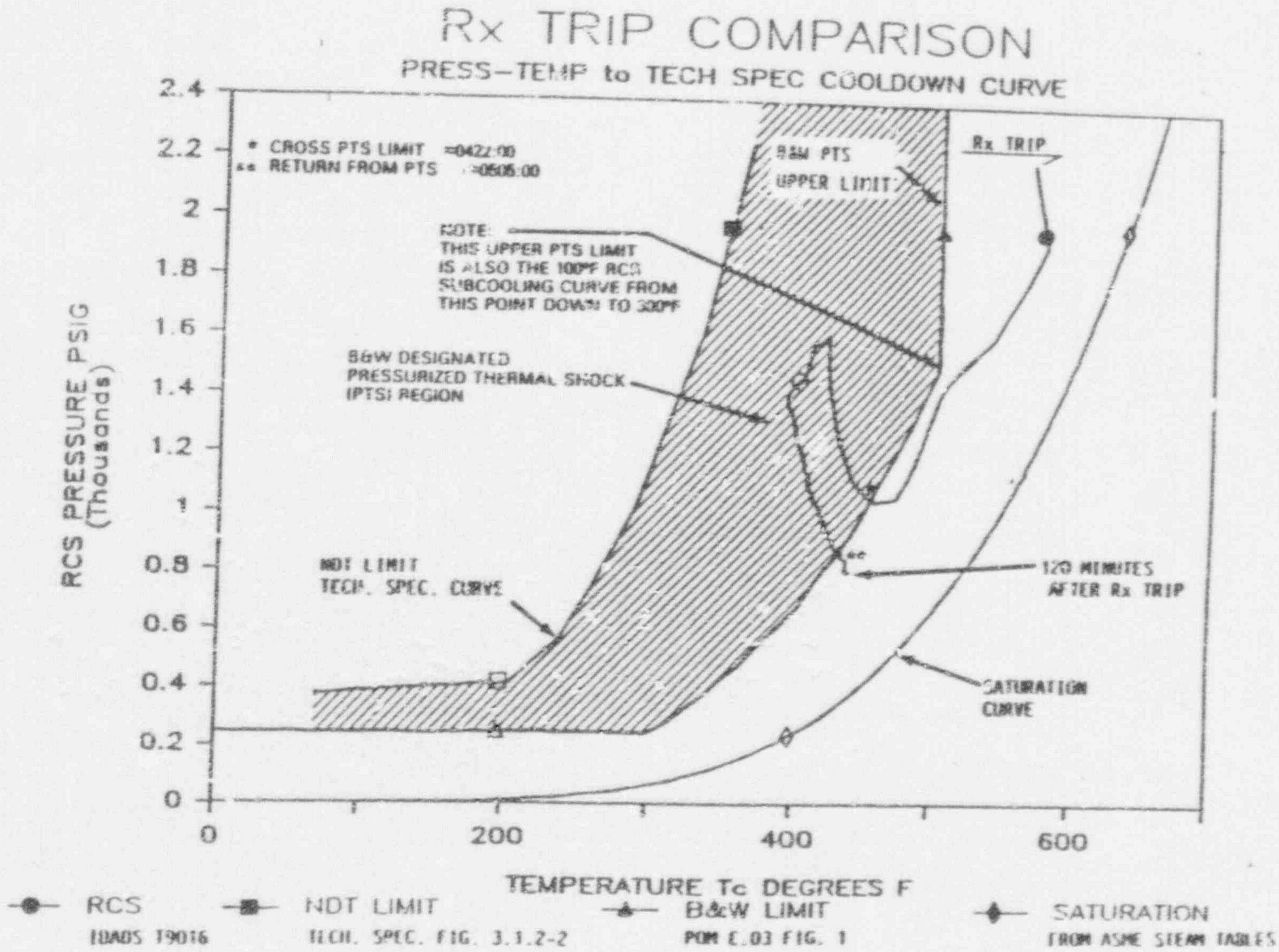

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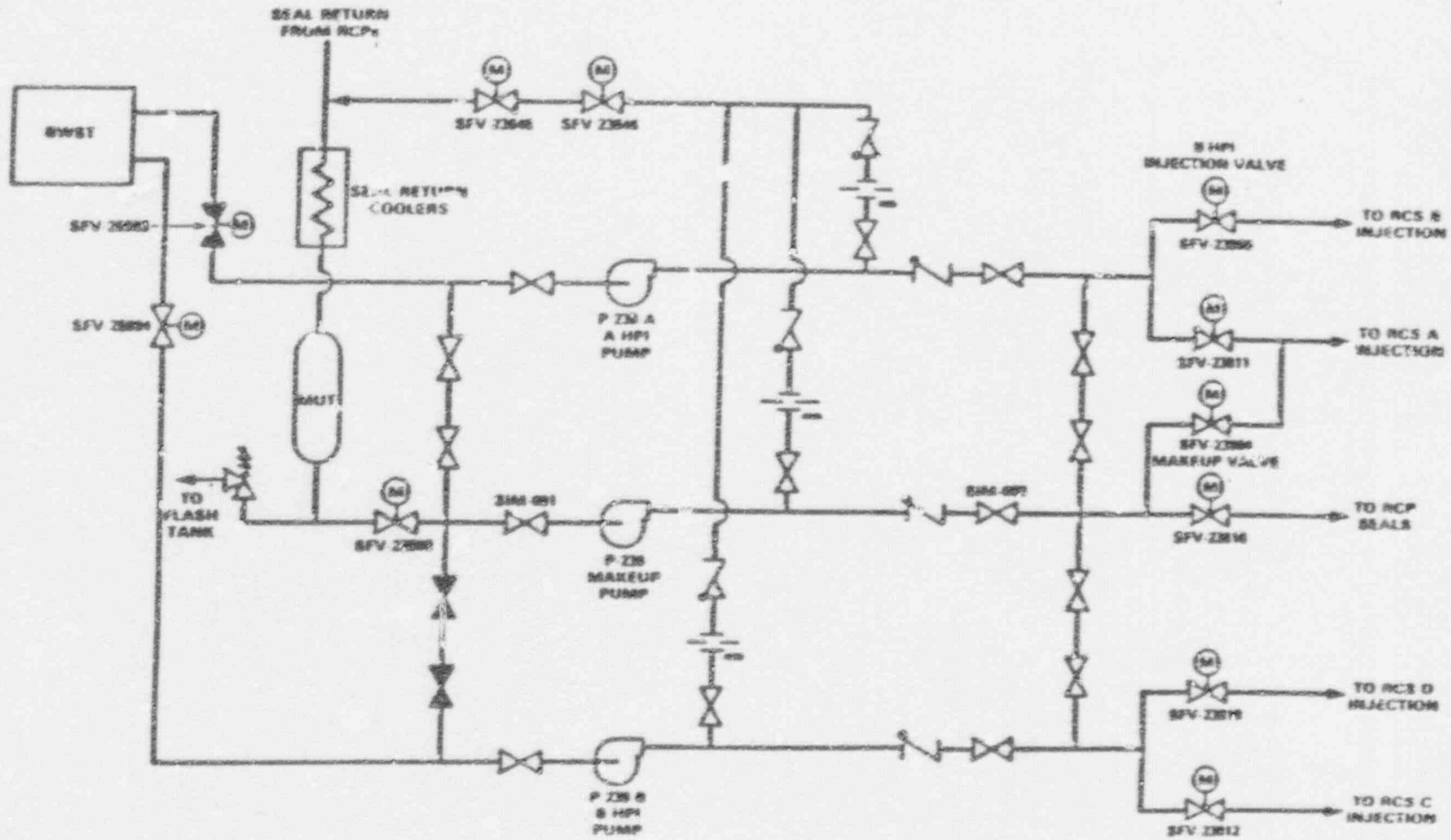
Figure 7
Makeup/High Pressure Injection System (Simplified)



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VII. ATTACHMENTS

Attachment A
Event Chronology

04:13:47 "Loss of ICS or Fan Power" annunciator alarm occurs.

Most ICS demand signals go to mid-scale. The startup and main feedwater (MFW) valves close to 50 percent. The MFW pump speed decreases to the minimum speed of approximately 2500 rpm and the main feedwater block valves close; with the plant initially at 76 percent power, this reduction in MFW flow increases RCS pressure. One of two sets of auxiliary feedwater (AFW) flow control valves, the atmospheric dump valves (ADV) and the turbine bypass valves (TBV) open to 50 percent demand.

NOTE: The plant has two parallel sets of AFW flow control valves. One set is controlled by the integrated control system (ICS) and the other by the safety features actuation system.

04:13:? Control room operators notice MFW flow decreasing rapidly and RCS pressure increasing. Operators open the pressurizer spray valve in an attempt to stop the RCS pressure increase.

04:14:01 The reduction in MFW pump speed causes a low MFW pump discharge pressure of less than 850 psig that automatically starts the motor-driven AFW pump.

04:14:03 Reactor scrams on high RCS pressure. A turbine trip is initiated by the reactor trip. A control room operator closes the pressurizer spray valve in anticipation of RCS cooldown and depressurization.

04:14:04 A peak RCS pressure of 2298 psig is reached. The steam generator code safety valves lift and subsequently reseat.

04:14:06 The AFW dual-drive, steam and electric pump, auto starts on low MFW pump discharge pressure (850 psig).

NOTE: This AFW pump is steam-driven throughout the transient.

04:14:06 Peak RCS hot leg temperature of 606.5 degrees Fahrenheit is reached.

04:14 Control room operators reduce RCS letdown flow in accordance with emergency operating procedure "Reactor Trip Immediate Actions."

04:14:11 AFW flow begins to both once-through steam generators through the ICS-controlled AFW flow control valves.

04:14:25 Operators note pressurizer level decreasing and fully open the "A" high pressure injection valve for more makeup flow.

04:14:30 Operators recognize the beginning of an overcooling transient. The loss of ICS power also results in loss of manual control of ICS-controlled valves from the control room. Non-licensed operators are sent to close eight valves at four different locations in the plant: 4 TBVs, 2 ADVs, and 2 AFW flow control valves. The ICS failure left these valves open to 50 percent demand. The AFW flow control valves are outdoors where it is cold, dark, and foggy.

04:14:48 Makeup tank level is decreasing rapidly. Operators open the borated water storage tank (BWST) discharge valve on the "A" side to provide an additional source of makeup water.

04:15:04 Operators start the "B" high pressure injection (HPI) pump to increase makeup flow to the RCS from the BWST.

04:16:02 Operators trip both MFW pumps. AFW flow is greater than 1000 gpm to each steam generator. A control room operator announces that they lost ICS power.

04:16:57 RCS pressure has decreased from 2298 to 1600 psig and pressurizer level decreased from 220 to 15 inches. The safety features actuation system (SFAS) automatically initiates. A, B, C, and D HPI injection valves open to predetermined positions. Selected SFAS equipment, including the motordriven AFW pump, automatically sheds from the vital buses, and sequence loading of SFAS equipment begins. AFW, SFAS-controlled valves travel full open. "A" and "B" low pressure injection/decay heat removal pumps auto start in the recirculation mode. Diesel generators auto start but do not close onto the vital buses since there has been no loss of power to these buses.

04:16:59 The "A" HPI pump starts on the SFAS signal; "B" pump was already operating.

04:17:10 The control room operator takes manual control of the SFAS-controlled AFW flow control valves and closes them.

4:17:27 The motor-driven AFW pump automatically sequences back onto the vital bus and restarts.

04:18:58 RCS temperature decreases below 500 degrees Fahrenheit.

04:20 Pressurizer level is off-scale low. Subcooling margin is 85 degrees Fahrenheit and increasing.

04:20+ The shift supervisor sends a computer technician to check the ICS power supply. The technician reports that all four ICS 24-VDC power supplies are de-energized.

During the next 20 minutes, the shift supervisor, senior control room operator, and STA also inspect the ICS power supplies and do not recognize that the power supply switches S1 and S2 are off.

NOTE: As the pressure decreases, the running condensate pumps begin to supply MFW to the steam generators through the idle MFW pumps. This adds approximately 1000 gpm of flow to each steam generator.

04:21:25 Minimum RCS pressure of 1064 psig is reached with the RCS temperature at 464 degrees Fahrenheit.

04:21:+ Although the cooldown continues, the combined flow capacity of the two HPI pumps and the makeup pump, along with the reactor vessel bubble, begins to refill the pressurizer although the level remains below the indicating range. RCS pressure begins to increase.

04:22 The control room operator throttles HPI injection flow. RCS pressure continues to increase but pressurizer level remains off-scale low.

04:22:50 Steam generator pressures have decreased to 435 psig. Main steam line failure logic actuates and closes the MFW valves. MFW flow from the condensate pumps is stopped.

04:23 ADV and TBV isolation valves are shut locally by the operators using handwheels.

04:23:10 Using the valve handwheel, a non-licensed operator attempts to close the "B" AFW ICS-controlled flow control valve that feeds the "B" steam generator. When he encounters resistance, the operator believes he has completely closed the valve. AFW flow to the "B" OTSG, however, has then decreased by only about 40 percent.

04:26 Using the valve handwheel, a non-licensed operator attempts to close the ICS-controlled "A" AFW flow control valve that feeds the "A" steam generator.

04:26:22 The "A" AFW valve is closed. The operator, encountering resistance and noting 1/2-inch of uncorroded valve stem visible, believes the valve is only 80 percent closed. He leaves to locate a valve wrench.

04:26:47 Pressurizer level returns on scale and is increasing. Subcooling margin is 170 degrees Fahrenheit. Operators throttle HPI injection valves to reduce the rate of increase.

04:28:00 The operators stop the "C" RCP due to core lift restrictions. The makeup tank overfills.

04:28:59 The operators stop the "A" HPI pump.

04:29:40 The non-licensed operator uses a valve wrench on the "A" AFW, ICS-controlled flow control valve. The manual portion of the valve operator is damaged, and the valve fails to the open position. The operator calls the control room and is told to close the "A" AFW manual isolation valve.

04:29:40 RCS pressure peaks a second time at 1616 psig. RCS temperature is 422 degrees Fahrenheit.

04:29:45 The control room operator closes the "C" and "D" HPI valves to reduce the repressurization while temperature is still decreasing.

04:30 The shift supervisor declares an unusual event. The senior control room operator notifies state and county agencies.

04:30:30 The control room operator initiates normal pressurizer spray to decrease RCS pressure in an attempt to return to conditions outside the pressurized thermal shock region.

04:33 Strip charts indicate that the "A" steam generator is overfilling with the overflow entering the steam lines. The operators do not note this and do not stop the AFW pumps.

04:33:20 Unaware that another operator believed he had already closed the "B" AFW control valve, a non-licensed operator arrives at the valve and closes it all the way. AFW to the "B" steam generator is stopped.

04:35 Suction from the borated water storage tank is closed with the intent that the makeup pump draw more water from the makeup tank.

04:36 A non-licensed operator attempts to close the "A" AFW manual isolation valve with a valve wrench but it will not move.

04:39 The RCS subcooling margin reaches a peak of 201 degrees Fahrenheit and begins to decline. RCS temperature is 390 degrees Fahrenheit, RCS pressure is 1430 psig. This was approximately 800 psi beyond the pressurized thermal shock guidelines.

04:40 An SRO discovers that the switches to the ICS dc power supplies are tripped to the off position. ICS power is restored by closing these switches.

NOTE: Initially the ADVs, TBVs, and AFW valves receive a demand signal to go fully open when power is restored. However, the control or isolation valves for all but the "A" AFW line have been closed. The control room operators switch to manual control and shut the valves.

All AFW flow to both steam generators ceases. The RCS begins to heat up. The lowest RCS temperature of 386 degrees Fahrenheit is reached, and RCS pressure (1413 psig) is being reduced. The plant cooled down 190 degrees Fahrenheit in 24 minutes.

04:43:54 After noticing a loss of RCP seal injection flow, an operator restarted the "B" HPI pump to re-establish RCP seal injection flow. The loss of seal flow was due to the failure of the makeup pump.

04:49 Leakage (steam) from the damaged makeup pump is released via the auxiliary building ventilation system. The auxiliary building stack radiation monitor alarms and shifts exhaust to the charcoal filters. Smoke from the damaged makeup pump causes a fire alarm that isolates the auxiliary building ventilation system, stopping the release.

04:52 The backup shift supervisor collapses in front of the control panel. He had previously assisted in closing the ADV and TBV manual isolation valves. An ambulance was summoned at 05:05.

05:00:10 An operator tripped the makeup pump after recognizing it was damaged. An operator opened the makeup tank suction valve, which allowed primary system water to spill out of the damaged makeup pump onto the pump room floor. The operator subsequently shut the suction valve. Approximately 450 gallons are spilled.

05:05 RCS pressure decreased. A 3-hour soak is initiated. (RCS pressure = 870 psig, RCS temperature = 428 degrees Fahrenheit.)

05:09 Both AFW pumps are manually stopped while the steam generator level is reduced via the drain lines to allow re-establishment of normal MFW flow with the condensate pumps.

05:27 Non-licensed operators isolate the makeup pump by entering the pump room. The room contained airborne radioactivity and 3 to 4 inches of contaminated water. The operators do not wear respirators or high-top shoe covers and become contaminated from the water on the floor.

05:40 Main steam line failure logic is "inhibited." This permits MFW flow to the steam generators.

06:06 Control room operators "bypass" SFAS.

08:41 The unusual event is terminated.

Attachment B
Reactor Systems Description

This section describes the principal plant systems involved in the December 26, 1985 incident.

A. Integrated Control System

The integrated control system (ICS) is a non-safety related system that automatically coordinates the action of plant equipment to match megawatts generated to megawatts demanded by balancing steam production and steam use. Its functions include the following:

- control steam header pressure by modulating the turbine throttle valves
- control steam production by signalling the movement of control rods to maintain constant reactor average temperature and by modulating the feedwater flow
- control main feedwater pump speed to maintain a specified pressure drop across the feedwater control valves
- control the bypass of steam around the turbine to the condenser through the turbine bypass valves, and control the dumping of steam to the atmosphere through the atmospheric dump valves

Loss of dc power within the ICS will cause the following automatic actions: turbine bypass valves and atmospheric dump valves go to the 50 percent demand position; turbine throttle valves remain "as is"; main and startup main feedwater (MFW) flow control valves go to the 50 percent demand position; speed of the MFW pumps goes to minimum, initiating auxiliary feedwater flow (AFW) on low main feedwater pressure; the recorders for main generator frequency and MFW flow, but not the flow meters, go to mid-scale positions; the MFW stop valve is closed automatically, isolating flow through the main MFW flow control valve, but not the flow through the startup MFW flow control valve; AFW (ICS) flow control valves go to the 50 percent demand position; and the reactor control rods remain "as is." The rods can be controlled manually. Also, operators in the control room lose remote control of ICS-controlled plant equipment. Plant personnel must then go to locations throughout the plant to operate ICS-controlled equipment in a local, manual mode.

An alternate system, independent of ICS power, to operate the atmospheric dump valves (ADV) and the turbine bypass valve (TBV) from outside the control room was installed as a plant modification for control of the plant in case of a fire.

B. Main Steam System (Figure 2)

Superheated steam at 925 psig is generated in each of the two once-through steam generators (Figure 1). The main steam system distributes steam to the high pressure turbine, the two turbine-driven MFW pumps, the dual-drive AFW pump, and to other miscellaneous loads. TBVs and ADVs are provided to accept excess steam from the system. The TBVs and ADVs, combined with control rod motion, are designed to accommodate up to a 50 percent step decrease in turbine load without actuating the code safety valves.

C. Main Feedwater System (Figure 3)

The MFW system consists of two turbine-driven feedwater pumps and associated piping, valves, and instrumentation necessary to provide feedwater to the once-through steam generators. Each pump is capable of supplying both steam generators with 80 percent capacity against full secondary pressure. In automatic, the ICS controls the MFW pump turbine. Upon loss of ICS dc power, MFW pump turbine speed is run back to a minimum speed at which the pumps will not pump against any significant steam generator pressure. The positions of the main MFW flow control valves and startup MFW flow control valves are normally controlled automatically by the ICS. The motor-operated MFW stop valves, located immediately downstream of the main MFW flow control valves, automatically close on loss of ICS dc power.

D. Auxiliary Feedwater System (Figure 4)

The AFW system actuates automatically on loss of both MFW pumps (at a discharge pressure of less than 850 psig), loss of all four reactor coolant pumps (RCP), or upon receipt of a safety features actuation system (SFAS) signal indicating a reactor coolant system pressure of less than 1600 psig or a reactor building pressure of greater than 4 psig. Two AFW pumps are provided. One AFW pump is motor operated and the other is equipped with both a steam turbine and an electric motor mounted on the same shaft as the pump. AFW flow can be either automatically or manually controlled using air-operated flow control valves. The position of these valves is controlled by the ICS. Handwheels are provided that enable the operator to operate the valves locally if necessary.

E. Makeup/High Pressure Injection System (Figure 7)

The makeup system is used to maintain reactor coolant system (RCS) coolant inventory and to provide cooling and lubrication to the reactor coolant pump seals. Water to the makeup pump can be supplied from either the makeup tank (MUT) or from the borated water storage tank (BWST). The MUT is the normal supply to the makeup pump through a motor-operated suction valve from the MUT and a manual pump suction isolation valve. Upon actuation of SFAS, the suction valve from the MUT closes to isolate the MUT While the supply valves from the BWST open.

Attachment C
Earlier Events

During its first year of operation, Rancho Seco underwent several transients caused by loss of power to the integrated control system. As a result of these transients, the integrated control system was modified in 1975 to provide a redundant power supply. Later related events are described below.

A. Lightbulb Event on March 20, 1978

A severe transient resulted from a loss of power to the non-nuclear instrumentation, which provides one input signal to the integrated control system. During this event, which has come to be known as "the lightbulb incident," an operator was removing a light bulb from a back-lighted push button in the control room. While handling the bulb, he dropped it into the cavity left after removing the bulb retainer. This caused a short circuit in the non-nuclear instrument power system and resulted in a mid-scale failure of signals being sent to the integrated control system. The loss of non-nuclear instruments initiated a plant transient and caused the failure of control room instrumentation usually used by operators to determine plant conditions. Although the cooldown rate of the primary system was excessive--the plant cooled down 300 degrees Fahrenheit in 80 minutes--the operators were able to stabilize the plant. During the event, the safety features actuation system actuated automatically because of low reactor coolant system pressure. After reviewing the event, the utility changed the light socket design and the size and configuration of fuses. New instrumentation independent of the non-nuclear instrument system was installed, and procedures for loss of the system were prepared.

The integrated control system power supply is similar to the non-nuclear instrument system power supply, particularly with respect to the role of the power supply monitor. However, similar changes were not made to the integrated control system power supply, and no procedures were developed or training conducted for the loss of integrated control system power.

B. Loss of Integrated Control System Incident on January 5, 1979

In this event, the loss of the integrated control system resulted in a reactor cooldown that exceeded the limits in the plant technical specifications. The loss of power resulted in the feedwater valves going to the mid-stroke position, which caused the reactor coolant system pressure to increase, causing a reactor scram. Subsequent overcooling caused reactor coolant system pressure to decrease, causing safety features actuation system actuation, which in turn caused auxiliary feedwater to initiate. Thus, the course and consequences of this event were very similar to the December 26, 1985 incident. The cooldown in the January 1979 incident was not as severe as in the lightbulb incident. No changes were made in the design of the integrated control system or in procedures for loss of integrated control system power.

C. BAW-1564 "Integrated Control System Reliability Analysis," August 1979

In response to one of the Three Mile Island action items, B&W performed a reliability analysis of the integrated control system, as reported in BAW-1564. The B&W report noted that the most prevalent malfunctions and failures associated with the integrated control system were its power supplies. Specifically, the power supply is vulnerable to single failures with significant consequences. When the report was prepared, approximately one-third of the reactor scrams at B&W-designed plants were caused by problems associated with the integrated control system.

D. Crystal River Event on February 26, 1980

In this B&W designed plant, the power supply monitor tripped the non-nuclear instrument power supplies causing instruments to fail to mid-scale. In response to the faulty instrument input, actions initiated by the integrated control system and non-nuclear instrumentation controls resulted in plant transients and activation of safety systems. Some of the B&W designed plants, not including Rancho Seco, subsequently made modifications to override closure of the atmosphere dump valves upon loss of integrated control system power.

E. NRC and Industry Studies

Other studies of the reliability of non-nuclear instrument and integrated control systems and the consequences of their failure demonstrated the need for improvements and modifications. Rancho Seco had not implemented an improvement recommended in these studies, the installation of the emergency feedwater initiation and control system. In a transient, this system would take overriding control of auxiliary feedwater to prevent both overcooling and overfilling the steam generators.

VIII. REFERENCES

INPO Significant Event Report, SER 6-86, Loss of Power to the Integrated Control System Resulting in Overcooling Transient

NUREG-1195, U.S. NRC, Loss of Integrated Control System Power and Overcooling Transient at Rancho Seco on December 26, 1985

Rancho Seco Action Plan for Performance Improvement

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

05-03-90
05-03-1-90

MAR 23 1990

A

Docket No. 50-424
License No. NPF-68

Georgia Power Company
ATTN: Mr. W. G. Hairston, III
Senior Vice President -
Nuclear Operations
P. O. Box 1295
Birmingham, AL 35201

Gentlemen:

SUBJECT: CONFIRMATION OF ACTION LETTER

On March 20, 1990, a Site Area Emergency was declared due to a loss of offsite power with a concurrent loss of onsite emergency diesel generator capability. Because of the potential significance of this incident to public health and safety, the NRC's Executive Director for Operations has formed an Incident Investigation Team (IIT) to investigate the circumstances surrounding the incident. This IIT will replace the Augmented Inspection Team (AIT) presently on site in an orderly transfer of team authority. Unit 1 was in cold shutdown at the time of the incident for refueling. Unit 2 tripped from 100 percent power.

This letter confirms the conversation on March 23, 1990, between R. P. McDonald and myself related to this incident. With regard to the matters discussed, we understand that you have agreed to cooperate with the IIT and you have taken or will promptly take the following actions necessary to support this investigation:

1. Unit 1 will not be taken critical until the Regional Administrator is satisfied that appropriate corrective action has been taken and the plant can safely return to operation.

2. Equipment involved in the incident may be quarantined by the IIT. Personnel access to areas and equipment subject to this quarantine will be minimized, consistent with plant safety.

   The licensee is responsible for quarantined equipment and can take action involving this equipment it deems necessary to: (1) achieve or maintain safe plant conditions, (2) prevent further equipment degradation, or (3) test or inspect as required by the plant's Technical Specifications.

9004050409

2

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

PHOTOGRAPHIC SCIENCES CORPORATION
770 BASKET ROAD
P.O. BOX 338
WEBSTER, NEW YORK 14580
(716) 265-1600

2

IMAGE EVALUATION TEST TARGET (MT-3)

1.0 1.1 1.25 1.4 1.6 1.8 2.0 2.2 2.5 2.8 3.2 3.6 4.0

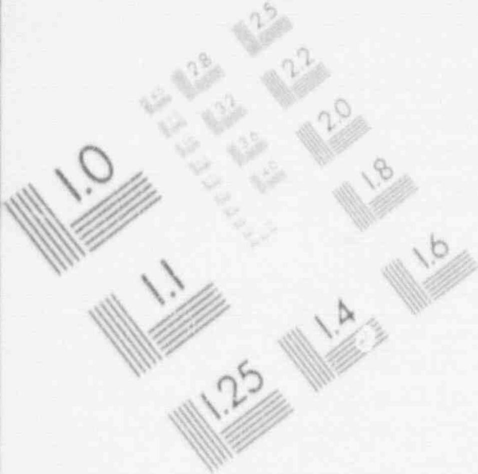
150mm

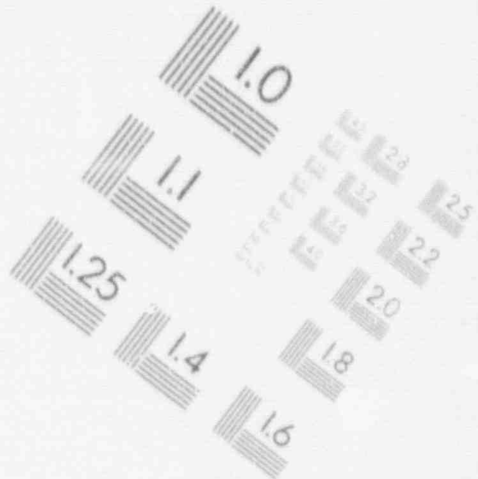
6"

PHOTOGRAPHIC SCIENCES CORPORATION
770 BASKET ROAD
P.O. BOX 338
WEBSTER, NEW YORK 14580
(716) 265-1600

2

IMAGE EVALUATION TEST TARGET (MT-3)





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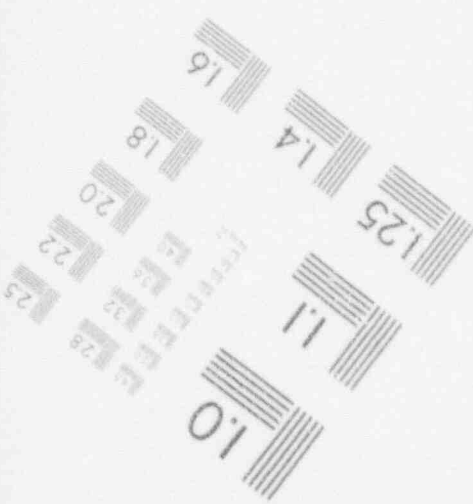
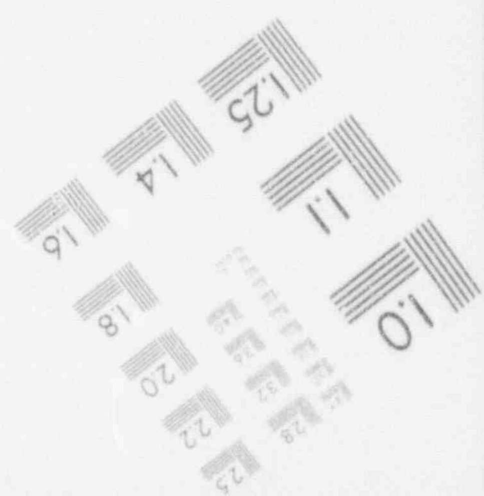
6″





PHOTOGRAPHIC SCIENCES CORPORATION
770 BASKET ROAD
P.O. BOX 338
WEBSTER, NEW YORK 14580
(716) 265-1600

To the maximum degree possible, these actions should be coordinated with the IIT team leader in advance or notification made as soon as practical. The IIT team leader may authorize a release, in whole or in part, of those areas or equipment subject to the quarantine upon a determination that the IIT has received sufficient information concerning the areas or equipment requested to be released, or to permit necessary troubleshooting of the equipment, required testing or maintenance to be performed.

3. All records or damaged equipment will be preserved intact that may be related to the event and any surrounding circumstances that could assist in understanding the event. Records shall be retained for at least two years following the event whether or not required to be retained by regulation or license condition.

4. The licensee will make available to the IIT for questioning such individuals employed by the licensee or its consultants and contractors with knowledge of the event or its causes as the IIT deems necessary for its investigation.

5. The licensee will ensure that any investigation to be conducted by the licensee or a third party will not interfere with the IIT investigation. The licensee will advise the IIT of any investigation to be conducted by the licensee or a third party. Reports of such investigation will be promptly provided to the IIT.

Issuance of this confirmatory action letter does not preclude the issuance of an order formalizing your commitments. The above commitments may be relaxed for good cause. If your understanding differs from that set forth above, please call me immediately.

Sincerely,

Stewart D. Ebneter

Stewart D. Ebneter
Regional Administrator

CAL-50-424/90-01

cc: IIT Leader
NRC Office Directors
Regional Administrators

(cc cont'd - See page 3)

cc: R. P. McDonald
Executive Vice President-Nuclear
Operations
Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

C. K. McCoy
Vice President-Nuclear
Georgia Power Company
P. O. 1295
Birmingham, AL 35201

G. Bockhold, Jr.
General Manager, Nuclear Operations
Georgia Power Company
P. O. 1600
Waynesboro, GA 30830

J. A. Bailey
Manager-Licensing
Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

Ernest L. Blake, Esquire
Shaw, Pittman, Potts and
Trowbridge
2300 N Street, NW
Washington, D. C. 20037

J. E. Joiner, Esquire
Troutman, Sanders, Lockerman, and
Ashmore
1400 Candler Building
127 Peachtree Street, NE
Atlanta, GA 30303

D. Kirkland, III, Counsel
Office of the Consumer's
Utility Council
Suite 225, 32 Peachtree Street, NE
Atlanta, GA 30302

Office of Planning and Budget
Room 615B
270 Washington Street, SW
Atlanta, GA 30334

(cc cont'd - See page 4)

Office of the County Commissioner
Burke County Commission
Waynesboro, GA 30830

J. Leonard Ledbetter, Director
Environmental Protection Division
Department of Natural Resources
205 Butler Street, SE, Suite 1252
Atlanta, GA 30334

Attorney General
Law Department
132 Judicial Building
Atlanta, GA 30334

State of Georgia

05-3-2-90

8E

March 20, 1990

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE PNO-II-90-16

Is preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region II staff on this date.

FACILITY: Georgia Power Company
Vogtle Unit 1
Docket No. 50-424, 50-425
Waynesboro, GA

Licensee Emergency Classification:
___ Notification of Unusual Event
_X_ Alert
___ Site Area Emergency
___ General Emergency
___ Not Applicable

SUBJECT: SITE AREA EMERGENCY AT VOGTLE UNIT 1 LOSS OF OFFSITE POWER

At 9:58 a.m., EST the licensee notified the NRC they were in a Site Area Emergency for Unit 1 due to a loss of offsite power with a concurrent loss of onsite emergency diesel generator capability. The loss of offsite power was caused by a truck accident onsite. Unit 1 was in cold shutdown at the time of the incident for refueling. Reactor coolant temperature peaked at 136°F and stabilized at 100°F after AC power was restored. The licensee has downgraded to an Alert at 10:15 a.m. EST based on restoration of onsite diesel power.

Unit 2 was at 100 percent power at the time, tripped normally, and was unaffected by the loss of offsite problem of Unit 1.

ion II has dispatched a team to the site headed by L. Reyes

The State of Georgia has been notified.

This information is current as of 11:20 a.m. on 3/20/90.

CONTACT: S. Ebneter - 841-5089

DISTRIBUTION:

One White Flint North	M'land Nat'l Bank Bldg	Regions	MAIL TO:	DCS (Original IE 34)
Chairman Carr	IRM	Region I		DOT (Transportation Only)
Comm. Roberts	OIG	Region II		
Comm. Rogers	AEOD	Region III	FAX TO:	INPO
Comm. Curtiss	NRC Ops Ctr	Region IV		LICENSEE (Corporate)
Comm. Remick		Region V		RII Resident
OGC				
OCA	Nicholson Lane	Phillips Bldg		
GPA/SLITP/PA	RES	ACRS		
EDO				
NRR	L Street	EWW		
NMSS	PDR	ASLAP		
OE				

. //90 @ ____ TO REGIONS AND HQ

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9004030129

05-3-3-90

March 21, 1990

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE PNO-II-90-16A

This preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region II staff on this date.

FACILITY: Georgia Power Company
Vogtle Unit 1
Docket No. 50-424
Waynesboro, GA

Licensee Emergency Classification:
____ Notification of Unusual Event
_X_ Alert
____ Site Area Emergency
____ General Emergency
____ Not Applicable

SUBJECT: SITE AREA EMERGENCY AT VOGTLE UNIT 1 LOSS OF OFFSITE POWER

At 12:47 7:30 p.m. CST, the licensee secured from the Emergency classification after both onsite and offsite power was restored. There has been extensive news media coverage of the event. Region II Regional and Resident Inspectors are onsite reviewing the event. Activities in Unit 1 are concentrated in filling the reactor coolant system.

A preliminary sequence of events has been prepared by the NRC.

NOTE: All times are presented in Central Standard Time (CST).

Initial Conditions:

Unit 2 was at full power with no significant equipment inoperabilities.

Unit 1 was shut down for refueling, in Mode 6. Fuel had been reloaded with approximately 1/3 of the core being new, unirradiated fuel. The reactor had been shut down for approximately 30 days; therefore, decay heat was not significant. The reactor head was in place and torquing was in process. Reactor Coolant Inventory was at Mid-Loop conditions. Shutdown Cooling was in effect. The "B" Reserve Auxiliary Transformer (RAT) was inoperable due to maintenance (oil change). The "B" Diesel Generator was also inoperable due to regularly scheduled maintenance.

TIME	ACTIVITY
0820	Lubricant truck in the Unit 1 switchyard hits supporting tower for the 230 KV feeder to the Unit 1 "A" RAT. The insulator fell off of the tower and the "C" Phase connection was broken. This established a fault to ground. Abreaker in the 230 KV switchyard opened, effectively isolating power to the Unit 1 "A" RAT and the Unit 2 "B" RAT.
	Turbine trip - Reactor trip on Unit 2 due to a protective relay actuating as a result of the switchyard transient.
0821	Unit 1 Diesel Generator "A" starts and then trips for unknown reason, and manually started.
	Main Steam Line Isolation manually initiated - Unit 2.
0840	Site Area Emergency declared - Unit 1.
0856	Headquarters Duty Officer notified of the event. Region tied into the notification.

9004040285

05-3-4-90

March 22, 1990

MINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE PNO-II-90-16B

1. preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region II staff on this date.

FACILITY: Georgia Power Company
Vogtle Unit 1
Docket No. 50-424
Waynesboro, GA

Licensee Emergency Classification:
____ Notification of Unusual Event
____ Alert
____ Site Area Emergency
____ General Emergency
__X__ Not Applicable

SUBJECT: AUGMENTED INSPECTION TEAM IS DISPATCHED TO VOGTLE UNIT 1

An Augmented Inspection Team is at the Vogtle site to review the event of March 20, 1990, which resulted in a Site Area Emergency when Unit 1 lost its offsite and onsite AC power. The team is composed of members representing AEOD, NRR, and Region II. Extensive media coverage continues.

Unit 2 is operating at 25 percent power after recovering from a reactor trip on March 20, 1990.

State of Georgia has been notified.

information is current as of 10:00 a.m. on 3/22/90.

CONTACT: S. Ebneter - 841-5089

DISTRIBUTION:

One White Flint North	M'land Nat'l Bank Bldg	Regions	MAIL TO:	DCS (Original IE 34)
Chairman Carr	IRM	Region I		DOT (Transportation Only)
Comm. Roberts	OIG	Region II		
Comm. Rogers	AEOD	Region III	FAX TO:	INPO
Comm. Curtiss	NRC Ops Ctr	Region IV		LICENSEE (Corporate)
Comm. Remick		Region V		RII Resident
OGC				
OCA	Nicholson Lane	Phillips Bldg		
GPA/SLITP/PA	RES	ACRS		
EDO				
NRR	L Street	EWW		
NMSS	PDR	ASLAP		
OE				

O: 03/22/90 @ 12:30 P.M. TO REGIONS AND HQ
****

9004050221

05-3-5-90

OWER REACTOR

EVENT NUMBER: 18024

.CILITY: VOGTLE
UNIT: [1] [ ] [ ]
RX TYPE: [1] W-4-LP,[2] W-4-LP
REGION: 2
STATE: GA

NRC NOTIFIED BY: GASSER
HQ OPS OFFICER: JOHN MACKINNON

NOTIFICATION DATE: 03/20/90
NOTIFICATION TIME: 09:58 [ET]
EVENT DATE: 03/20/90
EVENT TIME: 08:40[CST]
LAST UPDATE DATE: 03/20/90

EMERGENCY CLASS: SITE AREA EMERGENCY
10 CFR SECTION:
AAEC 50.72(a)(1)(i) EMERGENCY DECLARED

NOTIFICATIONS

UNIT	SCRAM CODE	RX CRIT	INIT PWR	INIT RX MODE	CURR PWR	CURR RX MODE
1	N	N	0		0	

EVENT TEXT

.TIAL PLANT STATUS BEFORE THE LOSS OF OFFSITE POWER. THE "B" RESERVE XILIARY TRANSFORMER(RAT) WAS TAGGED OUT FOR MAINTENANCE, "B" EDG TAGGED OUT AND TORN APART FOR MAINTENANCE, "A" RAT WAS SUPPLYING POWER TO UNIT 1, REACTOR COOLANT SYSTEM TEMPERATURE WAS BEING MAINTAINED BY RHR COOLING, AND THE REACTOR VESSEL HEAD IS ON BUT IT IS NOT FULLY TENSIONED.
A TRUCK TOPPLED A TOWER OVER IN THE VOGEL SWITCHYARD WHICH CAUSED THE UNIT 1 "A" RAT TO DEENERGIZE. THIS SENT A LOSS OF OFFSITE POWER SIGNAL TO UNIT 1 "A" EDG. THE "A" EDG STARTED THEN TRIPPED FOR UNKNOWN REASONS. AT 0841CST THEY STARTED "A" EDG USING A NORMAL START SIGNAL. THE "A" EDG TRIPPED ON LOW JACKET WATER PRESSURE TO THE EDG. AT 0856CST LICENSEE LOCALLY EMERGENCY STARTED THE EDG. THIS BYPASSED THE FLOW JACKET WATER PRESSURE SIGNAL. CURRENTLY "A" EDG IS OPERATING PROPERLY AND IS SUPPLYING POWER TO THE "A" TRAIN BUSES. DURING 36 MINUTES THAT THEY LOST OFFSITE POWER REACTOR COOLANT TEMPERATURE INCREASED FROM 90F TO 136F. THIS MEANS THEY HAD A HEAT UP RATE OF 1.3 F/min. WHEN "A" TRAIN BUSES WERE ENERGIZED FROM THE "A" EDG THEY RESTARTED "A" TRAIN RHR PUMP AND COOLED RCS DOWN TO 107F(STABLE TEMPERATURE NOW). EVENT WAS DOWNGRADED TO ALERT AT AT 0915CST WHEN POWER WAS RESTORED VIA THE "A" EDG. LICENSEE IS CLEARING THE TAGOUT ON THE "B" RAT. AT 1129 EST "B" RAT WAS REENERGIZED. UNIT 2 WAS AT 100% POWER WHEN VOLTAGE TRANSIENT UNIT 1 CAUSED A LOSS OF THE UNIT 2 "B" RAT. THIS CAUSED A REACTOR TRIP FROM 100% POWER. ALL RODS FULLY INSERTED FULLY INTO THE CORE AND THE PLANT IS IN A STABLE HOT SHUTDOWN CONDITION. THE UNIT 2 "B' EDG STARTED AND IS SUPPLYING POWER TO THE "B" TRAIN POWER SUPPLIES AND THE "A" RAT IS STILL SUPPLYING POWER TO UNIT 2 "A" TRAIN.

05-3-6-90

D R A F T

NRC STAFF DISPATCHES AUGMENTED INSPECTION TEAM TO VOGTLE NUCLEAR POWER PLANT

The Nuclear Regulatory Commission staff has dispatched a special Augmented Inspection Team (AIT) to Georgia Power Company's Vogtle nuclear power plant near Augusta, Georgia, where a Site Area Emergency was declared for a period of time on Tuesday, March 20, 1990, after a truck backed into a power pole, knocking out offsite power to the plant's Unit 1 reactor.

NRC officials said the team, composed of inspectors from the agency's headquarters in Washington, D.C., and Region II office in Atlanta, would arrive at the plant on Thursday, March 22. They said the AIT would conduct an independent evaluation of the sequence of events during the incident and the company's response. The special AIT inspection will be conducted in addition to inspections by NRC resident inspectors at the facility and those done by inspectors from the regional office who responded to the event when it occurred.

The AIT will prepare a report of its findings, and copies will be made available to the public as soon as the report is complete and ready for release.

#

05-3-7-90

Meeting Attendance Record

Georgia Power

Meeting Purpose	File
NRC Entrance	

Date	Conducted By
March 22, 1990	Ken Brockman

Name (Print)	Title (Print)	Phone ~~Employee~~ Number	Department/Company
GARMON WEST, JR.	PSYCHOLOGIST ENGINEERING	4249	NRC
Rick Kendall	Sr. Elec. Engr.	4249	NRC
Bill Jones	Sr Exsys Engr	4249	NRC
GENE TRAGER	NUCLEAR ENGINEER	4249	NRC
Herb Beacher	Sr. Plant Engr.	3769/138	Tech. Support / GPC
Skip kitchens	Asst. GM - Ops	3140	Mgt / GPC
GEORGE FREDERICK	SUPR - SAER	X3228	GPC
Allen L. Mosbaugh	Asst GM Pt. Support	3143	GPC
GLENN A. McCARLEY	ISEG SUPVR	3239	GPC
CHARLES L. COURSEY	SUPT. MAINT	3468	GPC
MIKE LACKEY	O&P MGR	4209	O&P/GPC
Jimmy Cash	OPS Supt.	3330	OPS/GPC
E.M. DANNEMILLER II	NUC SECURITY MANAGER	3637	SECURITY / GPC
G BOCKHOLD	GM	3118	GPC
LEIGH TROCINE	PROJECT ENGINEER	4249	NRC, REGION II
KEN BROCKMAN	CHIEF, REACTOR PROJECTS SECTION 3B	4249	NRC, REGION II
WARREN C LYON	SR. REACTOR ENG		NRC/NRR/SRXB
ELDAN D. TESTA	SR. Rad Spec		NRC RII EPS
R.D. STARKEY	RESIDENT INSPECTOR	4249	NRC
R.F. AIELLO	SRI	4249	NRC
C.C. Eckert	M.I.T.	X3360	GPC
Indira Kochery	HP Supt	3229	GPC
T.N. Roberts	Emergency Preparedness Coordinator	3916	GPC
KR Holmes	Mgr Training & EP	3901	GPC
J.G. Aufdenkampe	Mgr Technical Support	3600	Tech Support/GPC
J.E. SWARTZWELDER	OPS. MGR.	3618	OPS/GPC

Meeting Attendance Record Georgia Power

Meeting Purpose	File
NRC Entrance Meeting	

Date	Conducted By
3-22-90	Ken Brockman

Name (Print)	Title (Print)	~~Employee~~ Phone Number	Department/Company
ERNIE TOUPIN	SITE REP	3402	OPC
FRAY THOMPSON	ENGINEERING GROUP SUPERVISOR - SCS - B'HAM	205-877-7069	SCS - VOGTLE SUPPORT ELECTRICAL
Robert Moye	PLT ENGR SUPV	64637	GPC / ENGR
R. LEE MANSFIELD	PLT ENGR SUPV	3110	ENGR SUP / GPC
P. BURWINKEL	PLT ENG SUPV	X-3389	ENG SUPPORT / GPC
Tom Webb	Sr. Plant Engineer	3105	Tech Support / GPC
J.F. D'AMICO	OUTAGE SCHED SUPV	3139	OUTAGES & PLANNING / GPC
PAUL M. KOCHERY	ENGG SUPVR	3132	Engg Support

05-3-8-90

U.S. NUCLEAR REGULATORY COMMISSION
STATUS SUMMARY

****** R E A L   E V E N T ******

SUMMARY NUMBER 1   DATE 20-Mar-90   SITE TIME 10:56 EDT   HQ TIME 10:4

EVENT CLASSIFICATION: ALERT   as of 20-Mar-90 at 10:15 EDT
NRC RESPONSE MODE: STANDBY   as of 20-Mar-90 at 11:05 EDT
SUMMARY APPROVED BY BASE TEAM MANAGER: S. Ebneter

STATUS:

This is an event at the Vogtle Nuclear Plant operated by Georgia Power Company. The Vogtle plant is located on the Savannah River near Augusta, GA

At 9:58 a.m. EST the licensee notified the NRC they were in a Site Area Emergency for Unit 1 due to a loss of offsite power with a concurrent loss of onsite emergency diesel generator capability. The loss of offsite power was caused by a truck accident onsite. Unit 1 was in cold shutdown at the time of the incident for refueling with a stable reactor coolant temperature of 100 degrees F. Unit 2 was at 100% power at the time and has now tripped. The licensee has downgraded to an Alert at 10:15 a.m. EST based on restorati of onsite emergency diesel power.

Region II has dispatched a team to the site.

The State of Georgia has been notified.

---------------------------- End of Status Summary Text ----------------------------

05-3-9-90

U.S. NUCLEAR REGULATORY COMMISSION
STATUS SUMMARY

****** R E A L   E V E N T ******

SUMMARY NUMBER 2   DATE 20-Mar-90   SITE TIME 12:30 EST   HQ TIME 12:30 ES

EVENT CLASSIFICATION: ALERT   as of 20-Mar-90 at 10:15 EST
NRC RESPONSE MODE: STANDBY   as of 20-Mar-90 at 11:05 EST
SUMMARY APPROVED BY BASE TEAM MANAGER: S. Ebneter

STATUS:

This is an emergency event at the Vogtle Nuclear Plant operated by Georgia Power Company. The Vogtle plant is located on the Savannah River near Augusta, GA.

At 9:58 a.m. EST the licensee notified the NRC they were in a Site Area Emergency for Unit 1 due to a loss of offsite power with a concurrent loss of onsite emergency diesel generator capability. The loss of offsite power was caused by a truck accident onsite. Unit 1 was in cold shutdown at the time of the incident for refueling. Unit 1 reactor coolant temperature peaked at 136 degrees F and stabilized at 100 degrees F after AC power was restored. The licensee has downgraded to an Alert at 10:15 a.m. EST based on restoration of onsite emergency diesel power.

Unit 2 tripped from 100% power at the time of the truck accident, but Unit 2 did not lose offsite power.

At ..:29 a.m. EST the offsite B transformer was re-energized with efforts continuing to restore power to buses.

The licensee has confirmed that no radioactive release has occurred and none is anticipated at this time. No protective action recommendations for the public are necesary at this time.

Region II has dispatched a team to the site headed by L. Reyes.

The States of Georgia and South Carolina have been notified. DOE, FEMA and EPA have also been notifed. Region II will participate with Georgia Power Company in news briefings in Atlanta and at the site later today.

------------------------- End of Status Summary Text -------------------------

The Augusta Chronicle

[illegible]nesday, March 21, 1990 The South's Oldest Newspaper - Est. 1785

Alert declared at Vogtle after truck hits tower

By John Winters
Staff Writer

Vogtle Nuclear Power Plant's Unit 1 suffered a power loss early Tuesday, automatic notification systems failed to work and backup power equipment took more than 30 minutes to get started.

There was no release of radiation and no threat to plant employees or surrounding residents, according to Georgia Power Co. officials, although the first site emergency in the plant's history was called. A site emergency is the second-most serious of four nuclear incident levels.

The site emergency was called at 9:40 a.m., about 15 minutes after a construction subcontractor's truck backed into a transmission support tower, knocking out power to Unit 1, said Ken McCoy, vice president of the Nuclear-Vogtle Project for Georgia Power. The plant is near Waynesboro.

Unit 1 was in the middle of a refueling cycle and was not operating. Unit 2, which was operating at 100 percent power, automatically shut down after sensors detected the electric power problem in Unit 1.

Unit 2 currently is in a "stable" condition. Mr. McCoy said the reactor could be restarted by today.

Some state and county officials were not notified of the problem for an hour because the automatic

Please see NOTIFYING on 5A

Chain of events

- About 9:20 a.m. — A construction subcontractor's truck backs into a transmission support tower, knocking out power to Unit 1.
- 9:40 a.m. — A site emergency — the second-highest nuclear incident level — is called after on- and off-site power to the reactor is off more than 15 minutes.
- 10:15 a.m. — The site emergency is downgraded to an alert — the second-lowest of four nuclear incident levels — after emergency power is restored to the reactor.
- 1:47 p.m. — The alert is canceled.

05-3-10-90

The Augusta Chronicle

Notifying concerns officials

Continued from 1A

phone systems didn't work and each agency had to be notified one at a time. The system is supposed to simultaneously send notifications and information about mishaps to the agencies. When it failed, a worker had to phone each agency and read the information over the telephone.

"The notification didn't work properly," Mr. McCoy said. "It took longer than necessary. . . . That is an area we are going to have to strengthen. . . . For some reason, the (automatic system) didn't work."

Mr. McCoy also said that only one person was making the notification calls and that the company was looking into why more personnel weren't used.

Ken Clark, a spokesman for the Nuclear Regulatory Commission, which oversees commercial nuclear plants, said, "We have been satisfied with what Georgia Power has done" in handling the incident.

But Mr. Clark said his agency was reviewing the situation to determine whether anything needs to be changed. NRC officials were noncommittal about whether fines or specific changes would be required until their investigation is completed.

Another problem occurred because backup power systems failed to kick in promptly.

Unit 1 has four redundant power sources – two transformers and two diesel generators.

Because Unit 1 was being refueled, one transformer was out of service to replace oil, and one diesel generator also was down for an overhaul. Procedures allow those systems to be shut down during a reactor refueling.

But after the truck knocked out the second transformer, the second diesel generator failed to start promptly. An operator finally got e second generator started, but it took 36 minutes.

During that 36-minute period, the water temperature in the reactor increased from about 100 degrees to 118 degrees, Mr. McCoy said.

It would have taken about 24 hours before the water boiled enough to begin melting fuel rods in the reactor core. But officials said manual valves could have been opened to allow water to flow by gravity to the reactor core, keeping the fuel rods cool enough for several days or even weeks.

"I'd like to commend the employees for their prompt manner of action," said A.W. Dahlberg, president and chief executive officer for Georgia Power. "We annually have practice drills . . . they are good training sessions, and they worked."

Earl Porterfield, director of the Burke County Emergency Management Agency, was notified at 10:16 a.m., 36 minutes after the site emergency was declared.

"We didn't see any need to evacuate anyone," Mr. Porterfield said. "We were talking freely with people at Georgia Power and there was no indication of any need (to evacuate residents).

"Mostly we've been dealing with rumors," he added.

A site emergency is called when on- and off-site reactor power is lost for more than 15 minutes.

The site emergency was reduced to an alert – the second-least serious nuclear incident level – at 10:15 a.m. The alert was canceled at 1:47 p.m.

Mr. McCoy said Unit 1 is scheduled to restart April 9, adding that he didn't see any problem with meeting that schedule despite Tuesday's accident.

★★ Wednesday, March 21, 1990/ 5A

The Augusta Chronicle

05-3-11-90

Wednesday, March 21, 1990

Outage at Vogtle means moment of fear for some

By John Winters
Staff Writer

Avner DeLaigle was getting ready for work Tuesday morning when one of his daughters called him and said there was a problem at Vogtle Nuclear Power Plant.

It ended up being a busy day for Mr. DeLaigle, who operates A&A Minit Mart and Restaurant, approximately a mile from Plant Vogtle's main gate.

The restaurant served about twice its normal 100 customers as plant personnel came over to eat. Without power, the plant's cafeteria wasn't serving.

"We ran out of the food we had cooked for the buffet and ended up serving hamburgers and steaks," he said.

The noon rush was the big excitement of the day for Mr. DeLaigle – bigger than the power outage and site emergency.

"It really didn't bother me at all," Mr. DeLaigle said. "I've been here since Day 1 and I've watched Georgia Power train its people. I felt they had it under control."

Please see OUTAGE on 4A

Outage reports draw criticism

Continued from 1A

But for some, there were a few scary moments early on.

In Waynesboro, Judy Ivey was at work as store manager of the Golden Pantry when a customer came in about noon and asked if she had heard the news.

"I didn't know what had happened," said Ms. Ivey, who immediately turned on the radio. "I thought we might be blown to bits at first. Those things kind of scare you because people always seem to blow it out of proportion."

About the time Ms. Ivey was talking with the customer, her sister-in-law, Sandra Ivey, came in with the news.

Sandra Ivey heard about the outage 1 – caused when a truck backed into a tower – on her car radio.

"I just caught the tail-end of it. I heard the word 'evacuate' and turned the radio up.

"I remember thinking, 'Oh Lord, it's our time to go,' " she added. "But then I heard there wasn't any radiation leak and everybody was relieved."

At Johnson's Beauty and Barber Shop in downtown Waynesboro, Amy Kutrufis said she heard about it on her car radio as she drove toward Augusta from St. Simons, Ga.

"I heard there was some sort of crisis, but I wasn't too worried," she said. "If it had been something dangerous, the police would have been out to stop us."

Over at Taylor's Drugs, people at the lunch counter talked mostly about misinformation that originally circulated – first they'd heard the plant was evacuated, then that it wasn't.

"I was real busy. I really didn't bother with it," said Catherine Pate. "If something happens, it's going to get you . . . But it is scary when you stop and think about it.

"Mainly, we just tried to figure out what was really going on," she added. "We just listened to the radio."

05-B-12-90

Questions & Responses

What caused the 1st 1A EDG trip?

Presently the cause of the trip is unknown. It is suspected the jacket water pressure switch caused both trips but this has not been determined. The investigation is continuing. A special test is being developed to duplicate the event and identify the cause of the trip.

What was the RWST lvl at the time of the SAE?

Approximately 78%

Which Accum iso valves were open/worked on?

At the time of the event only 1HV-8808D was being worked on.

What (related) CVCS check valves were open for maint?

1-1208-U4-036 (Normal charging check valve) was open

*** 1-1201-U4-007 and 1-1201-U6-144 (RTD bypass manifold isolation valves) were being worked but the valves had not been breached at the time of the event ***

What man/auto valves must be operated to gravity feed from RWST?

There are several gravity feed paths, but with respect to this event the valves that would have to be open to gravity feed through RHR are 1HV-8812A or 1HV-8812B.

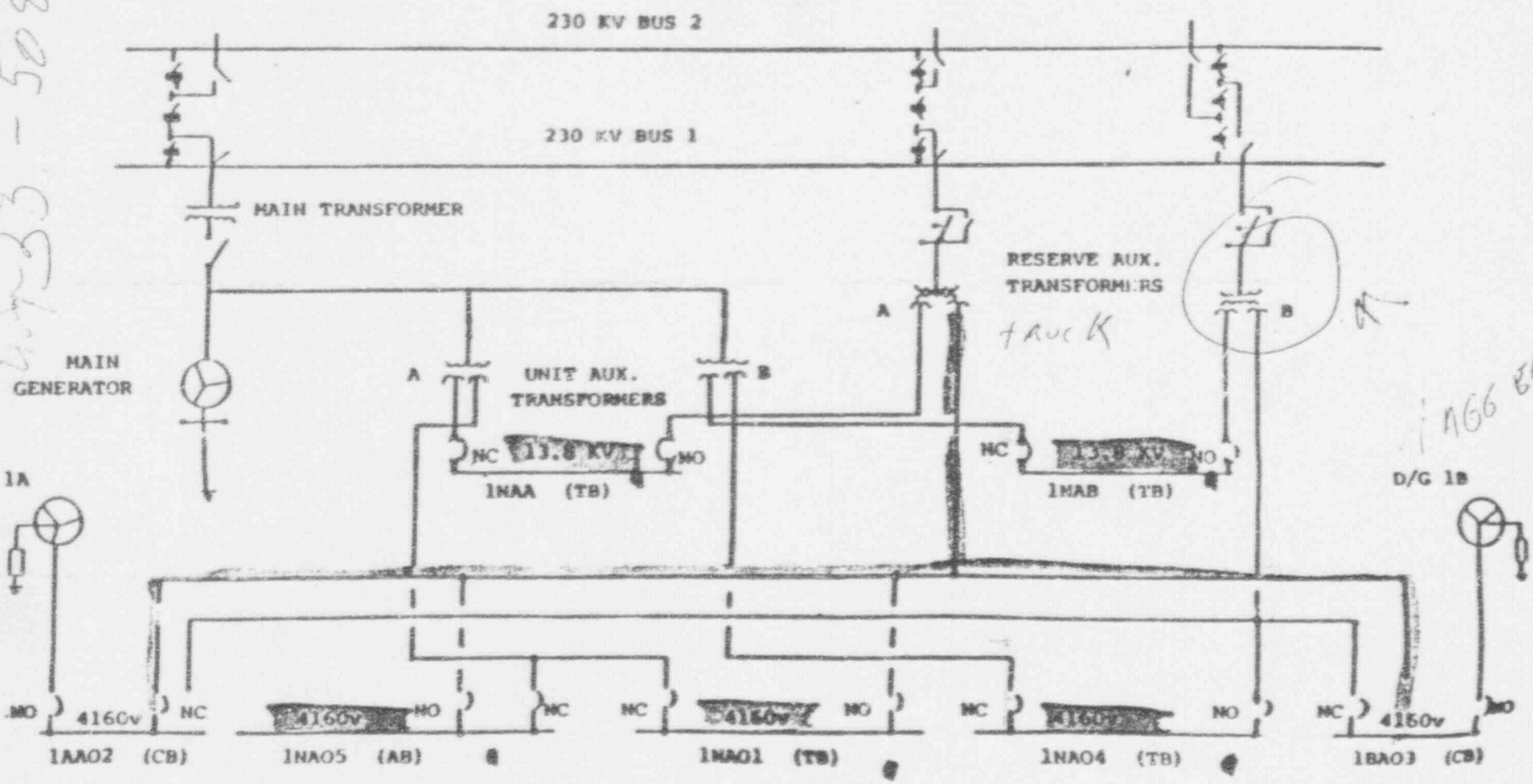

FIGURE 16A-3
ONSITE AC

Electrical Distribution Schematic Charts

05-3-13-90

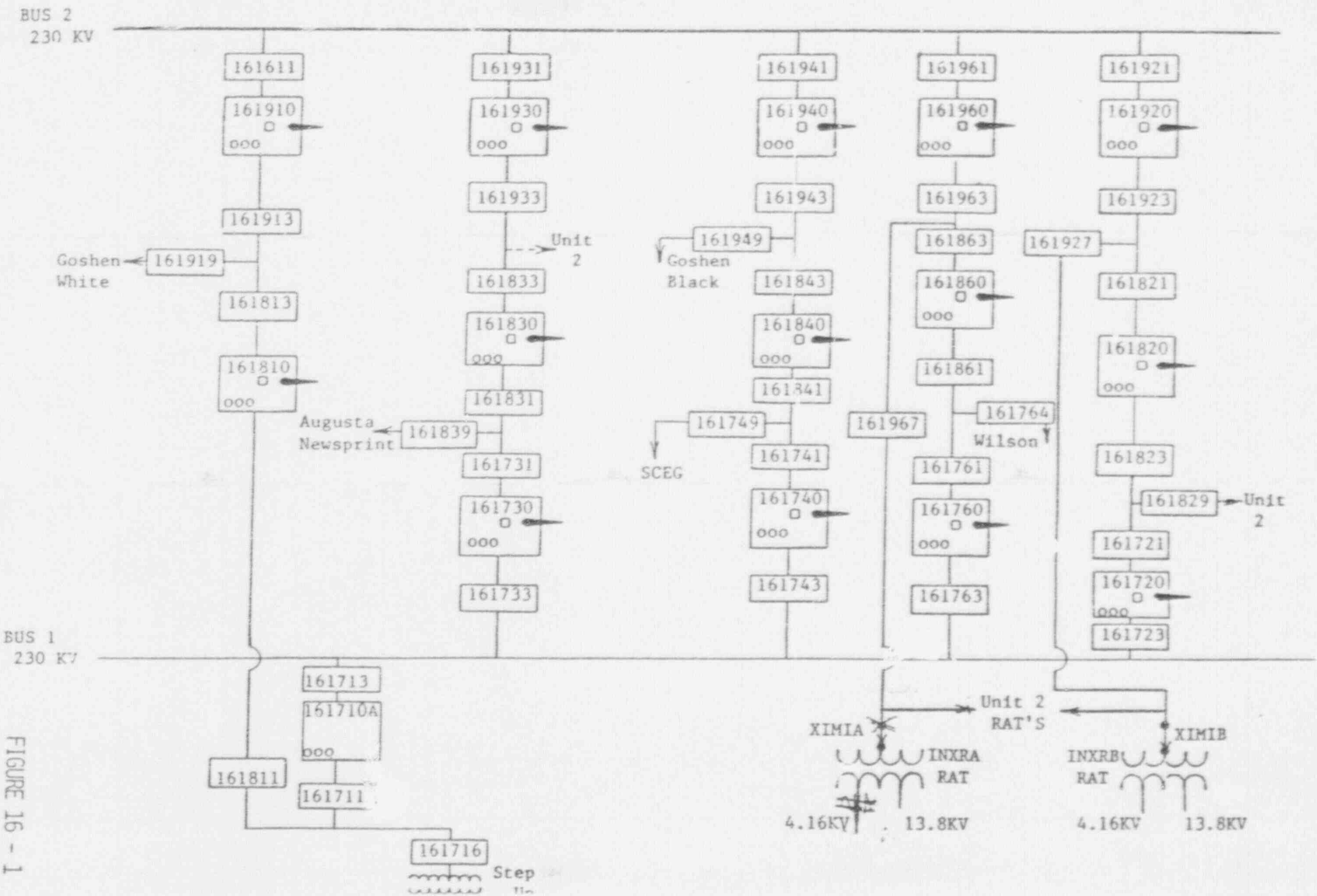

FIGURE 16 - 1
OFFSITE A C

1500 3/22

VR-1

SITE AREA EMERGENCY
3-20-90

05-3-14-90

EST	TIMELINE
0900	Fuel truck entered protected area
0920	Lost of 1A & 2B RAT due to switchyard accident because fuel truck backed into insulator support
0920	Unit 2 Trip - unit stable Unit 1 DG-1A started, tripped after running for 1 minute 20 seconds. PEO dispatched to investigate DG trip, SRO dispatched to investigate sequences.
*0921	Security Diesel started and loaded properly
0940	Site Area Emergency declared - Loss of power
0941	A train sequencer reset & D/G 1A Auto started and tripped after running for 1 minute 10 seconds
*0957	Start initial notification of SAE using SC Backup ENN
0956	Local start of DG-1A - power to 1E Bus, NSCW and CCW pumps on A Train (onsite power restored)
0958	NRC operations center notified of SAE

*Times are not confirmed

EST	TIMELINE
1000	Started A Train RHR pump and placed it in the shutdown cooling mode. At this time the maximum core exit T/C temperature was ~~136°F.~~ 118° and RHR inlet temp was 132
1001	Page announcement to site (Site Area Emergency Announcement)
1002	Security commenced accountability
1002	Security (PESB) notified by ED via communicator
1003	Emergency Message #2 started
1005	General Office Operations Center (Birmingham) activated
1009	Visitors Center initial notification (Public Information)
*1011	GPC Public Information in Atlanta notified by Ray Harris
1013	Completed initial notifications to Aiken, Allendale, Barnwell, SRS, S.C. (GEMA and BCEMA not notified)
1013	TSC ENN communicator conducts roll call to test TSC equipment

*Times are not confirmed

EST	TIMELINE
1015	Called GEMA on commercial phone numbers, did not transmit message due to confusion by communicators
1015	George Bockhold relieves John Hopkins as Emergency Director. #2 Emergency Notification form approved by ED.
1015	Site Area Emergency downgraded to Alert. Diesel Generator maintaining load.
1016	Initial notification made to Burke County EMA on commercial telephone
*1017	Alert Plant Page announcement made.
1020	OSC Activitated
1022	EOF ENN communicator test ENN equipment from EOF
1026	TSC Activated
1030	Personnel dispatched to Met Tower to relay data
1034	Steam generator Primary manways secured
1035	EOF Standby Status
1035	Message #3 started by communicator in Control Room (using BUENN)

*Times are not confirmed

VR-1

EST

TIMELINE

1035	GEMA received notification message # 1 from South Carolina EPD via FAX
1038	Message #2 complete to all South Carolina Agencies
1040	Initial Notification completed to GEMA
1042	Containment Equipment hatch bolted
1046	Met Data from MET Tower building 10 meter height, 8-9 mph; 68°-71°; Delta T = -2.0
1050	Radiation monitors information received from PERMS; all normal
1050	Message #2 completed to Georgia
1050	Message #3 completed to All South Carolina agencies.
1050	Corporate Office Birmingham contacts Public Information - Atlanta with initial information
1055	ED departs Control Room to TSC.
1056	Message #2 completed to Burke County. ED at TSC and assumes duties and responsibilities.

*Times are not confirmed

EST	TIMELINE
1059	Message #3 completed to Georgia
1100	Briefing in TSC concerning accountability. PA announcement made for non-essential personnel to leave protected area and report to admin bldg parking lot
1101	Containment personnel hatch interlocks set
1105	Message # 4 initiated by ENN communicator in TSC using Primary ENN for both Georgia and South Carolina
1112	Unit 2 in Mode 3
1116	Message # 4 completed to All agencies by TSC ENN communicator
1130	Unit 1B RAT has offsite power to hi-side
1135	Message #5 initiated by ENN communicator in TSC
1140	1BA03 energized from RAT 1B
1140	Pressurizer manway installed
1141	Message #5 completed by TSC communicator

*Times are not confirmed

EST	TIMELINE
1143	All buses off of 1BA03 energized
1159	Train B NSCW started
1203	Train B CCW pumps started
1205	Message # 6 initiated by TSC ENN communicator
1212	Message # 6 completed by TSC ENN communicator
1222	TSC Briefing
1225	Public information leaves EOF and returns to Visitor Center
1229	TSC receives Status of personnel accountability
1231	Train B RHR pump started
1235	Message # 7 initiated by TSC ENN communicator
1238	RHR Train B place in shutdown cooling mode RHR Train A placed in recirc
1241	Message # 7 completed to All agencies TSC ENN communicator

*Times are not confirmed

EST	TIMELINE
1257	1AA02 alternate incoming breaker closed to supply power form RAT 1B/paralled with D/G 1A
1305	Message #8 initiated by TSC ENN communicator
1310	ED conference call to local agencies to discuss termination of emergency
1313	Message # 8 completed to All agencies by TSC ENN communicator
1313	Offsite power restored - plant in normal refueling configuration
1326	104 people unaccounted for by security
1347	Emergency Terminated
1350	Message # 9 (Termination) initiated by TSC ENN communicator
1356	Message # 9 completed to all agencies by TSC ENN communicator
1400	News Release concerning termination of emergency
1430	Press Conference in Atlanta
1545	Joint News Release to Media
1630	Press Conference at Vogtle

*Times are not confirmed

1500, 3/23

VR-2

05-3-15-90

(1)

SITE AREA EMERGENCY

3-20-90

EST	TIMELINE
0900	Fuel truck entered protected area
0920	Loss of 1A & 2B RAT due to switchyard accident because fuel truck backed into insulator support
0920	Unit 2 Trip - unit stable Unit 1 DG-1A started, tripped 1 minute 20 seconds after breaker closure. PEO dispatched to investigate DG trip. SRO dispatched to investigate sequencer.
0921	Security Diesel started and loaded properly
0940	Site Area Emergency (SAE) declared Due to Loss of power
0941	A train sequencer reset & D/G 1A Auto started and tripped 1 minute 10 seconds after breaker closure.
0957	Start initial notification of SAE using SC Backup ENN
0956	Local start of DG-1A - power to 1E Bus, NSCW and CCW pumps on A Train (onsite power restored)
0958	NRC operations center notified of SAE

EST	TIMELINE
1000	Started A Train RHR pump and placed it in the shutdown cooling mode. At this time the maximum core exit T/C temperature was 118° F., RHR inlet was 136° F.
1001	Page announcement to site (Site Area Emergency Announcement)
1002	Security commenced accountability
1002	Security (PESB) notified by ED via communicator
1005	General Office Operations Center (Birmingham) activated
1009	Visitors Center initial notification (Public Information)
1011	GPC Public Information in Atlanta notified by Ray Harris
1013	Completed initial notifications to Aiken, Allendale, Barnwell, SRS, S.C. (GEMA and BCEMA not notified)
1013	TSC ENN communicator conducts roll call to test TSC equipment

EST TIMELINE

Xerox machine

1015 Called GEMA on commercial phone numbers, did not transmit message due to confusion by communicators

1015 George Bockhold relieves John Hopkins as Emergency Director. #2 Emergency Notification form approved by ED.

1015 Site Area Emergency downgraded to Alert. Diesel Generator maintaining load.

1016 Initial notification made to Burke County EMA on commercial telephone

*1017 Alert Plant Page announcement made.

1020 OSC Activitated

1022 EOF ENN communicator test ENN equipment from EOF

1026 TSC Activated

1030 Personnel dispatched to Met Tower to relay data

1034 Steam generator Primary manways secured

1035 EOF Standby Status

1035 Message #3 started by communicator in Control Room (using BUENN)

*Times are not confirmed

EST TIMELINE

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1050	Message #3 completed to All South Carolina agencies.
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1140	1BA03 energized from RAT 1B
1140	Pressurizer manway installed
1141	Message #5 completed by TSC communicator

EST TIMELINE

1143	All buses off of 1BA03 energized
1159	Train B NSCW started
1203	Train B CCW pumps started
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1238	RHR Train B place in shutdown cooling mode RHR Train A placed in recirc
1241	Message # 7 completed to All agencies TSC ENN communicator

TIMELINE

EST	
1257	1AA02 alternate incoming breaker closed to supply power form RAT 1B/paralled with D/G 1A
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1356	Message # 9 completed to all agencies by TSC ENN communicator
1400	News Release concerning termination of emergency
1430	Press Conference in Atlanta
1545	Joint News Release to Media
1630	Press Conference at Vogtle

05-03-16-90

ATTENTION

At all times, the licensee is responsible for quarantined equipment and can take action involving this equipment it deems necessary to:

- Achieve or maintain safe plant conditions,
- Prevent further equipment degradation, or
- Test or inspect, as required by the plant's Technical Specifications.

To the maximum degree possible, these actions should be coordinated with the Team Leader in advance, or notification made as soon as possible.

Effective Time: 241000MAR90

The Licensee is maintaining the following Items Quarantined:

1. Mid-Loop Instrumentation still connected.
2. PERMS
3. Met Tower (To include the data transmission connections)
4. POL Truck (Allowable to use for normal deliveries)
5. Emergency Notification Network (ENN) (Notification Procedures excluded)
6. 230 KV Insulator to Reserve Auxiliary Transformer 1A (Broken on 20 Mar 90)
7. All replaced CALCON Switches for 1A & 1B Diesel Generators

The following restrictions concerning Diesel Generator troubleshooting, repair, and testing are agreed to:

1. Any component replacements will be concurred with by the Team Leader prior to performing the work. All replaced components will be retained until released by the Team Leader.

2. The following test procedures will be reviewed by the team prior to performance:

   a. 1B UV Test
   b. 1A UV Test (#1)
   c. 1A UV Test (#2)

The following tests will be announced to the team leader, or a designated representative, 4 hours prior to initiation. It will not be performed until approved by the Team Leader.

a. 13 Sequencer Test
b. 13 UV Test
c. 14 UV Test (#1)
d. 14 UV Test (#2)

The following personnel will not take vacation until approved by the Team Leader (normal off days are not restricted):

a. All Operations Department Management
b. All operators (licensed and non-licensed) in the Operations Department who were on duty during the 20 Mar 90 event
c. All Event Critique Team members.

05-3-17-90

DIESEL GENERATOR TESTING
UNIT 1

3/24/90

SUNDAY/25			MONDAY/26			TUESDAY/27			WEDNESDAY/28		
24:00	08:00	16:00	24:00	08:00	16:00	24:00	08:00	16:00	24:00	08:00	16:00

RCS FILL/VENT COMPLETE

DG 1B LOGIC TESTING
26 HRS

SEE NOTE

1B UV TEST
8 HRS

SEE NOTE

DG 1A UV TST
8 HRS

1A LOGIC TESTING
24 HRS

SEE NOTE

1A UV TEST
8 HRS

MWO 19000245
FUNCTIONAL
1 HR

DG 1B SENSOR TEST
12 HOURS

MWO 18903677
FUNCTIONAL
1 HR

1A SENSOR TEST
24 HRS

MWO 18903678
FUNCTIONAL
1 HR

'B' SEQUENCER
TEST
6 HRS

SEE NOTE

MWO 18904076
FUNCTIONAL
1 HR

RHR PUMP/MOTOR
OPERABILITY RUN 12 HRS

RHR PUMP/MOTOR DCP
60 HRS

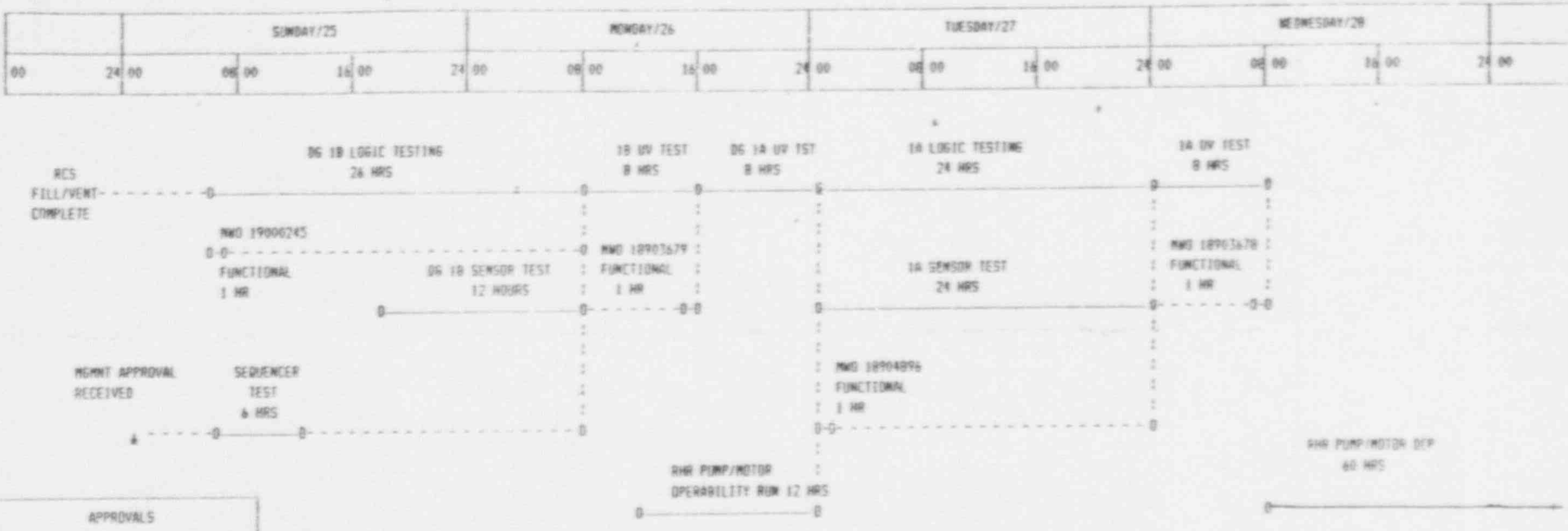
COMMENCE 1BA03 OUTAGE

GM	G. BOCKHOLD	001
OUTAGE MNGR	M. LACKEY	110
OPS MNGR	J SWARTZWELDER	044
MAINT	H. HANDFINGER	310
ASST GM PLNT SPPRT	A. MOSBAUGH	200
PLNT EP	K. HOLMES	103
WPG	S. SWANSON	127
ENG	M. HORTON	107

NOTE: NRC NOTIFICATION REQUIRED
NOTIFICATION TO THE
NRC IS REQUIRED TO BE MADE
BY THE SHIFT OUTAGE MGR
4 HOURS PRIOR TO THE ACTIVITY START.

DIESEL TESTING

REV. 0
3/24/90



APPROVALS

PLNT MNG	G. BOCKHOLD	001
OUTAGE MNGR	M. LACKEY	110
OPS MNGR	J SWARTZWELDER	044
MAINT	H. HANDFINGER	310
ENG	A. MOSBAUGH	200
PLNT EP	K. HOLMES	303
WPG	S. SWANSON	127

IMPORTANT

~~[illegible]~~ EXTREME CAUTION must be taken to ensure that the work performed by this MWO does not in any way cause a loss of information concerning the cause or causes that led to the trips of EDG 1A on March 20, 19 or the low jacket water pressure and low turbo oil pressure alarms ~~during~~ ~~[illegible]~~ for EDG 1B on March 23, 1990. CARE should be taken to preserve the as found condition of replaced components (e.g., prevention of damage due to jarring or dropping), and to carefully document any abnormal or unusual conditions that could potentially affect component operation. All testing or calibration activities should be carefully observed and any abnormal or not operation of EDG parts should be carefully and thoroughly documented

PROCEDURE NO.	REVISION	PAGE NO.
VEGP 00057-C	4	28 of 37

DATA SHEET 1

Report: Page ___ of ___

DRAFT

1st Draft of GPC Event Critique (Unofficial)

EVENT REPORT

EVENT TITLE: Loss of Off-Site & On-Site AC Power

REPORT NUMBER: ______

DATE(S) OF EVENT: 3/20/90

EVENT CLASSIFICATION: ______

Names of
EVENT REVIEW TEAM MEMBERS

Ken Holmes - Leader
Charles Coursey
Joe D'Amico
Jimmy Cash
Paul Kochery
George Frederick
Indira Kochery
Tom Webb

Signature of
EVENT REVIEW TEAM LEADER ______

DATE COMPLETED ______

MANAGEMENT REVIEW AND APPROVAL ______

PRB Review Required YES [] NO []

______ PRB Chairman

______ Meeting No / Date

DATA SHEET 1

Report: Page ___ of ____

TABLE OF CONTENTS FOR

EVENT REPORT NO. __________

* ERTL TO NUMBER EACH PAGE OF THE REPORT AND ENTER APPROPRIATE PAGE NUMBERS. ADDITIONALLY, THE ERTL WILL ENSURE THE EVENT REPORT NUMBER APPEARS ON EACH PAGE OF THE REPORT.

** INFORMATION WILL BE PRESENTED ON THE INDICATED FIGURE.

Sheet 3 of 10

DATA SHEET 1
EVENT DATA COLLECTION

Event Report No.________
Report: Page ____ of ___

1. EVENT DESCRIPTION LCSP on Unit 1 Due to Loss of "1A" RAT
EVENT DATE 03-20-90 UNIT ONE EVENT TIME 0820
DEFICIENCY CARD NUMBER 1-90-0123
(IF REQUIRED)

2. TYPE OF EVENT

A.	REACTOR TRIP	( )	F.	RADIOACTIVE SPILL/ UNCONTROLLED RELEASE	( )
B.	FORCED REDUCTION	( )			
C.	PLANT TRANSIENT	( )	G.	LIQUID INVENTORY LOSS	( )
D.	ESFAS	(X)	H.	OTHER SIGNIFICANT EVENT	( )
E.	PERSONNEL CONTAMIN	( )			

3. EVENT REVIEW TEAM CALLED OUT: TIME ________
SAER INFORMED: TIME ________
CORPORATE DUTY MANAGER INFORMED: TIME ________

4. DATA COLLECTION ASSIGNMENT Jimmy Paul Cash

5. DATA: FOR REACTOR TRIPS COMPLETE 10006-C, AND GIVE A COPY TO THE EVENT REVIEW TEAM. FOR ALL OTHER EVENTS, COMPLETE THE SECTION 5 THROUGH 16 AND PERSONAL STATEMENTS.

SHIFT PERSONNEL	ACTIVITY PERFORMED AT THE TIME OF THE EVENT	STATEMENT ATTACHED YES OR NA
OSOS J. Hopkins	shift Superintendent	
SS B. Snider	Unit S.S.	
SSS C. Christiansen	Support S.S	
RO P. Vennier	Reactor Operator	
PO P. Humphrey	Balance of Plant operator	
STA Snider	Unit S.S	
OTHERS INVOLVED		
See Attached		
Statements		

6. DATA TO BE COLLECTED (OSOS TO CHECK ITEMS)
NOTE: REMOVE THE DISK PACK AFTER A TRIP/SI.

PLANT COMPUTER ALARM PRINTOUT	( )	PLANT COMPUTER EVENT LOGS	( )
ATSI PRINTOUT	( )	ERF COMPUTER EVENT LOGS	( )
FAULT RECORDER PRINTOUT	( )	ERF COMPUTER TREND PRINTS	( )

CHART RECORDERS (LIST) ________

COPIES OF:		NRC-OC NOTIFICATION WORKSHEET	( )
SS LOGS	(X)	AUX BLDG OPERATOR LOG	(X)
TURBINE BLDG LOG	(X)	RWO LOG	(X)
CONTROL BLDG OPERATOR LOG	(X)	ELECTRICAL LOG	( )
OUTSIDE OPERATOR LOG	(X)	UNIT CONTROL	(X)

CHEMISTRY ________
HP ________
MWO'S ________

Sheet 4 of 10

DATA SHEET 1

Event Report No._______
Report: Page ___ of ___

7. PLANT CONDITION WHEN APPROPRIATE

	PRE-EVENT	MAXIMUM/MINIMUM VALUE	POST EVENT
MODE	6	6 / 6	6
REACTOR POWER	100 CPS	100 / 100	100 CPS
BORON CONCENTRATION	2457	2457 / 2457	2457
STEAM GENERATOR LEVEL 1*	NA	NA / NA	NA
* Use NR or WR, 2*		/	
whichever is 3*		/	
indicating 4*		/	
GENERATOR OUTPUT		/	MWE
PRESSURIZER LEVEL	NA	NA / NA	NA

8. PLANT CONFIGURATION

8.1 OFF NORMAL STATUS OF PLANT SYSTEMS "1B" RAT OOS for Oil Change "1B" D/G OOS for Maintence

8.2 TESTS AND SURVEILLANCES IN PROCESS SSPS Train B Time Response "24831-1" & "24625-1" RE-006 ACOT;

8.3 OTHER OPERATIONS IN PROGRESS AT THE TIME OF THE EVENT Various Maintance Outage Activities

9. FOR ESFAS ACTUATION OR FAILURE AUTOMATIC (✓) MANUAL ( ) N/A ( )

9.1 LIST CHANNEL ACTUATED/FAILED LOSP on Loss of 1A RAT

EXPLAIN SYSTEM RESPONSE See Statements

9.2 DID THE ESFAS COMPONENTS OPERATE CORRECTLY? YES ( ) NO (X)
WITHOUT UNDUE DELAY? YES ( ) NO (X)

9.3 EXPLAIN ANY ABNORMAL SYSTEM ESFAS RESPONSES. WHY? 1A D/G Tripped See Attached Statements

Sheet 5 of 10

DATA SHEET 1

Event Report No._____

Report: Page ___ of ___

9.4 DESCRIBE ANY OTHER MALFUNCTIONS NOTICED: None

9.5 APPARENT EVENT CAUSE WAS Losing a phase from 1A RAT when a truck backed into an insulator

10. CORRECTIVE ACTIONS

10.1 WHAT IMMEDIATE CORRECTIVE ACTIONS WERE TAKEN AS A RESULT OF THE EVENT? 1A D/G was manually emergency started and 1B RAT was Returned to service

10.2 WHAT SUBSEQUENT CORRECTIVE ACTIONS ARE IN PROGRESS AS A RESULT OF THE EVENT? ~~1B RAT~~ 3-20-90 1A RAT is being Repaired

10.3 WHAT FURTHER CORRECTIVE ACTIONS ARE RECOMMENDED? Return 1B D/G to service and investigate cause

11. LIST CORRECTIVE ACTION TAKEN FOR EACH ABNORMAL OCCURRENCE OR EQUIPMENT MALFUNCTION THAT ACCOMPANIED THE EVENT (STATE WHETHER COMPLETED, IN PROGRESS, OR PROPOSED).

1A & 1B Rat's have been Returned to service
Trouble shooting is in progress for D/G 1A

12. WERE PROCEDURES USED ADEQUATE? YES (X) NO ( )
WHY NOT?

13. DID THE OPERATORS AND OTHER PERSONNEL HANDLE THE EVENT CORRECTLY? EXPLAIN. DISCUSS CORRECTIVE ACTION TO DATE.
Event was handled Correctly

Sheet 6 of 10

DATA SHEET 1

Event Report No.________
Report: Page ___ of ____

14. WAS AN EMERGENCY PLAN EAL REACHED? DESCRIBE LEVEL INVOLVED (NOUE, ALERT, SITE AREA, GENERAL). Site Area on Loss of All AC power for greater than 15 minutes

15. LIST LCO'S ENTERED

LCO NO.	DESCRIPTION	INITIALS
1-90-353	Both 1A + 1B D/G Inop	[illegible]

16. LIST ANY SAFETY LIMITS EXCEEDED. TECH SPEC AND DESCRIPTION
No Safety Limits were exceeded

COMPLETED BY: ____________________
DATA COLLECTOR

05-3-19-90

(1)

POWER LEVEL/MODE

Unit One was in Mode 6 at an approximate power of 100 Counts per seconds. The reactor had been shutdown on 2-24-90 for a 45 day schedule refueling outage. The reactor core reload had been completed and the reactor vessel head was in place. Westinghouse had completed the initial pass to tension the reactor vessel head studs, and was awaiting permission from the Control Room to begin the final tensioning. Reactor Coolant System (RCS) level was being maintained at Mid-loop (187'-11") with 1A Residual Heat Removal (RHR) pump in service for decay heat removal. RCS temperature was being maintained at approximately 90°F degrees per the two connected incore thermal couples. The Emergency Boration Water Source was the Reactor Water Storage Tank (RWST). It was at 79% level (approx. 600,000 gallons) with a boron concentration of 2457 ppm. The Emergency Boration Flow Path was from the RWST through 1A Centrifugal Charging Pump (CCP) and the alternate charging flow path via 1HV-8147. Both 1A and 1B Safety Injection (SI) pumps were capable of being racked in and operated in the hot leg injection mode if needed.

INOPERABLE EQUIPMENT/ABNORMAL SYSTEM ALIGNMENT (2)

There were many pieces of inoperable equipment and several abnormal system configurations due to the refueling outage maintenance activities in progress.

"1B" Diesel Generator (D/G) was out of service for a required 18 month maintenance inspection. "1B" Reserve Auxiliary Transformer (RAT) had been removed from service for an oil change. 1BA03, the "B" Train 1E 4160 Volt switchgear, was being power from "1A" RAT through its alternate supply breaker. All Non-1E switchgear was being powered from the Unit Auxiliary Transformer (UAT). 13417-1, "Main and Unit Auxiliary Transformer Backfeed to the 13.8KV and 4160V Non-1E Busses" was used to establish power to 1NA01, 1NA04, and 1NA05.

1B CCP was removed from service for various corrective maintenance work orders. The Chemical and Volume Control System (CVCS) letdown flowpath had been out service for various maintenance activities and was being aligned for return to service.

There were several RCS valves and manways open inside Containment. The Accumulator #4 Isolation Valve (HV-8808D) and the CVCS Normal Charging Check Valve (1-1208-U6-036) were disassembled for repair. All Steam Generator (S/G) Nozzle Dams had been removed, but only S/G's #1 and #4 had their primary manways secured. Maintenance was in the process of restoring the primary manways on S/G's #2 and #3. It was necessary to maintain the RCS level at mid-loop for the valve repairs and the S/G manway restorations. In addition the pressurizer manway was removed to provide a RCS vent path.

On March 20, 1990 at approximately 0900 Mr. Donnie Willhite entered the protected area driving the fuel truck. His duties were to refuel air compressors and welding machines staged around the site for the outage on Unit I. He has had these duties for the past three weeks.

Mr. Willhite stated that in the past he had backed into the switchyard to fuel the machines in this area. On this morning he pulled straight in, he checked the welding machine that was in the area, it did not need fuel. He got back in the fuel truck and was in the process of backing up when he hit the support holding "C" phase insulator for the "A" Reserve Aux transformer, the insulator and line fell to the ground tripping the transformer.

9 ON 3-20-90 9-20 EST RESERVE
1A & 2B
AUX TRANSFORMER HI SIDE AND LOW SIDE
BREAKERS TRIPPED CAUSING A LOSS OF
U-1
OFF SITE POWER CONDITION TO TRAIN
(1AA02) & TRAIN B 2B
A, CLASS 1E, 4160 V BUS AND 480V
BUSSES SUPPLIED BY ~~...4160~~ 1AA02
DURING THIS TIME NON 1E ~~BUS WAS~~
FOR UNIT-1
BUSSES WERE ENERGIZED THROUGH
230 KV SWITCH YARD TO STEP-UP
TRANSFORMERS (STEP DOWN - IN THIS CASE)
TO ~~NON CLA~~ UNIT AUXILARY
TRANSFORMERS TO NON CLASS 1E
BUSSES 1NA01, 1NA04 AND 1NA05.
~~LOSS OF~~ AND UNIT TWO WERE AT
NORMAL ALIGNMENT. UNIT-1 ~~AND~~
~~UNIT-2~~ DIESEL GENERATOR 1A AND
UNIT-2 D/G 2B STARTED & ~~LOA~~
SEQUENCED THE LOADS to ~~1E BUSS~~
THEIR RESPECTIVE BUSSES. SINCE
THIS REPORT IS TO PROVID SEQUENCE
EVENTS FOR UNIT-1, AND UNIT-2
FUNCTIONED AS NEED, ~~NO~~ UNIT-2
WILL NOT BE FURTHER DESCRIBED IN
THE REPORT.

AFTER D/G 1A STARTED AND SEQUENCED THE LOADS TO 1E BUS ~~1E~~ 1E 1 min 20 SECOND ~~AFTER~~ AFTER THE BREAKER CLOSURE, D/G 1A TRIPPED THIS CAUSE A UNDER VOLTAGE CONDITION TO ~~1E~~ 1E BUS_1AA02, AGAIN. UNDER VOLTAGE SIGNAL IS A MAINTAINED SIGNAL AND ~~ON~~ D/G 1A STARTING LOGIC RECEIVED THIS SIGNAL AND ~~ENERGIZED~~ RELAY R49, TD2A AND SOL-202-1A (ACTIVATE SHUT-DOWNS) ENERGIZED. RELAY R-49 IS ENERGIZED TROUGH ~~TD2~~ TD2A ~~CONTACT~~ NORMALY CLOSED CONTACT ENERGIZED TO OPEN AFTER 5 SECONDS. STARTING AIR SOLENOIDS ARE ENERGIZED TROUGH R49 CONTACTS AND PROVIDE STARTING AIR TO ~~D/G~~ D/G 1A FOR 5 SECONDS UNTIL THE TD2A CONTACTS TIMED OUT AND RELAY R49 ~~DRO~~ DEENERGIZE. SINCE D/G IS COSTING DOWN FROM THE TRIP THE SHUTDOWN LOGIC DO NOT ALLOW THE D/G FUEL RACK TO OPEN

AND START THE ENGINE FOR 120 SECONDS AFTER THE TRIP. THIS CAUSE THE ENGINE ~~[illegible]~~ STARTING LOGIC TO LOCKED UP CONDITION UNTILL THE UV ~~CONDITION~~ RESIGNAL IS RESET AND ALLOW ~~[illegible]~~ TD2A TO DEENERGIZE.

THAT WAS THE REASON D/G 1A DID NOT START BY ITSELF AFTER THE TRIP.

AFTER THE TRIP OPERATORS WERE DESPATCHED TO ENGINE CONTROL PANEL TO INVESTIGATED THE CAUSE OF THE TRIP. ACCORDING TO THEM THEY SAW SEVERAL ANNUNCIATORS LIT AND WITH OUT EVALUATING ~~THE~~ RESET THE ANNUNCIATORS. ON GENERATOR AUX' VOLTAGE BALANCE RELAY 16 FOUND TO BE ACTUATED. DURING THIS TIME SHIFT SUPERVISOR (SS) AND PED WENT TO SEQUENCER PANEL ~~AND TO~~ FIND OUT ANY PROBLEM WITH SEQUENCER. HE ~~THOUGHT HE SAW THREE UV LIGHTS AND~~ QUICKLY PUSH THE ~~R~~ UV RESET BUTTON ~~AND~~ WHICH ~~[illegible]~~ MAY GENERATE A RESET SIGNAL ~~TO~~ IN & SOLID

STATE LOGIC PORTION OF THE
SEQUENCER AND ELECTROMECHANICAL
RELAY MAY NOT HAVE ENOUGH TIME
TO ENERGIZE. ELECTROMECHANICAL RELAY D/G STARTING LOG
MAY NOT PROVIDE A STARTING
SIGNAL TO D/G. THIS COULD
PROVIDE THREE UV LIGHTS ON
SEQUENCER AND TWO UV SIGNAL
TO D/G. AFTER ~~RESE~~ PUSHING
THE RESET BUTTON, SS RESET
THE SEQUENCER BY DEENERGIZING AND
ENERGIZING ~~THE~~ POWER SUPPLY TO SEQUENCER. THIS CAUSED
~~A~~ THE ~~2TDA~~ TD2A RELAY TO DEENERGIZE AND ENERGIZE
AND PROVIDED PERMISSIVE TO STARTING AIR SOLENOID
TO ENERGIZE FOR ANOTHER 5 SECONDS
~~AND SSP~~ WHICH CAUSE THE ENGINE
TO START. THIS HAPPENED 19 ~~SECONDS~~ MINUTES
AFTER THE D/G TRIPPED FOR THE
FIRST TIME. THE ENGINE STARTED
AND SEQUENCER SEQUENCED THE
LOADS AS DESIGNED. AFTER 1 min
AND 10 SECONDS THE ~~ENGINE~~
~~STO~~ THE BERKER TRIPPED AND
ENGINE TRIPPED. IT DID NOT STARTED
BACK DUE TO STRATING LOGIC

BLOCKED AS DESCRIBED ABOVE. AT THIS TIME OPERATORS, MAINTENANCE FORMAN AND ~~the~~ D/G VENDOR REPRESENT WERE IN THE D/G ROOM. THE OPERATION PERSONEL WERE ALSO IN THE ENGINE ROOM. THE INITIAL REPORT WAS THE JACKET WATER PRESSURE TRIP ANNUNCIATOR WAS THE CAUSE OF THE TRIP, AND CONTROL ROOM OBSERVED LUBE OIL SENSOR MALFUNCTION ALARM ALSO. MAINTENANCE FORMAN AND VENDOR REP. OBSERVED THE JACKET WATER PRESSURE ~~AT the~~ THE GUAGE WAS ABOUT 12-13 PSIG. THE TRIP SET POINT 6 PSIG AND ALARM IS 8 PSIG.

15 MIN AFTER THE 2nd D/G ~~1A TRIP~~, DG 1A WAS STARTED FROM THE ENGINE 1A CONTROL PANEL USING EMERGENCY START PUSH BUTTON. THIS TIME ENGINE WAS STARTED AND LOADS WERE MANUALY LOADED. AT ~~AND ESTABLISH~~ THE ON SITE EMERGENCY BUS. WHEN D/G IS STARTED USING EMERGENCY PUSH BUTTON ALL THE TRIPS EXCEPT

FOUR TRIPS WILL BE BY PASSED, HOWEVER ALL ALARMS WILL BE ANNUNCIATED AND WILL NOT BE BY PASSED. DURING THE EMERGENCY RUN NO TRIP ALARMS WERE NOTICED BY THE PERSONEL AT THE CONTROL ROOM OR THE ENGINE CONTROL PANEL. D/G 1A. THE ONLY ALARMS THE CONTROL ROOM OPERATOR ASSIGNED FOR D/G RUN WERE LUBE OIL PR. SENSOR MALFUNCTION AND LUBE OIL LVEL LOW ALARM.

DG 1A RAN UNTIL 12:57 SUPPLYING POWER TO 1AA02 4160 BUS. AT 1140 RESERVE AUX TRANSFORMER (RAT) 1B ENERGIZED AND SOON SUPPLYING POWER TO 1BA03, 4160V, CLASS 1E TRAIN B BUS. 12:57 RAT 1B WAS TIED TO 1AA02 BUS AND D/G 1A WAS STOPPED.

BASED ON THE INITIAL INFORMATION TO RECREATE A SIMILAR STARTING SENARIO, DG 1A WAS STARTED MANUALY FROM CONTROL ROOM AND TIED TO THE BUS AND LOADED TO 6000 KW. DURING THIS TIME RAT-A

WAS READY TO ENERGIZE. > RAT
B WAS DISCONNECTED FROM 1AA02 BUS
RAT A WAS ENERGIZED AT AND
TIED TO 1AA02 BUS. DIESEL GENERATOR
WAS TRIPPED MANUALY. 5 MIN LATER 1A
WAS STARTED RAN FOR 5 MIN
WITH OUT TIEING TO THE GRID
AND MANUALY TRIPPED. WAITED
5 MIN. AND STARTED MANUALY
AND RAN FOR A 5 MIN AND
MANUALY TRIPPED. DURING THE
ABOVE THREE STARTS AND RUN
D/G DID NOT EITHER TRIPPED OR
SHOWS ANY MALFUNCTION.

INVESIGATION CONTINUED
AFTER TALKING TO SEVERAL D/G EXPERTS
FOLLOWING ACTION WERE RECOMMEND (1) CALIBRATE
JACKET WATER PR SENSOR (2) CALIBRATE
LUBE OIL PR SENSORS (3 EACH). (3) VERIFY THE
TUBING TO VIBRATION SWITCHES. (4) SNOOP TEST
THE PNEUMATIC LINES IN ENGINE CONTROL
SYSTEM WHILE THE ENGINE IS RUNNING (5) SIMMULATE UV SIGNAL AND
START AND LOAD D/G USING SEQUENCER.
FOUR OUT OF FIVE

23 MAR 90

05-3-21-90

Interview List

0800 : J. Swartzwelder — OPNS MGR

0900 : D.R. VINEYARD — SS Outage Support

0930 : P.A. HUMPHREY 4 (hrs) — BOP Operator

1000 : L.P. VANNIER 3 (hrs) — RO

1030 : R.B. SNIDER 2 (hrs) — Unit Shift Supvr.

1100 : K.A. JOHNS — Extra CRO (CR/DG)

1130 : J.W. ACREE DG — Shift Supvr (Outage Support)

1300 : R.K. POPE sequencer — Shift Supvr (Outage Support)

1330 : D. DELOACH — PEO's EDG — Also at 1530 in the D/G 1A Room

1400 : S. WHITMAN — PEO's EDG — Also at 1530 in the D/G 1A Room

1430 : J.P. CASH — Opers Superintendent/TSC

1500 : W.L. BURMEISTER — " "

(? time) ~1730 : J.T. HEFNER 1 (2hrs) Senior SRO (Shift Superintendent

Out in TSC?

P.

2hrs

Event cat... ...

12:30 S.R.O.

2:30 Unit Shf Sv

4:30 R.O

5:30 BOP

OS-3-22-90

WHEN TSC RECEIVED ACCOUNTABILITY SHEETS WITH MISSING PERSONS THE STARTED CLEARING UP SOME OF THE MISSING. NUMBER OF MISSING CHANGE TO 110 MISSING PERSONS.

AFTER SECURITY RAN A FOLLOW UP ACCOUNTABILITY REPORT AND WITH THE HELP OF TSC SEC. COORD REDUCED THE NUMBER TO 47 MISSING PERSONS.

SHORTLY AFTER THIS NUMBER WAS GIVEN THEN EVENT WAS TERMINATE AND SYSTEM RETURNED TO NORMAL. (8)

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(14)

PROBLEMS THAT OCCURRED DURING ACCOUNTABILITY:

- SECURITY WAS UNAWARE OF DECLARATION OF SITE AREA EMERG. UNTL PAGE ANNOUNCEMENT AND TONE WAS SOUNDED. (SOLUTION - AN IMMEDIATE NOTIFICATION TO SECURITY FROM CONTROL RM. AT TIME OF DECLARATION.)

- MISINFORMATION ON WHETHER TO LEAVE SITE OR NOT FOR ACCOUNTABILITY. (SOLUTION - CLEAR PAGE ANNOUNCEMENTS ON WHETHER IT IS EVACUATION, EARLY DISMISSAL OR JUST LEAVING P.A. FOR ACCOUNTABILITY AT ASSEMBLY AREAS.

- SOME PEOPLE DID NOT REPORT TO ASSEMBLY AREAS FOR ACCOUNTABILITY. THERE WAS SEVERAL REASON FOR THIS, SOME DID NOT TAKE EVENT SERIOUS AND DID [illegible]

AND SOME DID NOT KNOW WHERE THEIR ASSEMBLY AREA WAS.

(SOLUTION - MORE TRAINING EMPHASIS ON THE IMPORTANCE OF LEAVING SITE, EACH GROUP BE GIVEN A MAP OF THEIR ASSEMBLY AREAS WITH INSTRUCTIONS, SECURITY BE GIVEN LOCATIONS OF ALL ASSEMBLY AREAS AND WHO GOES THEIR. BETTER PAGE ANNOUNCEMENTS AND DIRECTIONS.

- PERSONNEL DID NOT SCAN THEIR ACADS WHEN DEPARTING SITE / P.A. (SOLUTION - INCREASE AWARENESS OF IMPORTANCE OF SCANNING ACADS OUT FOR ACCOUNTABILITY DURING G.E.T. TRAINING AND SUPERVISORS MEETINGS.)

- LIST CAME FROM C.R., TSC + OSC IN DIFFERENT FORMS. IN MOST CASES THEY USED A MIXTURE OF I.D. NUMBERS AND ACAD NUMBERS HOWEVER NOT SHOWING WHICH WAS USED. IN SOME CASES THEY GAVE NAMES AND OTHER CASES THEY DID NOT. FIRST SECURITY WOULD HAVE TO DECIPHER LIST BEFORE THEY COULD BE USED. (SOLUTION - INCREASE TRAINING ON FORMS USED BY RESPONSE ORGANIZATIONS. HAVE FORMS AVAILABLE FOR USE IN TSC, OSC AND C.R.)

- LARGE AMOUNTS OF ACADS BEING TURNED INTO BADGE ISLAND AT ONE TIME. (PROBLEM, BUT AT THIS TIME NO SOLUTION OTHER THEN MORE OFFICER TO PROCESS ACADS)

- SLOWNESS OF SECURITY COMPUTER DUE TO SWAP OF PERSONNEL CAUSED BY TEMPORARY LOSS OF POWER TO PESB. (THIS CAUSED COMPUTER TO TAKE EXTRA TIME READING [illegible] AND COMPLETING PRINTOUTS FOR ACCOUNTABILITY. SOLUTION - IS MAINTENANCE ON SECURITY SYSTEM TO SPEED UP COMPUTER ACTIVITIES.)

- MISINFORMATION THAT ALLOWED PERSONNEL BACK INTO PA BEFORE ACCOUNTABILITY WAS COMPLETE AND THEN SENT THEM BACK OUT AGAIN. (SOLUTION - BETTER INFORMATION FROM C.R. OR TSC ON ACCESS CONTROLS THEY WANT MAINTAINED AT PESB/APESB.)

The plant was at midloop when the accident occurred. Several work orders were in progress at the time. Instructions were given to complete the following tasks prior to leaving containment;

1HV-8808D (MWO 18808316) was reassembled and the bonnet bolts were tightened down. This is the SIS Accumulator #4 isolation valve.

1-1208-U6-036 (MWO 18905286) was reassembled, the bonnet was tightened down. This is CVCS Charging RCS Loop #1 Inlet Check Valve.

The pressurizer primary manway was put in place and the nuts hammered tight (MWO 18906594).

Steam Generators #2 & #3 manways were put in place and nuts hammered tight (MWO's 18906589 & 18906588).

Other crews were sent in containment to close the equipment hatch (MWO 18906592) and reinstall the interlocks on the personnel air lock (MWO 18906593).

All work was accomplished and Maintenance personnel out of containment by 1150 EST.

Shortly after the Loss of Power, John Hopkins directed Ron LeGrand to evacuate CNMT in a controlled, orderly manner. He also directed Mike Lackey to "button-up" the mid-loop work. The pressurizer manway was to be left off to provide a RCS vent path. John realized he had given conflicting instructions to Ron and Mike. John called Ron back and informed him of the work that was to continue inside Containment. A communications error led Ron to believe that all RCS openings, including the pressurizer manway should be secured. Power had been restored and RHR cooling reestablished when it was announced that the pressurizer manway was secured. George Bockhold, who by now had assumed the E.D. position, decided not to remove the manway because the plant was stable.

9.0(c)
3-23-90

SECURITY EVENT CRITQUE (ACCOUNTABILITY)

AT APPROX 1001 HRS SECURITY HALO TONE AND P.A. ANNOUNCEMENT OF SITE AREA EMERGENCY.

PER PROCEDURE DURING SITE AREA EMER. AN ACCOUNTABILITY IS MADE AS DIRECTED BY E.D.

TWENTY MINUTES AFTER DECLARATON OF SITE AREA EMER. SECURITY WILL RUN A BADGE ACCOUNTABILITY PRINTOUT.

SECURITY WILL THEN BY USE OF PRINTOUT, ACCOUNTABILITY SHEETS FROM OSC, TSC AND CR ATTEMPT TO MAKE AN ACCOUNT OF MISSING PERSONS. AFTER CROSS REF WITH SHEETS THEY THEN CALL BADGE ISLANDS + AGAIN CROSS REF BADGE RACK WITH MISSING PERSONNEL.

FINAL NUMBERS ARE THEN CALL TO TSC WITH MISSING PERSONS REPORT CARRIED TO TSC. THEY LOOK OVER ACCOUNTABILITY FORMS TO TRY TO CLEAR UP ANY INDIVIDUAL THAT MAY STILL BE MISSING. THEY THEN DETERMINE THE DIRECTION THAT WILL BE USED TO LOCATE MISSING. (FINAL FIRST ROUND COUNT 197 PERSONS)

SECURITY WILL BE RUNNING ANOTHER BADGE ACCOUNT FORM TO TRY TO CLEAR UP ANY MISSING PERSONS AND TO CONTINUE A COUNT OF PERSON IN P.A./V.A

(9)

Site Evacuation

On Tuesday March 20, 1990 at 0940 Eastern Standard Time a Site Area Emergency was declared due to a loss of on site and off site power. A public address system announcement was made at approximately 1001 Eastern Standard Time from the control room. The announcement of the emergency stated a Site Area Emergency has been declared and that all visitors and escorts report to the PESB; and all emergency response personnel should report to their emergency response facility. The prescripted section of the announcement from the emergency procedure concerning ~~evacuation~~ evacuation & assembly was purposely omitted; therefore, neither a total site evacuation nor assembly and accountability were [illegible] conducted. The ~~emergency directors decision to omit~~ decision to omit this section by the emergency director was based on there not being any immediate radiological danger to ~~the~~ plant personnel. The omission of the evacuation assembly announcement caused confusion on the plant site because there were no instructions for the non-essential personnel. Some personnel exited the protected area and assembled in the Administration building and parking lot area; some personnel stayed at their work location [illegible] and approximately 200 personnel relocated to the recreation area.

Another public address system announcement was made at approximately 1017 Eastern Standard time stating that the emergency had been downgraded to an Alert status and that all non-essential personnel were to assemble at the Admin Building parking lot. Some Personnel already located in the admin parking lot area did not hear this announcement due to ~~page~~ public address system inaudibility. (approximately 200 personnel reported) ~~No further instructions were given~~ to personnel outside the protected area ~~until the emergency was terminated.~~ Therefore no other information was given to these people. Many person considered themselves essential and did not heed the page announcement.

Once the event was downgraded to an Alert, security notified the recreation park via the land department. The land department personnel then told all personnel at the recreation area to go back to the site and return to work. Plant personnel returned to the PESB and entered the protected area. The security department at this time made two public address announcements for all non essential personnel to exit the protected area and assemble in the admin parking area.

News ~~media~~ releases were made out of Georgia Power corporate office in Atlanta, Ga. with information supplied by the SONOPCO Project office in Birmingham, AL. The process that SONOPCO uses to release information to the media is as follows:

- ~~The~~ SONOPCO public affairs personnel are notified upon activation of the General Office Operations Center (GOOC) by the GOOC manager. Upon notification they report to the GOOC.

- The GOOC manager assists public affairs personnel by providing plant status information coupled with technical assistance as the PA personnel prepare draft press releases.

[illegible] press releases are then approved by the [illegible]ect V.P. or corporate Duty Manager [illegible] [illegible]smitted to the corporate Supervisor of public relations in Atlanta by telecopy. The supervisor of Public Relations then ~~tr~~ ~~the~~ the press release to the site public relations supervisor (i.e. Ray Harris) and to media personnel.

Event Termination

By 1300 EST, plant conditions had stabilized with off-site power restored to unit 1 and RHR established for core cooling. The Emergency Director initiated a conference call with local government agencies (S. Carolina, Georgia, Allendale, Barnwell ~~[illegible]~~ Burke County and SRS) to discuss ~~event~~ termination of the emergency. The Emergency Director also discussed termination with the NRC. Agreement was reached with all parties that the emergency should be terminated. The emergency was terminated at 1347 and all agencies were notified ~~[illegible]~~ at ~~[illegible]~~ 1356.

[illegible]

new paragraph

This process appears to work well provided the general office recieves accurate plant status. Plant status to the ~~[illegible]~~ GOOC was hampered by failure of the E telephone bridge station loop to work properly. ~~This [illegible]~~ GOOC personnel established communications with the TSC thru a seperate phone line to obtain plant status. The first press release contained two errors. The first error was in the time of declaration of the site area emergency. The [redacted] occurred when ~~the~~ the ED called the project V.P. [redacted] indicate that a Site Emergency had been declared. Th[redacted] the first indication for corporate personnel that a site area em[redacted] had been declared and the time of the call was approximately 9:00 AM (CST). Previous notification by the site duty manager to the corporate duty manager did not indicate that activation of the emergency plan had occurred at 8:40 AM (CST). GOOC personnel assumed the site area emergency had been declared at 9:00AM (CST). The second error ~~stated that "nonessential personnel were evacuated"~~ [redacted] stated that nonessential personnel [redacted]ed from the protected area to [redacted]site accountability. This error resulted from a miss communication between the plant and ~~the~~ GOOC personnel. The second press release contained no errors and ~~the~~ both press releases are attached. No further press releases were needed due to the press conference held in Atlanta.

05-3-23-90 RK
24 Mar 90

(1)

STATUS OF AIT CHARTER ITEM ASSIGNED TO RICK KENDALL (ITEMS NOS # 5 & 6)

ITEM 5. A FAULT IN THE UNIT 1 SWITCHYARD CAUSED UNIT 2 TO TRIP. THE CAUSE WAS A "MISWIRED" CURRENT TRANSFORMER. GIVEN THE "WIRING ERROR", THE UNIT 2 TRIP SHOULD HAVE BEEN EXPECTED. THE ERROR APPEARS TO HAVE BEEN DUE TO A MISTAKE MADE WHILE TRANSFERRING GPC DESIGN SPECIFICATIONS ONTO FIELD DRAWINGS. THE FIELD WIRING WAS IN ACCORDANCE WITH THE INSTALLATION DRAWINGS. IT DOES NOT APPEAR THAT UNIT 2 IS OVERLY SUSCEPTIBLE TO UNIT 1 TRIPS OR VISE VERSA. THE UNIT 1 SWITCHYARD BREAKER ACTUATIONS IN RESPONSE TO THE FAULT WERE APPROPRIATE AND EXPECTED. THE REVIEW CONDUCTED FOR THIS ITEM HAS EXPANDED BEYOND ITS SCOPE TO INCLUDE 1) IDENTIFICATION OF POSSIBLE ALTERNATE SOURCES OF POWER TO THE UNIT 1 TRAIN A BUS HAD THE EDG NOT EVENTUALLY STARTED OR HAD NOT RESTARTED AFTER IT TRIPPED, AND 2) LICENSEE ACTIONS TAKEN AND BEING CONSIDERED TO MAKE THE SOURCES AVAILABLE. THE "AIT REVIEW" FOR THIS SECTION IS ~90+% COMPLETE AS FAR AS INFORMATION GATHERING, AND ~15-20% COMPLETE AS FAR AS DRAFT WRITEUP.

ITEM 6. RESPONSE OF THE 1A EDG. THE "AIT REVIEW HERE HAS NOT GOTTEN VERY FAR. THERE HAS BEEN A SIGNIFICANT NEW DEVELOPMENT; NAMELY, THE 1B EDG WHICH WAS BEING TESTED ON 23 MAR 90 WAS RUNNING WHEN SEVERAL ALARMS CAME IN (LOW JACKET WATER PRESSURE AND LOW TURBO OIL PRESSURE) THAT ALSO CAME IN WHEN THE 1A EDG TRIPPED DURING THE 20 MAR 90 EVENT. BOTH EDGs HAD UNDERGONE REFUELING INTERVAL MAINTENANCE (MUCH OF WHICH WAS PERFORMED BY THE VENDOR) AND HAD SUCCESSFULLY PASSED POST MAINTENANCE TESTING. IT APPEARS THAT THE MAINTENANCE MAY HAVE BEEN A FACTOR. THE LICENSEE IS PREPARING FOR THE INITIAL TESTS FOR TROUBLESHOOTING. THE VENDOR (COOPER INDUSTRIES; FORMERLY TDI) WILL ARRIVE ONSITE THE MORNING OF 25 MAR 90. THE 1B EDG WILL BE TESTED FIRST.

RK
24 MAR 90

TESTING ON THE 1B EDG IS PLANNED TO BEGIN ON 25 MAR 90. EDG 1A TESTING IS NOT PLANNED UNTIL 26 MAR 90 AT THE EARLIEST. WE HAVE MORE OR LESS (?) QUARENTINED EDG 1A, BUT ARE ALLOWING THE LICENSEE TO DO WORK ON EDG 1B WITHOUT CONSULTING US FIRST TO ALLOW THEM TO COMPLY WITH TECH SPECS WITH REGARD TO RESTORING AN EDG TO OPERABILITY. ALL WORK ON THE EDGs REQUIRES A MAINTENANCE WORK ORDER (MWO). WE PREPARED A CAUTION STATEMENT THAT WILL BE PART OF EACH EDG 1B MWO (AND ALSO FOR EDG 1A) THAT ADDRESSES NEED TO BE CAREFUL NOT TO DESTROY AND TO CAREFULLY DOCUMENT ANY INFORMATION RELAVENT TO ROOT CAUSE. WE ARE MONITORING THE LICENSEES ACTIVITIES. INFORMATION GATHERING PHASE FOR AIT IS ~40% COMPLETE. WRITEUP HAS NOT BEGUN.

AL / KEN FYI

5-3-24-90

RK
25 Mar 90

25 Mar 90 DISCUSSION w/ PAUL KOCHERY (~10:30 AM)

ON 23 MAR 90 THE 1B EDG WAS STARTED FOR AN 8-HR TEST. THE EDG RAN FINE FOR ~2 HRS AND THEN TRIPPED. THE TRIP ALARMS THAT CAME IN WERE LOW JACKET WATER PRESSURE AND LOW TURBO LUBE OIL PRESSURE (THESE TWO ALARMS, AND OTHERS, ARE BELIEVED TO HAVE COME IN ON THE 1A EDG TRIPS ON 20 MAR 90). THE TRIP SIGNALS WERE RESET, AND THE EDG (1B) WAS THEN RUN FOR 8 HRS WITHOUT ANY PROBLEMS.

GPC PLANS TO DO EDG 1B LOGIC TESTING BEGINNING SOMETIME THIS MORNING (MAY HAVE ALREADY STARTED), AND EDG 1B SEQUENCER TESTING THIS AFTERNOON. PAUL CONFIRMED THAT NO TESTING IS PLANNED FOR EDG 1A UNTIL 26 MAR 90 AT THE EARLIEST. THE SEQUENCER TEST WILL BE MADE AVAILABLE TO THE IIT PRIOR TO THE TEST. GPC WANTS TO VERIFY PROPER OPERATION FOLLOWING PART REPLACEMENT (DON'T KNOW WHICH PART). THE SEQUENCER WAS NOT ACTUATED OR INVOLVED DURING THE EDG 1B TESTING ON 23 MAR 90 DISCUSSED ABOVE.

IN A PREVIOUS DISCUSSION WITH PAUL (~9:00 AM), HE CONFIRMED THAT THE VENDOR REPs PERFORMING THE EDG 1B LOGIC TESTS ARE THE EXPERTS AND ARE THE MOST QUALIFIED TO DO THE TESTS. THE VENDOR REPs HAVE BEEN CAUTIONED CONCERNING THE NEED TO ENSURE THAT INFORMATION RELAVENT TO THE CAUSE(S) FOR THE 23 MAR 90 EDG 1B TRIP IS NOT LOST BECAUSE OF THE TESTS, AND TO CAREFULLY DOCUMENT ANY INFORMATION THAT MAY BE RELAVENT TO THE CAUSE(S). ALL UNNECESSARY / UNRELATED ACTIVITIES IN THE EDG AREA HAVE BEEN STOPPED TO ALLOW THE VENDOR REPs TO PROCEED WITHOUT DISTRACTIONS.

(1) 05-3-25-90 (5a)

~~Date~~ Offsite Communication

The Site Area Emergency was declared at 0940 Eastern Time. The Emergency Director signed the notification form and to inform off site government agencies of the emergency at 0948. The ENN communicator then attempted to notify off site agencies using the ~~primary~~ primary ENN ~~line~~ ~~The primary~~ to Georgia and South Carolina. The primary ENN was inoperable due to loss of power. The primary ENN ~~it~~ receive power from the A-train 1E buses which ~~was~~ were deenergized due to the loss of electrical power event. The general manager made ~~a~~ an update to the notification form at 0956. to state that

(2)

The ENN Communicator then went to the S. Carolina backup ENN and established communications with S. Carolina agencies (S. Carolina EPD, SRS, Aiken, Allendale and Barnwell counties) at approximately ~~about~~ 0958 Eastern Standard Time. Initial notification of the emergency ~~was~~ to these agencies was completed at approximately about 1010 EST. Georgia Emergency Management Agencies (GEMA) was contacted via commercial telephone, which is the designated back up to GEMA and Burke County EMA, at approximately about 1015 EST; however, NO notification message was transmitted during this contact (due to ?) because of communicator confusion.

~~At~~ At the ~~same~~ time the Control

③

room ENN communicator was talking (contacted) to GEMA on the commercial telephone, the TSC ENN Communicator was checking (confirming) the operability of the primary ENN to Georgia and S. Carolina. The ENN in the TSC was operable because it received power from the Security Diesel which was operating properly. The commercial telephone contact between the control room and GEMA was terminated because both parties (was) the ~~in information~~ the notification would be transmitted via the ENN. In fact, the TSC ENN communicator did not have the notification forms and could not

(4)

pass the required information. Attempts by GEMA to obtain the notification form information were successfull at 1035 when South Carolina Emergency Preparedness Division (EPD) sent ~~them~~ GEMA the notification form via facsimilie. Vogtle established communications with GEMA at 1040 and passed the notification information successfully via commercial telephone line. ~~Subsequent no~~

Subsequent notifications were made without difficulty. The primary ENN in the TSC was used to ~~so~~ ~~transmitt~~ transmit all messages after message #4 to all offsite agencies.

(5)

The initial notification to the NRC was made at 0958 by the Control room. ~~Sent~~ on the ENS. Subsequent updates from the Control room and TSC were performed without major problem except for a hardware ~~an equipment~~ problem on the NRC end which ~~and which~~ caused them to drop off the line occasionally

3-26

(5b)

On-Site Notification

The primary means of notifying on-site personnel is via the plant public address system (plant page) for personnel in the protected area and telephone calls to key buildings ~~[illegible]~~ for

personnel outside

the protected area but in the owner controlled area. In general, these notifications were made successfully with a few minor exceptions.

The ~~[illegible]~~ plant page announcement of the site area emergency was made at 1001. It was heard in all areas of the protected area except inside containment

(2) On-site notification

and on the turbine deck of the turbine build

Personnel in these area were ~~notified~~ notified

by informal means (word of mouth, super

observing others leaving area, etc.) ~~in ab~~

within ~~a~~ ~~about~~ approximately 10 minutes

of the page announcement. ~~Other pe~~

Personnel in buildings outside the protected

area were notified by telephone calls

from security by 1017.

The delay in making the plant

page announcement from emergency

declaration at 0940 to page announce

at 1001 caused emergency facility activation

and accountability to be delayed on a mim

to minute basis ie 21 minutes.

05-3-~~28~~-90 №
27

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Control Log

Time Tuesday Date 3/20/90

Time	
0007	1400 complete & sat
0103	RHR CB 2457 @ 0005 CST - williams
0301	Tygon tube 187'8"
0350	OSP 14801 complete + sat for NSCW transfer pump #8
0409	1400-1 complete
0452	Sol ~~~
0416	—— LBS ——
0500	→ Cle ——
0523	Tygon tube @ 187'8" - manned continuously
0537	OSP 14811-1 complete + sat for RA xfer pump #
0558	—— R+ ——
0623	—— LBK →
0703	~~[illegible]~~ 3/20/90 Night shift off relieved by P. Vannier - JEK
0703	Day Shift OM: / RO LP Vannier BOP PA HUMPHREY
	PLANT STATUS: Mode 6 100 cps RCS Boron 2457 RHR Train 'A' service for core cooling. Vessel at mid loop operation
0816	OSP-14225-1 DPS Weekly Surveillance logs Complete
0820	LOSP occurred. LOST 'A' RAT - D/G 1A TIED and tripped. E AOP 18031C and 18032C
0841	D/G 1A Auto Started after Sequencer reset & tripped on low water pressure.
0859	Site Area Emergency Declared - loss of AC > 10 min; loss offsite & onsite Power
LE 0856	D/G 1A Emergency Break Glass START Locally; NSCW pumps 1+3 Started & C
0900	RHR PUMP 'A' Started for shutdown cooling - core exit thermocouple and core cooling commenced.
0917	Emergency downgraded to an Alert
0937	Spent Fuel Cooling Train 'A' restored to service
0942	Equipment Hatch latched in place
1029	RAT 'B' Energized
1030	Normal Chiller No. 1 placed in service
1038	ANA01 Reenergized to start River Water Pumps
1040	1BA03 Energized from 'B' RAT.
1059	NSCW Train B Pumps 2 + 4 started
1103	CCW PUMPS 2 + 4 started
1131	RHR PUMP 'B' Started
1158	RHR PUMP 'B' placed in service for shutdown cooling and RHR P Removed from cooling mode & placed on recirc.

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Control Log

№

Time Twenty Date 3-20-90

1155	D/G 1A placed back in remote
1157	1AA02 Alternate Incoming breaker closed in. Paralleling with
1211	D/G 1A Loaded to 6800 kw to be run for 45 minutes due to
	load operation
1234	OSP 14000-1 Complete + Sat. Day Shift
1241	Annunciators placed back on normal supply.
1247	Emergency Terminated
1324	D/G 1A TIE Breaker opened
1326	D/G 1A Shutdown
1405	D/G 1A placed in standby readiness
1416	RHR Train A Placed in shutdown cooling and RHR Train B re
	from shutdown cooling & placed on recirc.
1419	RHR pump B Stopped
1514	Normal Chillers aligned in sequence 2-1
1648	WJ
1657	WRB
1705	
LE 1651	Aux Steam Header Pressurized to 200 psig from Aux Boiler &
	valve to unit two is opened.
LE 1708	OSP 14915-1 Data sheet 9 complete & sat (Air or Sea Temp < 70°F)
1720	D/G 1A Declared Inoperable LCO No.
1741	RAT A Energized.
1812	RB
1820	MH
1831	Both Diesel fire water pumps and electric fire pump se
	and placed into Auto.
1855	Relieved by E. Brown LPVanier
1855	Night shift on duty. RO E Brown BOP L Hightow
	Mode 6; RHR 'A' In service, Vessel at mid loop,
	Source range reading 100 cps
1956	Aux boiler being shutdown, 1HS 5898 shut
2001	Tec Spec rounds for modes 5 ~~+6~~ 3-21-90 complete and SAT
2031	DG 1'A' in maintenance mode for moisture check
2032	Investigation by P.O. after CST H VAC degasifier P-2
	pressure reveals feed pump and fuel transfer pump off.
2058	1NB11 trouble annunciator and loss of air compressor
	Started air compressor #4
2119	Started DG 1A'

704783A MCB 129

Jorgia Power Company
ogtle Electric Generating Plant
Jnit 1 Control Log

№

Time	Tuesday Date 3-20-90
2122	DG 1A' output breaker shut and sync to 1AA02
2128	Started air comp #2 because of vibration on AC #4
2129	Stopped air comp #4
2153	Alternate feeder to 1AA02 (breaker #1) opened and 1AA02 being powered by DG 1A
2201	Normal feeder to 1AA02 closed in (1AA02 breaker #5)
2205	DG 1'A output breaker opened
2206	DG 1A' shutdown
2223	DG 1'A' started
2228	DG 1'A' secured
2233	DG 1'A' started
LE 2227	Temperature rounds complete and SAT (OSP 14001-1)
2250	Tygon tube watch reduced from continuous to every 4 hours
2254	DG 1'A' secured
2400	Last entry of the day

WB

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Shift Supervisor Log

05-3-28-90

Nº 5

Time | Date 3-20-90

0000	New day - same conditions as before
0017	OSP 14005-1 Shutdown Margin Calculation for Mo. entry complete & sat.
0230	JCR
0301	18 mo. Calibration on 1RE-003 per 43690-1 comp. &
0355	OSP 14801-1 NSCW XFR Pump IST complete & sat.
0411	OSP 14001-1 Shift Area Temperature log complete & sat. for 0400 hours.
0456	JDH
0502	DAC
0507	CBS
0546	Relieved by Bruce Snider David T. Woodfin Jr.
0623	OSP 14811-1 'DATE + Diesel Check Valve IST' review complete & SAT for A train
0720	Mode 6

SHIFT COMPLEMENT (UNIT #1) DATE: 3-20-90

OS-SS	Hopkins	RO	Kasner	FIRE TEAM	
UNIT SS	Snider	BOP	Humphrey	LEADER	Cheatham
SUPPORT SS	Clayton	ABO	Grady		Grant
STA FUNCTION	Snider	OAO	Whitmire		Barnaby
SHIFT CLERK	Jenkins	TBO	Jackson		Jackson
RWO	Morgan	CBO	Gordon		Gordon
ACO	Hutchinson				
OTHERS					

0740	Authorized 24625-1 'RE-006' ACOT
0820	Loss of "A" RAT - power to AA02 lost - only RH [illegible] A D/G started - then tripped on ~~4~~ [illegible] AOP 18021-1 & 18019-1
0841	D/G 1A auto started by resetting sequencer. Tripped on low jacket water press
0856	D/G 1A locally emergency started, tied to bus automatically
0859	Site area emergency declared for Unit 1 - loss power > 15 min - loss of offsite & onsite power
0900	RHR pump 'A' started - core exit thermo @
0902	Commenced cooling core via A RHR.
0913	Emergency notification complete
0915	G. Bockhold relieves T. Hopkins as E.D.
0917	Emerg. downgraded to alert

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Shift Supervisor Log

№ 5

Time 1/CUM — Date 3-20-90

0924	S/G manways removed
0937	"A" SFPC cooling restored
0946	Equipment hatch bolted
1003	Air lock functional
1029	Power restored to "B" RAT
1040	1BA03 energized from normal source
1042	"B" train AC's energized
1136	"B" RHR started & placed in service. "A" on miniflo
1157	Paralleled "A" D/G & AA02
1211	Loaded A D/G to 6800 MWe for 4 min
1247	Emergency terminated
1248	OSP 14001-1 Temp Rounds reviewed SAT for 1...
1248	OSP 14000-1 "Tech Spec Rounds" reviewed SAT for ... B only.
1326	D/G A unloaded from grid & secured in standby
1419	"B" RHR on line, "A" train secured
1520	OSP 14225-1 "Spec. Weekly Surv. Log" reviewed complete SAT.
1603	OSP 14001-1 Temp Rounds reviewed SAT for 1600 only
1640	D/G "A" standby checklist reviewed SAT
1650	ERB
1705	~~AA25~~
1715	
1720	Entered LCO 1-90-151 on A D/G & B D/G ...
1741	Energized "A" RAT
1824	Relieved by B Diehl Bruce Snider
1825	No further entries this page

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Shift Supervisor Log

No. 5

Time | Date 3-20-90

1845 NIGHT SHIFT ON ~~[illegible]~~

SHIFT COMPLEMENT (UNIT #1) DATE: 3-20-90

OSOS	CANTRELL	RO	BROWN	FIRE TEAM	
UNIT SS	DIEHL	BOP	HIGHTOWER	LEADER	BALLEGEAR
SUPPORT SS	~~[illegible]~~ BALLEGEAR	ABO	BAKEHUD		MCMAIOR
STA FUNCTION	CARTER	OAO	SHARKEY		CRADA
SHIFT CLERK	MORRIS	TBO	CRADA		MORTON
RWO	OLV FORTNEY	CBO	MCBRIDE		BEMAR
	AUX WILLEY				
OTHERS	DEKAD				

Plant Status
Rx Pwr 100 Cps
Tavg 99 °F
RCS Cb 2457 ppm
Mode 6 Refuel or
not fully tentioned
Equipment out of Se
① Trn"B" FHB Exh Filter
② 1DDA
③ NSCW Pump #6
④ CCP "A"
⑤ 1DD1
⑥ Trn"B" ESF Chiller
⑦ Trn"B" CREFS
⑧ D/G 1B
⑨ D/G 1A
⑩ Trn"A" SSPS in TE
Trn"B" SSPS out all
⑪ BAST Cb low
⑫ ARRLXTL #7B 3.
⑬ Trn"B" Cnmt Cooler
⑭ RAT "B" supplying
1AA02 & 1BA03

1849 Authorized ACOT 24548-C on AARC1119 and 2455
on AARC1112, Enter LCO 1-90-299 I

1900 Authorized MWO 19000740 on NSCW Trn"B" level
~~[illegible]~~ Inge 12-1601 [redacted]

2235 OS[redacted]001-1 Area Temp Rounds reviewed
COMPLETE & SAT

2335 1RE0014 isolated by clearance 19000371
rendering it INOPERABLE Enter T.S. Action
3.3.3.9 Action 37; no releases in progress
at this time and Al Duval of Chem
notified of 1RE0014 INOPERABILITY & requirement
of T.S. 3.3.3.9 Action 37 for sampling releases. D.C.
1-90-126 written

2400 END OF DAY NO FURTHER ENTRIES

Unit 1 Control Building Operator Log — 05-3-29-90 — 002199

Date 3-20-90

Time	
0001	New DAY.
0625	Bennie White relieved by W. L. [illegible] — [illegible]
	WLB
0859	Site area emergency declared due to loss of off site power and failure of diesel Gen 1A to load.
0917	Site area emergency ~~degraded~~ reduced to alert emergency due to startup and loading of diesel Gen 1A.
1247	Emergency status over.
1445	After several attempts to restart Normal chiller #3, Placed Chiller #1 into service. Shutdown Chiller #1 and realigned the chillers for a 2-1 sequence. Started normal chiller #2 with the sequence switch in N-3. In order to maintain condensor pressure above 2 psi had to place normal chiller #2 in the cold weather mode of operation.
1730	Station Status - Normal Chiller #2
	Normal chilled water pumps 2+3
	TSC chilled water pump
	CAS chilled water pump
	Battery chargers 1AD1CA + 1AD1CB on Equalize.
	D train batteries out of service.
1840	Relieved by [illegible] — WLB
1830	[redacted] on As CBO
1930	[redacted]D
2235	[redacted]te equipment status: Normal Chiller #2
	Normal chill wtr pumps 2+3
2359	End of Day

05-3-30-90

№ 2322

Turbine Building Operating Log

Time Date 3-20-90

0001 New Day
0220 Started pumping the TB-DDT to the WWRB using alternate pump - per procedure 13211-1
0445 Stopped pumping the TB-DDT to the WWRB
~~1755~~ 0555 Equipment in service - A/C 2+3, instrument air dryer 5C2.
monitor EHC temp. - heaters are cut off + temp. is about 100°.
06:22
~~0622~~ Relieved by J. Jackson ——— LAA
06:22 J. Jackson on as TBO #1 - Reviewed Rounds & Logs for 5 days
0644 Cl. 190154?? Removed + IND201 Close ??
08:20 Assisted U-1 OAO at 1A Diesel after trip on U-2
12:21 Reset Breaker #9 on 1NBL-02 to Restore lighting back to Level 1 Southside of Turbine Bldg.
12:40 Turned on heater to EHC skid to raise temp
14:48 Racked out Breaker 1NA04-15 per C.R.
14:55 Racked Breaker 1NA04-15 back in per C.R.
16:??10 Started Rounds
17:35 ~~Start~~ Finished Rounds
18:20 J. Jackson Relieved by Robert Cook
1821 R. Cook on as U1TBO, rounds reviewed; logs reviewed for past 5 days
2058 A/C #2 tripped on high discharge temp, started #4
2138 A/C #4 tripped on high vibration, started #2, reset #4 high
[redacted]
2305 [redacted]
2358 [redacted] Building status;
[redacted] #2,3
[redacted] - I/A #2 ✓
2359 End of day
No NA
NA
NA
3-21-90
D ??? RC

05-3-31-90

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Auxiliary Building Operating Log

№ 2226

Time	Date 3.20.90
0001	New Day & Equipt Status: CCW pmp # 1,2,3,4
	RHR pmp "A"
	RMWST pmp #1
	Aux Bldg Cont Exh Units #1:2
0300	Piping Leak Test "A" (14515-1)
0330	BAST pmp and Check Vlv Test pmp #6 (14811-1)
0612	~~N.J. Kirkham Relieved by~~ DL Gandy NJB.
	DLG
0620	Reviewed logs for past 5 days.
0645	Rounds started
0818	All Equipment tripped due to loss of offsite power.
0855	Rounds Complete All equip. off due to loss of off site power.
0856	"A" diesel emergency started
0857	CCW pmp # 1 & 3 started bldg A
0859	"Site Area emergency" declared
0900	RHR pmp "A" started
0917	Emergency down graded to an "Alert area emergency"
1103	CCW pmp # 2+4 started
1131	RHR pmp "B" started
1138	RHR pmp "B" in service. "A" running on recirc.
1247	Emergency terminated
1416	RHR pmp "A" in service. "B" running on recirc.
1419	RHR pmp "B" stopped.
1800	Equip. status: CCW pmp # 1,2,3+4
	[redacted] Aux Bldg Exh unit #1+2
	"RHR" pmp "A"
1823	[redacted] relieved by NJ Kirkham DG
	NJK
0830	Began Rounds
2330	Completed Rounds
2357	End of Day

NJK

05-3-32-90

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Auxiliary Building Radwaste Operator Log

№ 2358

Date 3/20/90

Time	
0002	NEW DAY
0009	Starting Rounds
0047	Rounds Complete
0220	U1 Control Room is Draining RCS to WHUT
0400	Starting Rounds
0426	Rounds Complete
0427	Returning M.D.
0755	Rounds, U2 rx trip
0956	U1 SFP pump tripped due to loss of power
~~0900~~ 1300	Site general Emergency was declared @ 0900, rounds are now complete, all equipment same status except "A" trn SFP now in service, B train taken out per control room
1352	Placed info tags on RCDT HS's due to vapor off a pump casing drain is open in CNMT. [redacted]
1358	A trn purification in service, informed SS (AKS-SS)
1405	Working on Waste gas purification
1620	Rounds, waiting on permit for WMT009, WMT012 still on recirc thru A+B
1710	Relieved by
2010	Rounds started
1930	Made containment entry for RCDT lineup.
2049	WMT #12 on recirc lab notified - Hamilton
2232	Processing WMT #9 → WMT #13
2359	End of [redacted]

Georgia Power Company
Vogtle Electric Generating Plant
Unit 1 Outside Area Operating Log

05-3-33-90

№ 2339
RLM

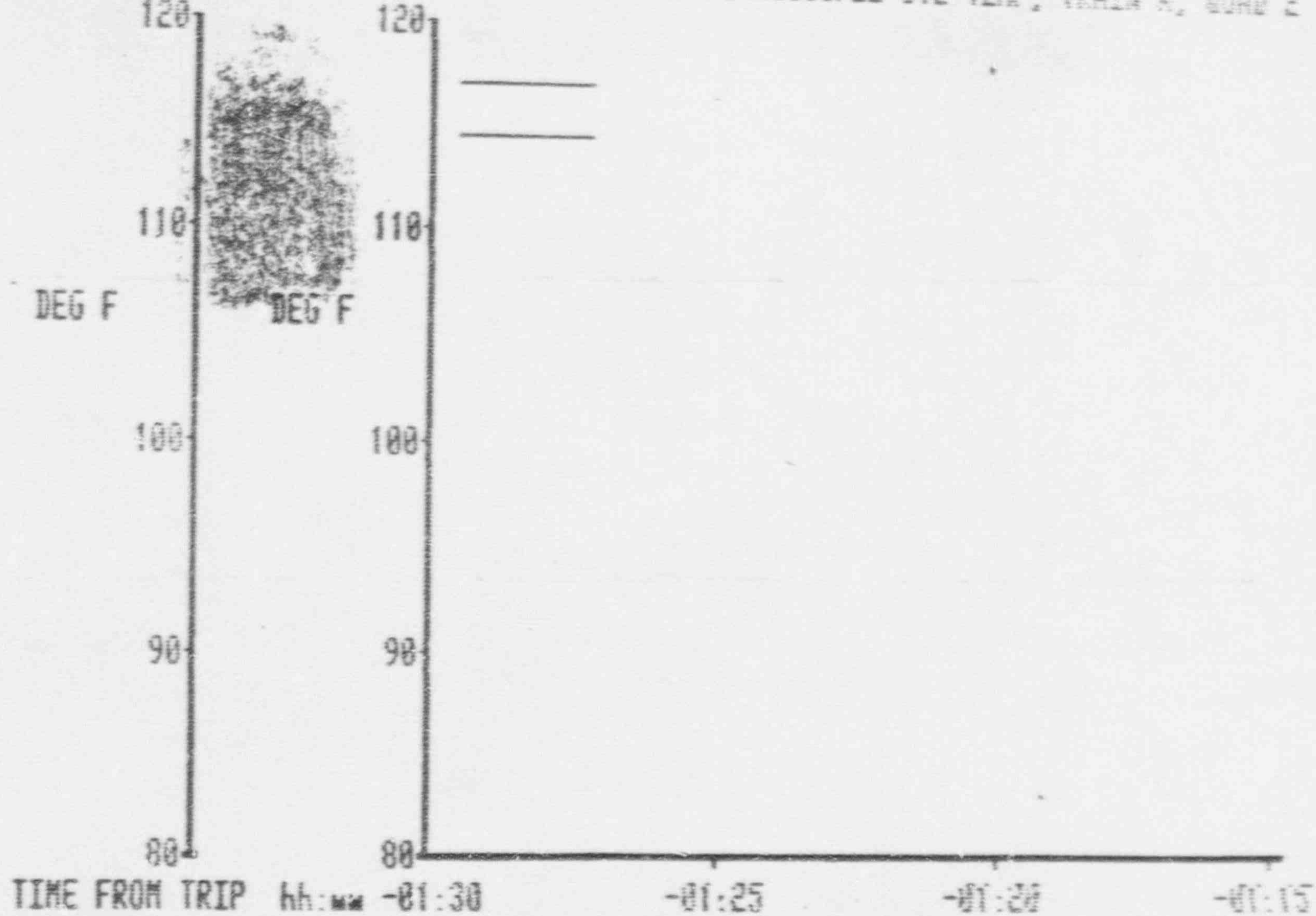
Time | Date 20 March 90

Time	
0000	NEW Day
0030	Rounds completed
0330 / 0030	Completed surv. per proc. 14801-1 on NSCW transfer pump 8 A. train
0410	Stopped NWWRB
0600	Equipment Status: NSCW pmps 1,2,3,4
	"B" D/G tagged out
	"B" D/G, A/C 1&2 tagged out
	'B' MDAFW pmp taggedout
	"B" RAT tagged out
	TDAFW tagged out
	Aux BLR [illegible] Hot stand by
0622	Relieved by [illegible]
0720	Pressurized N2 header to 700 psig for 1-2 accum.
0820	LOSP. DG1A started and trip
0841	DG1A started and tripped
0856	DG1A started by emergency b[illegible] ss and continued to run.
1020	N2 header isolated
1036	River water pumps started
1155	DG1A placed in remote
1326	DG1A stopped
1430	Started pumping down U1 WWRB
1824	Relieved by [illegible]
1828	Logs reviewed last 5 days rounds reviewed
1832	[illegible] fire water pmp 1&2 and electric fire water pmp stop
1952	[illegible] shut down Aux Blr
2110	Aux Blr in Hot stand by
2031	D/G 1A [illegible] started
2119	Started D/G 1A
2206	Stop D/G 1A
2223	D/G 1/A Started
2228	D/G 1/A Stop
2238	D/G 1A Started
2254	DG 1A Stop
2359	Last Entry End of Day

RX TRIP
POST TRIP REVIEW
TRIP@ 10:14:59 03/20/90

UNIT 1 03/20/90 11:41:14 MODE 0

T5033 INCORE THERMOCOUPLE EX2 TEMP, TRAIN A, QUAD 3
T5041 INCORE THERMOCOUPLE JX2 TEMP, TRAIN B, QUAD 2

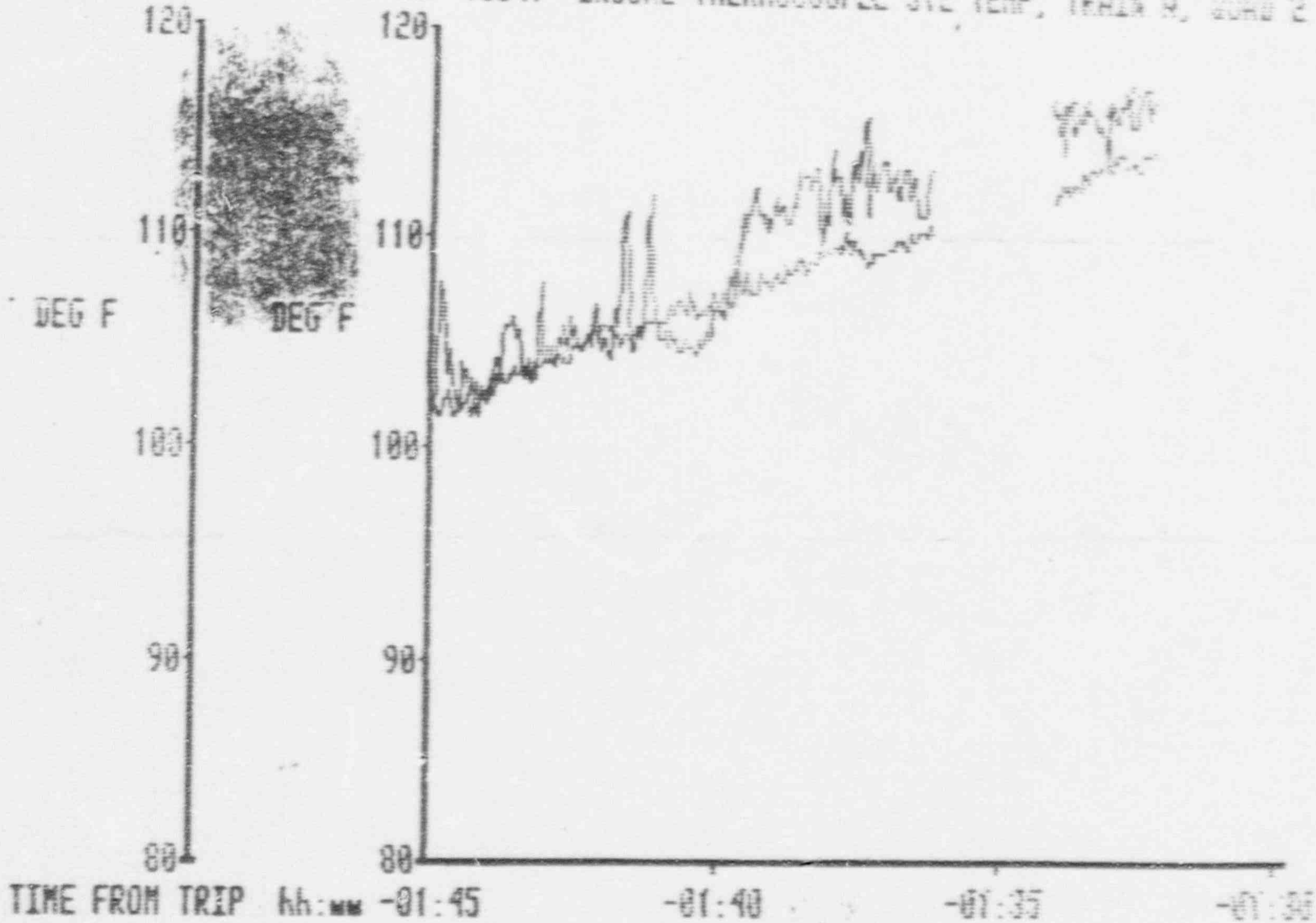


05-3-34-90

X TRIP
POST TRIP REVIEW
TRIP@ 10:14:59 03/20/90

UNIT 1 03/20/90 11:48:56 MODE

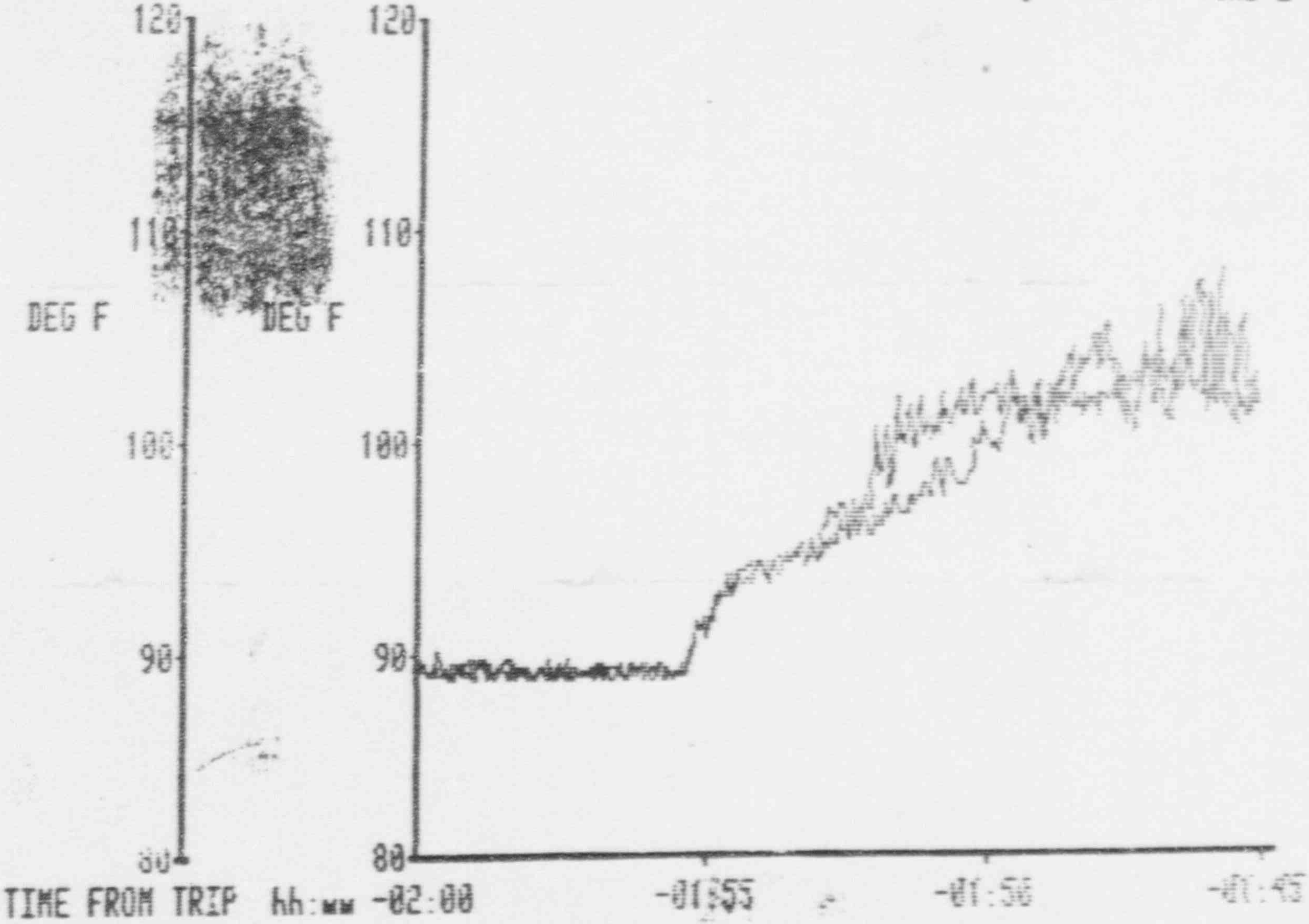
T5033 INCORE THERMOCOUPLE E12 TEMP, TRAIN A, QUAD 1
T5041 INCORE THERMOCOUPLE J12 TEMP, TRAIN B, QUAD 2



RX TRIP UNIT 1

POST TRIP REVIEW T5033 INCORE THERMOCOUPLE E12 TEMP, TRAIN A

TRIP@ 10:14:59 03/20/90 T5041 INCORE THERMOCOUPLE J12 TEMP, TRAIN A



23 MAR 90

OS-3-35-90

0800 :	J. Swartzwelder	OPNS MGR
0900 :	D.R. VINEYARD	SS Outage Support
0930 :	P.A. HUMPHREY	BOP Operator
1000 :	L.P. VANNIER	Po
1030 :	R.B. SNIDER	Unit Shift Supvr
1100 :	K.A. JOHNS	Extra CRO (CR/DG)
1130 :	J.W. ACREE DG	Shift Supvr (Outage Support)
1300 :	R.K. POPE Sequencer	
1330 :	D. DELOACH	PEO's EDG — Also at 1530 in the D/G 1A Room
1400 :	S. WHITMAN	
1430 :	J.P. CASH	Opers Superintendent/TSC
1500 :	W.L. B[illegible]ER	" " "
(? time) ~1730 :	J.T. HET[illegible]	Senior SRO (Shift Superintendent

CR or TSC?

05-3-36-90

E P People Interviewed - AIT 3/24/90

1. Jim Roberts EPC @ various Times notes & contained in Results
2. Herb Whitener NRC RII inspector onsite 3/20/90 during event
3. Ed. Kazinsky CR Layout Drawings
4. Pauline Jenkins Communicator
5. Theresa Jones "
6. Jimmy Cash Ops Supt.
7. Wm. Burmeister Plant Duty Mgr.
8. Unnammed Sampling of Service Bldg Employees
9. John Hopkins - Incomplete
10. Capt. Wm. Johnson - Security
11. Lt. Wm. Stewart

See index
for TID

05-3-37-90

Warren Lyon - Status report 3/24 PM

- Item 1. Background material from licensee ~90% complete. Not reviewed for adequacy. I will be asking licensee for additional detail, which is to be determined

- Item 7. • Interviewed ~ 12 people formally, + ~6 during walk-thru activities.
  - <u>Actual</u> event was not a significant risk of core melt or release. Preliminary estimate - 1 to 2 days with little operator action and no AC power restoration → no fuel damage. Need further study to confirm. Options existed to provide more time
  - <u>Potential</u> problems exist had several conditions been different
  - Procedures strengths and weaknesses have been identified - evaluation continuing. Generic implications.
  - Understanding - same as procedures
  - Containment walk-thru, control room walk-thru on mid-loop instrumentation and containment/ RCS closure activities completed.

1.

STATUS REGADING AIT CHARTER ITEM NO. 3

05-3-38-90

CHARTER ITEM DESCRIPTION

- Identify any procedural requirements and/or deficiencies associated with the fuel truck's movement in the protected area.
- Evaluate the potential for fuel detonation in this scenario.

ACTIVITIES COMPLETED

- Interviewed driver of fuel truck involved in event.
- Interviewed security officer who escorted fuel truck driver.
- Interviewed the two primary supervisors of security regarding access and control of vehicles in the protected area.

- Interviewed the licensee's person responsible for root cause related to the fuel truck driver initiating the event.
- Interviewed licensee's safety advisor OSHA requirements and licensee's policy regarding a ground guide when a vehicle is ~~backup~~ backing up.
- Obtained drug and alcohol results completed on the fuel truck driver.
- Obtained OSHA standards related to the truck being in the protected area.
- Obtained the inventory for the fuel truck at the time of the event.

o Obtained plant-specific policies concerning site access and control of vehicles and flammables.

o Requested licensee to provide calculations relevant to the detonation issue (that is, probability and damage effects),

o Obtained Vogtle's safety handbook, indicating when a truck driver is required to have a ground guide.

o Reviewed and obtained copies of the fuel truck driver's and security officer's statements about the event, completed shortly after the event.

SUMMARY OF PRELIMINARY FINDINGS AND CONCLUSIONS

- Procedures do exist for access and control of trucks and flammables. (specifically, location and movement) Regarding control of vehicles once they enter the protected area, the procedures are inadequate. No corporate policy exists in this area.
- Given various flammables on the fuel truck and the 230KV wire, the potential for detonation existed.
- Regarding fitness for duty, the results of the alcohol and drug tests completed on the truck driver were negative

o Based on Vogtle safety standard, the truck driver was required to have a ground guide because (a) he was backing up and (b) his rear vision was not clear.

o It appears that some OSHA standards may have been violated.

o From a human factors perspective, the truck driver was performing his refueling function atypically. Normally, he would back into the refueling area of the switchyard. Prior to the event, he drove into the subject area.

05-3-39-90

EP Summary (#4)

3/24/90

- Notification of the Site Area Emergency was significantly delayed to the State of Ga (≅ 1 hr) and local Ga County (Burke County). This was due in part to a failure of the Emergency Notification Network (ENN). A back up system BUENN only has the State of S Carolina and counties of SC on the system. The State of Ga and Burke County were notified using commercial phone. Loss of Power to the ENN in CR rendered it out of service. The BUENN is powered from the Security Diesel and worked. The TSC copy of the ENN would have worked since it is located in the TSC and was powered from the security diesel. The loss of power also affected the CR ability to make Xerox copies thus the TSC did not have a copy of message #1 the SAE declaration
- Classification of the event was delayed due to rapidly changing events. The unit 2 trip and the short lived start up of the Diesel on Unit 1 contributed to some of the delay. The person making the classification opted to go for SAE and by-pass NOUE or alert because the Diesel tripped off and was not relying at that time.
- The ability to assess actual or potential offsite consequences from the event was severely limited. Meteorological Data was lost in the Control Room EPF computer and the PERMS (vent monitors) were also lost. The effect if a release was on going as that to [illegible] dose projection would have been questionable. A person was dispatched to the meteorological Tower when it was recognized that information was unavailable about 1 hr after event.
- Activation of Emergency Response Facilities occurred within the time frame of the approved plan; however close to the end limit. One wonders what the results would have been at 2 AM if the event occurred then.
- Accountability was not achieved by event termination. There were still 49 people unaccounted. People were confused as to where they should go and what they should do. Some in the cafeteria took advantage of "free food" when the cooks and other non essential cafeteria people left. People exiting the gate told the guard they were to go and be deactivated. Security people expressed a real disappointment with how people performed. Security was never officially informed of the event. The PA in the SAS was inoperable. Training Security were never [illegible] to perform accountability.
- Interviews with CR communicators and review of training records for these people who were on shift indicated they performed adequately. They were experienced having participated in actual NOUE notifications and drills [illegible].

[illegible]

05-3-40-90

VOGTLE AIT Charter Item 7.

"Evaluate the performance of the control room operators and other key plant personnel who responded to the event, to include at least RCS heatup and potential containment challenges. Conduct interviews as necessary to ascertain both strengths and weaknesses, on personnel training, adequacy of procedures, management control and communications during the event."

Progress:

3-22-90

Made arrangements to interview the operations personnel that were involved in the event. These included the control room operators and shift supervisor present in the control room, the unit supervisors and shift superintendent, and other shift supervisors who were present because of the ongoing outage work and that took part in the event. We stated our need to speak with licensee personnel (1) who were responsible for maintenance work prior to and during the event and (2) who were responsible for training, particularly in loss of power and loss of RHR events.

Inspected the switchyard location where the fuel truck collided with the power line support. Inspected the unit 1 "A" diesel generator room.

3-23-90

Inspected the control room and instrumentation used during the event.

Conducted interviews of the following licensee personnel:

D.R. Vineyard - SS outage support
P.A. Humphrey - BOP control room operator
L.P. Nannier - Reactor operator
R.B. Snider - Unit shift supervisor
K.A. Johns - Extra CRO (CR/DG communications)
J.W. Acree - Shift supervisor (outage support)
R.K. Pope - " " " "
D. DeLoach - Plant equipment operator (diesel generator)
S. Whitman - " " " " "
J.P. Cash - Operations superintendent/TSC
W.L. Burmeister - " " "
J.D. Hopkins - Senior SRO (shift superintendent)

Inspected the unit 1 "A" diesel generator room with the two PEO's that had been interviewed.

05-04-90

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05-04-1-90

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CCMiller
3/24/90

EVALUATION OF POTENTIAL EXPLOSION IN THE VOGTLE SWITCHYARD

DESCRIPTION:

This study evaluates the impact of a support services vehicle in the switchyard either burning or exploding. This truck is postulated to carry materials which are normally used in servicing motorized equipment. A typical support services vehicle is assumed to carry the following materials:

Gasoline	100 Gal.
Diesel Fuel	300 Gal.
Waste Oil	100 Gal.
Water	100 Gal.
Antifreeze	50 Gal.
#68 Hydraulic Fluid	100 Gal.
Transmission Fluid	100 Gal.
Grease	50 Gal.
Motor Oil	100 Gal.
Gear Oil	100 Gal.
#32 Hydraulic Oil	50 Gal.

Two scenarios are evaluated. The first scenario places the typical vehicle at the same location as the truck which was involved in the March 20, 1990 event. The second scenario places the typical vehicle in the electrically worst case location of the switchyard (i.e. potential simultaneous damage to the greatest number of electrical trains). For each scenario the following events are considered.

FIRE All combustible materials on the typical vehicle are consumed in a fire

EXPLOSION
1. Realistic case - 5 gallons of gasoline vapor in free air explosion with fire of remaining material.
2. Worst Case - 100 gallon gasoline tank full of vapor at the upper combustible limit (approx. 8 gal. of vaporized gasoline) explosion without tank mitigation of blast with fire of remaining material.

For the worst case event the evaluation established a defined area of affect as shown on the attached sketch #1. The evaluation then considered the damage to equipment located within these areas and determined the impact to plant capabilities, and analyzed the ability to mitigate the effects of the damage and bring the plant to a safe orderly shutdown in accordance with the design bases. With the exception of the March 20, 1990 event the evaluation considers that the plant is operating at 100% power in its normal design configuration. All equipment is considered operational prior to the event.

CONCLUSIONS:

The evaluation concludes that for each postulated event the protection of the health and safety of the public is maintained and that the plant can be shutdown in an orderly manner as previously analyzed in the design bases of the plant. A summary of the evaluation for each event is attached.

EVENT EVALUATION # 1

DESCRIPTION:

- Specified truck located at site of March 20, 1990 event (see sketch #1)
- Sparks from damaged cables ignite combustible material on truck enveloping the truck and load in flames.
- Combustible material is assumed to be released and oxidized on location.
- Combustible material quantities are assumed to be actual truck inventories (see attachment #1)

RESULTS:

- The total BTUs released from fire =103,451,800
- Phase 3 conductor is approximately 16 feet above truck bed (fire base). Full effect of heat from fire will be radiated to conductor/insulator. (Flame height approximately 28 ft. based on data presented for gasoline in the Handbook of Fire Protection Engineering by the SFPE.)
- Offsite source lines are approximately 50 ft. above truck bed (fire base) and would be effected by heat from fire.
- Protective relays from offsite source 1 would clear phase to ground fault.

The following equipment would be lost:

Offsite source #1 - RAT 1NXRA and 2NXRB

ANALYSIS OF RESULTS:

- No impact to Safe Shutdown of plant due to availability of second source of offsite power
- Protective relays would clear faults.

EVENT EVALUATION # 2

DESCRIPTION:

- Typical vehicle located at site of March 20, 1990 event (see sketch #1)
- 5 gallon spill vaporized locally
- Sparks from damaged cables ignite vaporized gasoline in a local free air explosion of spilled materials and fire involves remaining combustible materials on the vehicle.
- Combustible materials, except 5 gallons of spilled gasoline, is assumed to oxidize on location.
- Combustible material quantities are assumed to be actual vehicle inventories described in event #1.
- Safe standoff distances are derived from NUREG/CR-2462, Capacity of Nuclear Power Plant Structures to Resist Blast Loadings, September 1983.

RESULTS:

- The 5 gallon gasoline free air explosion is approximately equivalent to 75 pounds of TNT.
- The explosion evaluation is enveloped by the event evaluation #3 explosion.
- The fire damage is enveloped by the event evaluation #1 and #3 fires.
- Event evaluation #3 results in greater potential to damage equipment and is the controlling event based on loss of both off-site power sources.

ANALYSIS OF RESULTS:

See event evaluation #3

EVENT EVALUATION #3

DESCRIPTION:

- Typical vehicle located at the site of the March 20, 1990 event (see sketch #1)
- Gasoline tank filled with gasoline vapor at the maximum combustible limits.
- Combustible material quantities are assumed to be actual truck inventories-see event evaluation #1
- Sparks from damaged cables ignite gasoline vapor resulting in an explosion
- No credit is taken for mitigating effects of tank wall on explosion area of effect
- Actual inventories (see event evaluation #1) of remaining combustible materials are assumed to burn locally
- Safe standoff distances are derived from NUREG/CR-2462, Capacity Of Nuclear Power Plant Structures To Resist Blast Loadings, September 1983.

RESULTS:

- The 100 gallon gasoline tank filled with vapor at the upper combustible limit yields approximately eight gallons of gasoline or an equivalent 135 pounds of TNT.
- Safe standoff distance is approximately 133 feet for a structure with ductility of 3.0 and f_{μ} of 54.
- Reserve auxiliary transformers (RAT) 1NXRA and 2NXRB are located within the safe standoff distance and are thus considered damaged resulting in loss of off-site power source #1 to Units 1 and 2.
- Fire damage is enveloped by event evalution #1 and results in no equipment losses beyond those of the initiating event or the resulting postulated explosion.

ANALYSIS OF RESULTS:

This event is enveloped by event evaluation #6. See analysis of results-event evaluation #6.

EVENT EVALUATION #4

DESCRIPTION:

- Same as event evaluation #1 except as follows.
- Combustible material quantities are as specified for a typical service vehicle in the evaluation description.
- Typical vehicle located as shown on sketch #1 "Worst Case" location.

RESULTS:

- Same as event evaluation #1 except for slight higher BTU rates.
- Depending on fire pattern both off-sight power sources could be lost via fire in trenches and damage to overhead lines.

ANALYSIS OF RESULTS:

- See event evaluation #6. Event evaluation #6 enveloping of worst case events.

EVENT EVALUATION #5

DESCRIPTION:

- Same as event evaluation #2 except as follows.
- Combustible material quantities are as specified for the typical service vehicle in the evaluation description.
- Typical vehicle located at worst case location as shown on sketch #1.

RESULTS:

- The 5 gallon free air explosion is approximately equivalent to 75 pounds of TNT.
- The explosion evaluation is enveloped by event evaluations #4 explosion.
- The fire damage is enveloped by event evaluations #4 and #6 fires.
- Event evaluation #6 results in greater potential to damage equipment and is the controlling worst case location event based on loss of both off-site power sources.

ANALYSIS OF RESULTS:

See event evaluation #6.

EVENT EVALUATION #6

DESCRIPTION:

- Same as event evaluation #3 except as follows.
- Combustible quantities are as specified for a typical service vehicle in the evaluation description.
- Typical vehicle located at worst case location as shown on sketch #1.

RESULTS:

- Explosion approximately equivalent to 135 pounds of TNT.
- Safe standoff 133 Ft. for μ =30 and $f\mu$ =54.
- All equipment located within safe standoff distance is assumed damaged.
- Insulators located within the safe standoff distance are assumed to fail resulting in the loss of electrical circuits (lines) due to phase to ground faults being cleared by the respective protective relaying systems.
- The following equipment systems could be taken out of service by the operation of the protective relaying:
  - off-site source #1 - RAT 1NXRA and RAT 2NXRB
  - off-site source #2 - RAT 1NXRB and RAT 2NXRA
  - Unit 1 Main Transformer - UATS
  - Unit 2 Main Transformer - UATS
- The fire damage is enveloped by event evaluation #4 and the explosion damage.

ANALYSIS OF RESULTS:

Failure modes and effects analysis (FSAR Table.3.1-3) of the loss of preferred power from the off-site power supply system (off-site source 1 or 2) indicates no effect on system safety function capability. A momentary loss of power will be seen by the safety related equipment as th associated diesel generator is started by the related sequence.

Loss of voltage (loss of the preferred power source) is sensed by four undervoltage devices. Two-out-of-four undervoltage logic trip the incoming preferred power source to isolate the safety systems, start the diesel generator and sequence the safety related loads on to the electrical distribution system. Hence protecting the health and safety of the public through an orderly plant shutdown in accordance plant design bases.

ATTACHMENT #1

Liquid	Gallons	lb/gal	Lbs.	Btu/lb	Btu's
Gasoline	94	5.7	535.8	21000	11251800
Diesel Fuel	264	7.3	1927.2	20000	38544000
Waste Oil (Tank Empty)	0	7.6	0	20000	0
Water	40	N/A	0	0	0
Antifreeze	15	N/A	0	0	0
#68 Hydraulic Fluid	100	7.6	760	20000	15200000
Transmission Fluid	80	7.6	608	20000	12160000
Grease	18	7.6	136.8	20000	2736000
Motor Oil	65	7.6	494	20000	9880000
Gear Oil	65	7.6	494	20000	9880000
#32 Hydraulic Oil	25	7.6	190	20000	3800000
			Total Btu's Released		103451800

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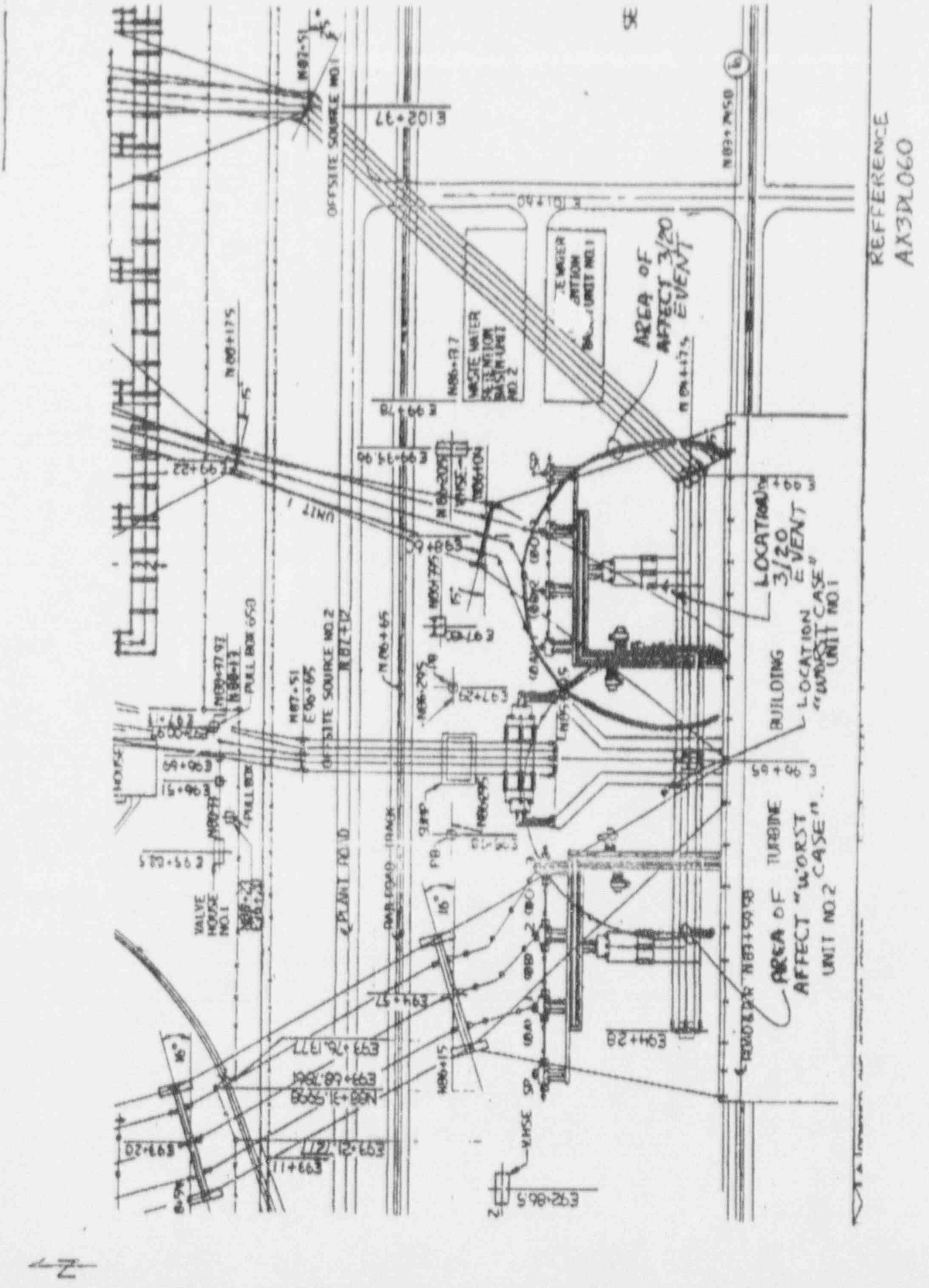

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EVENT EVALUATION #2

DESCRIPTION:

- Typical vehicle located at site of March 20, 1990 event (see sketch #2)
- 5 gallon spill vaporized locally
- Sparks from damaged cables ignite vaporized gasoline in a local free air explosion of spilled materials and fire involves remaining combustible materials on the vehicle
- Combustible materials, except 5 gallons of spilled gasoline, is assumed to oxidize on location
- Combustible material quantities are assumed to be actual vehicle inventories described in event #1
- Safe standoff distances are derived from NUREG/CR-2462, Capacity of Nuclear Power Plant Structures to Resist Blast Loadings, September 1983

Results

- The 5 gallon gasoline free air explosion is approximately equivalent to 75 pounds of TNT
- Safe standoff distance is approximately 108 ft for a structure with ductility of 3.0 and f_{μ} of 54
- Offsite source 1 which feeds reserve auxiliary transformers (RAT) 1NXRA and 2NXRB is located within the safe standoff distance and is thus considered damaged resulting in loss of off-site power source #1 to Units 1 and 2.
- The total BTUs released from fire = 103,451,800
- Phase 3 conductor is approximately 16 feet above truck bed (fire base). Full effect of heat from fire will be radiated to conductor/insulator. (Flame height approximately 28 feet based on data presented for gasoline in the Handbook of Fire Protection Engineering by the SFPE.)
- Offsite source lines are approximately 50 feet above truck bed (fire base) and would be effected by heat from fire.
- Protection relays from offsite source 1 would clear phase to ground fault.

The following equipment would be lost:

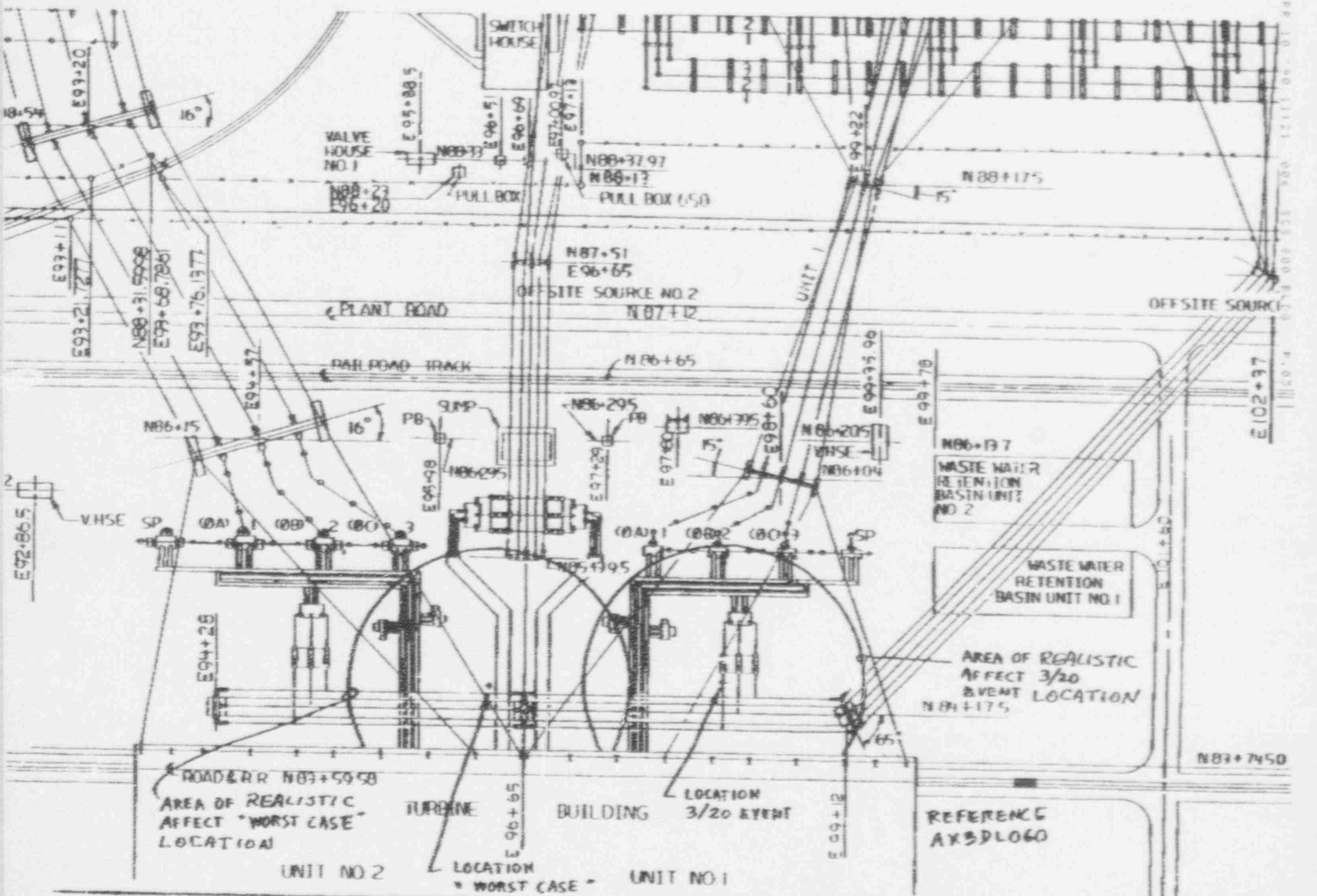
Offsite source #1 - RAT 1NXRA and 2NXRB

ANALYSIS OF RESULTS:

Failure modes and effects analysis (FSAR Table 3.1-3) of the loss of preferred power from the offsite power supply system (offsite source 1 or 2) indicates no effect on system safety function capability. A momentary loss of power will be seen by the safety related equipment as the associated diesel generator is started by the related sequence.

Loss of voltage (loss of the preferred power source) is sensed by four undervoltage devices. Two-out-of-four undervoltage logic trip the incoming preferred power source to isolate the safety systems, start the diesel generator and sequence the safety related loads on to the electrical distribution system. Hence protecting the health and safety of the public through an orderly plant shutdown in accordance plant design bases.

SKETCH 2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VALVE HOUSE NO.1
PULL BOX
PULL BOX 650
N88+23
E96+20
N88+37.97
N88+175
N87+51
E96+65
OFFSITE SOURCE NO.2
N87+12
PLANT ROAD
RAILROAD TRACK
N86+65
UNIT 1
OFFSITE SOURCE
SUMP
PB
N86+295
N86+15
N86+137
WASTE WATER RETENTION BASIN UNIT NO.2
WASTE WATER RETENTION BASIN UNIT NO.1
E102+37
E99+78
E99+35.96
V.HSE
SP
AREA OF REALISTIC AFFECT 3/20 EVENT LOCATION
N84+175
N83+7450
ROAD&RR N83+5958
AREA OF REALISTIC AFFECT "WORST CASE" LOCATION
TURBINE
BUILDING
LOCATION 3/20 EVENT
REFERENCE AXBDL060
UNIT NO.2
LOCATION "WORST CASE"
UNIT NO.1
E96+65
E99+12
E94+28
E92+86.5
E93+76.1377
E93+68.7861
E93+21.7277
E94+57
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15°
65°

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EVENT EVALUATION #2

DESCRIPTION:

- Typical vehicle located at site of March 20, 1990 event (see sketch #2)
- Combustible material quantities are assumed to be actual vehicle inventories described in attachment #1
- 5 gallon gasoline spill vaporized locally
- Sparks from damaged cables ignite vaporized gasoline in a local free air explosion and fire involves remaining combustible materials on the vehicle
- Combustible matarials, except 5 gallons of spilled gasoline, is assumed to oxidize on location
- Safe standoff distances are derived from NUREG/CR-2462, Capacity of Nuclear Power Plant Structures to Resist Blast Loadings, September 1983

Results

- The 5 gallon gasoline free air explosion is approximately equivalent to 75 pounds of TNT
- Safe standoff distance is approximately 108 ft for a structure with ductility of 3.0 and f_{α} of 54
- Offsite source 1 which feeds reserve auxiliary transformers (RAT) 1NXRA and 2NXRB is located within the safe standoff distance and is thus considered damaged resulting in loss of off-site power source #1 to Units 1 and 2.
- Reserve Auxiliary transformers (RAT) 1NXRA, Unit Auxiliary transformers (UAT) 1NXAA and 1NXAB, and Main Step-up transformers (MST) numbers 1, 2, and 3 are located within the safe standoff zone and are assumed damaged resulting in the loss of service of this equipment
- The total BTUs released from fire = 103,451,800
- Phase 3 conductor is approximately 16 feet above truck bed (fire base). Full effect of heat from fire will be radiated to conductor/insulator. (Flame height approximately 28 feet based on data presented for gasoline in the Handbook of Fire Protection Engineering by the SFPE.) This conductor is assumed to fail due to the fire.
- Offsite source #1 lines are approximately 50 feet above truck bed (fire base) and would be effected by heat from fire. The offsite source #1 is assumed to fail due to heat and/or arcing to ground through combustion gases
- Protection relays from offsite source 1 would clear phase to ground fault.

The following equipment would be assumed lost:

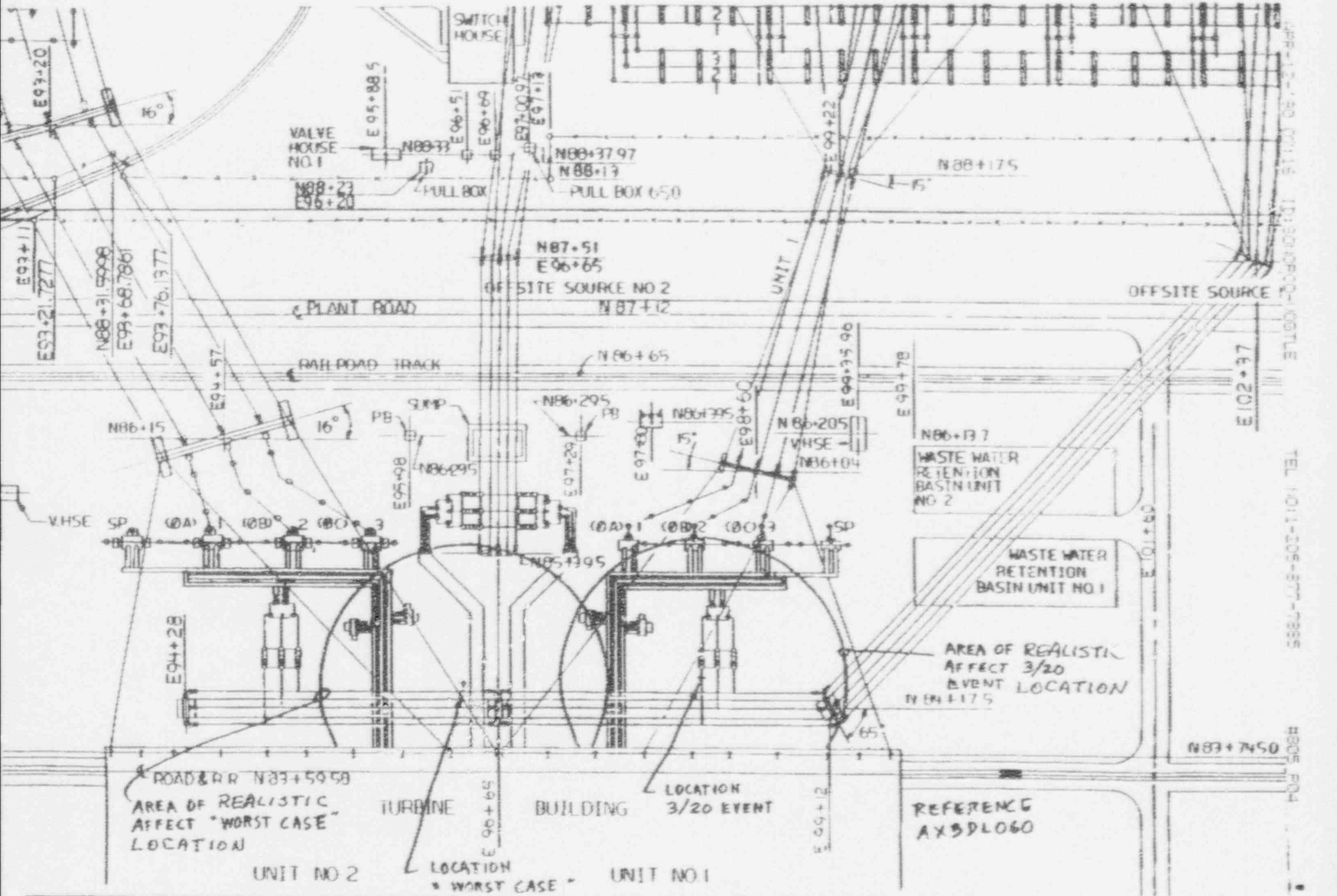
A. Offsite Source #1 Lines
B. RATs 1NXRA and 2NXRB
C. Unit 1 Main Step-up Transformers 1, 2 and 3
D. UATs 1NXAA and 1NXAB

ANALYSIS OF RESULTS:

Failure modes and effects analysis (FSAR Table 3.1-3) of the loss of preferred power from the offsite power supply system (offsite source 1 or 2) indicates no effect on system safety function capability. A momentary loss of power will be seen by the safety related equipment as the associated diesel generator is started by the related sequencer.

Loss of voltage (loss of the preferred power source) is sensed by four undervoltage devices. Two-out-of-four undervoltage logic trip the incoming preferred power source to isolate the safety systems, start the diesel generator and sequence the safety related loads on to the electrical distribution system, hence protecting the health and safety of the public through an orderly plant shutdown in accordance plant design bases.

SKETCH 2



SWITCH HOUSE
VALVE HOUSE NO.1
N88+33
PULL BOX
N88+23
E96+20
N88+37.97
N88+17
PULL BOX 650
N88+175
E99+22
E95+88.5
E96+51
E96+89
N87+51
E96+65
OFFSITE SOURCE NO 2
N87+12
OFFSITE SOURCE 1
UNIT 1
PLANT ROAD
RAILROAD TRACK
N86+65
E93+20
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PB
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E97+29
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N86+205
VHSE
N86+04
E99+35.96
E99+78
N86+13.7
WASTE WATER RETENTION BASIN UNIT NO 2
WASTE WATER RETENTION BASIN UNIT NO.1
E101+60
E102+37
V.HSE
SP
(ØA) 1
(ØB) 2
(ØC) 3
N85+395
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AREA OF REALISTIC AFFECT 3/20 EVENT LOCATION
N 84+175
65
N83+7450
ROAD&RR N83+59.50
AREA OF REALISTIC AFFECT "WORST CASE" LOCATION
TURBINE
BUILDING
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LOCATION 3/20 EVENT
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REFERENCE AX3DL060
UNIT NO 2
UNIT NO.1