Duke Energy

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August 21, 2002

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
Emergency Plan Implementing Procedures Manual
Volume B, Revision 2002-07

Please find attached for your use and review copies of the revision to the Oconee Nuclear Station Emergency Plan:

Volume B Revision 2002-07 August 2002

This revision is being submitted in accordance with 10 CFR 50-54(q) and does not decrease the effectiveness of the Emergency Plan or the Emergency Plan Implementing Procedures.

Any questions or concerns pertaining to this revision please call Rodney Brown, Emergency Planning Manager at 864-885-3301.

By copy of this letter, two copies of this revision are being provided to the NRC, Region II, Atlanta, Georgia.

Very truly yours,

W. R. McCollum, Jr.
VP, Oconee Nuclear Site

xc: (w/2 copies of attachments)
Mr. Luis Reyes,
Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
61 Forsyth St., SW, Suite 24T23
Atlanta, Georgia 30303

w/copy of attachments
Mr. Steven Baggett
Rockville, Maryland

(w/o Attachments, Oconee Nuclear Station)
NRC Resident Inspector
M. D. Thorne, Manager, Emergency Planning

A045
DJH

August 21, 2002

OCONEE NUCLEAR SITE

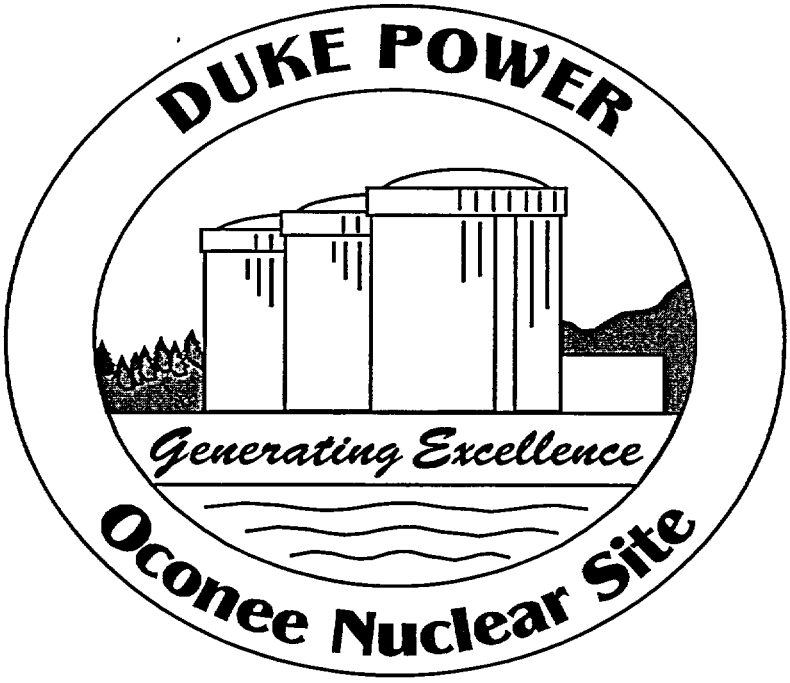
SUBJECT: Emergency Plan Implementing Procedures
Volume B, Revision 2002-07

Please make the following changes to the Emergency Plan, Volume B by following these instructions.

REMOVE	ADD
Cover Sheet Rev. 2002-06	Cover Sheet Rev. 2002-07
Table of Contents page 1	Table of Contents page 1
Table of Contents page 2	Table of Contents page 2
CP/1&2/A/2002/005 - (12/13/01)	CP/1&2/A/2002/005 - (07/24/02)
CP/3/A/2002/005 - (12/13/01)	CP/3/A/2002/005 - (07/24/02)
Chemistry Manual 5.1 - (04/16/02)	Chemistry Manual 5.1 - (07/29/02)
Chemistry Manual 5.2 - (04/11/02)	Chemistry Manual 5.2 - (07/29/02)

DUKE POWER

EMERGENCY PLAN
IMPLEMENTING PROCEDURES
VOLUME B



APPROVED:

W. W. Foster, Manager
Safety Assurance

August 21, 2002
Date Approved

August 21, 2002
Effective Date

VOLUME B
REVISION 2002-07
AUGUST 2002

VOLUME B
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VOLUME B
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(R04 01)

Duke Power Company
PROCEDURE PROCESS RECORD

(1) ID No CP/1&2/A/2002/005
Revision No. 17

Continuous Use

INFORMATION ONLY

PREPARATION

(2) Station Oconee Nuclear Station

(3) Procedure Title Post Accident Caustic Injection into the Low Pressure Injection System

(4) Prepared By ROBERT A. MARTIN Date 7/24/02

(5) Requires NSD 228 Applicability Determination?
- ☐ Yes (New procedure or revision with major changes)
- ☑ No (Revision with minor changes)
- ☐ No (To incorporate previously approved changes)

(6) Reviewed By _____ (QR) Date 7/24/2002

Cross-Disciplinary Review By _____ (QR) NA RW Date _____

Reactivity Mgmt. Review By _____ (QR) NA RW Date _____

Mgmt. Involvement Review By _____ (Ops. Supt.) NA RW Date _____

(7) Additional Reviews

QA Review By _____ Date _____

Reviewed By _____ Date _____

Reviewed By _____ Date _____

(8) Temporary Approval *(if necessary)*

By _____ (OSM/QR) Date _____

By _____ (QR) Date _____

(9) Approved By _____ Date 7/24/02

PERFORMANCE *(Compare with control copy every 14 calendar days while work is being performed.)*

(10) Compared with Control Copy _____ Date _____

Compared with Control Copy _____ Date _____

Compared with Control Copy _____ Date _____

(11) Date(s) Performed _____

Work Order Number (WO#) _____

COMPLETION

(12) Procedure Completion Verification

- ☐ Yes ☐ NA Check lists and/or blanks initialed, signed, dated, or filled in NA, as appropriate?
- ☐ Yes ☐ NA Required enclosures attached?
- ☐ Yes ☐ NA Data sheets attached, completed, dated, and signed?
- ☐ Yes ☐ NA Charts, graphs, etc attached, dated, identified, and marked?
- ☐ Yes ☐ NA Procedure requirements met?

Verified By _____ Date _____

(13) Procedure Completion Approved _____ Date _____

(14) Remarks *(Attach additional pages, if necessary)*

Post Accident Caustic Injection into the Low Pressure Injection System

NOTE:
1. This **entire** procedure supports an AP or EOP action. The procedure will require AP/EOP validation per NSD 705.
2. A control copy of this procedure shall be routed to the Emergency Preparedness Team within 3 working days after any approved changes.

1. Purpose

1.1 This procedure is to provide instruction for determining the amount and method of caustic addition into the LPI System during a LOCA.

1.2 Principle

Caustic is injected into the LPI System during a LOCA to neutralize the borated water used in the Reactor Building Emergency Spray System to pH 7.0 - 8.0.

The neutralization will inhibit the generation of hydrogen gas and promote a higher partition factor for iodine.

2. Limits and Precautions

☐ 2.1 The following safety equipment shall be worn when connecting/disconnecting caustic tote bins:

2.1.1 Chemical goggles

2.1.2 Face shield

2.1.3 Corrosive resistant suit, neoprene or chemrel

2.1.4 Corrosive resistant boots, neoprene or PVC

2.1.5 Corrosive resistant gloves, neoprene or PVC

☐ 2.2 Chemical hazards shall be known prior to use. For additional information refer to the MSDS sheets.

☐ 2.3 Under accident conditions, valve alignments shall **NOT** be made and injection shall **NOT** begin without prior authorization from the Operations Emergency Coordinator **OR** the Technical Support Center (TSC)/Operational Support Center (OSC)!

NOTE: An initial caustic add of 15 inches will neutralize an RCS inventory of 80,000 gallons with a boron concentration of 1800 ppm. This is a conservative initial add to allow immediate response to a large break LOCA.

☐ 2.4 An initial caustic add of 15 inches can be made without performing CSM 5.2, Enclosure 6.3 (Caustic Addition Calculations).

☐ 2.5 In the event of a caustic spill, call 4911.

☐ 2.6 ITS 5.4.1.a and SLC 16.13.7 require that pH be measured AND that the addition of caustic to Reactor Coolant commence within 30 minutes AFTER switchover to Recirculation Mode of Core Cooling to adjust the pH to a range of 7.0 to 8.0 WITHIN 24 hours.

During recirculation mode, long-term core cooling is provided by injection of water from the Reactor Building Emergency Sump to the core by the Low Pressure Injection (LPI) pumps (1 LP-19 & 20 or 2 LP-19 & 20 are open). Switchover to recirculation mode is accomplished with minimal level in the BWST.

☐ 2.7 Safety and caustic addition equipment is stored in the brown storage container located in the Auxiliary Building, Unit 1 & 2 Chemical Addition Area.

☐ 2.8 Keys to the brown storage container are stored with the caustic addition procedures in the OSC Chemistry Emergency Procedure Files and in the filing cabinet located in the Primary Chemistry lab office. All personnel in Primary Chemistry and Radwaste have also been issued individual keys.

☐ 2.9 Power to the caustic addition pump is provided through 1XL located near the LPI hatch area. For power supply diagram, see Enclosure 5.6.

3. Procedure

3.1 Upon notification from Operations Emergency Coordinator OR TSC / OSC take the following actions to align the caustic addition system to the appropriate unit:

NOTE: The following steps may be performed simultaneously to conserve time.

☐ Verify eyewash station and safety shower operable.

☐ Mark the current liquid level directly on the translucent tote bin container.

☐ Measure down from the liquid level mark 15 inches and mark this level directly on the tote bin.

☐ **IF** necessary, move the tote bin into position.

☐ Remove dust cover from swagelock fitting on tote bin.

☐ Remove dust cover from swagelock fitting at CA-36 (Caustic Pump Suction Tell Tale) (Bottom of 1&2 Caustic Mix Tank downstream of CA-35, Elev 783).

☐ 3.1.1 For Unit 1 **only**, make valve alignments per Enclosure 5.1 to allow caustic injection into the Low Pressure Injection (LPI) pump suction on Unit 1.

☐ 3.1.2 For Unit 2 **only**, make valve alignments per Enclosure 5.2 to allow caustic injection into the Low Pressure Injection (LPI) pump suction on Unit 2.

NOTE: Protective clothing shall be worn prior to Step 3.1.3.

☐ 3.1.3 Connect stainless steel flex hose to the Swagelock quick-connect fitting upstream of CA-36 (Caustic Pump Suction Tell Tale) (Bottom of 1&2 Caustic Mix Tank downstream of CA-35, Elev. 783).

☐ 3.1.4 Connect stainless steel flex hose to the Swagelock fitting on tote-bin.

☐ 3.1.5 Vent the caustic tote bin by removing the tote bin fill cap.

☐ 3.1.6 Open the caustic tote bin outlet valve.

☐ 3.1.7 Notify Operations **OR** the OSC (if activated) that valve alignments for caustic injection are complete and ready to be initiated.

Person contacted _____ Date/Time ____/____

NOTE: Use low dose waiting area as possible during addition.

☐ 3.1.8 **WHEN** notified by Operations, start the caustic addition pump at maximum flow setting. The caustic pump switch is located on the Chemical Addition Control Panel. The maximum pump capacity is approximately 2 gallons per minute.

☐ 3.1.9 Notify Operations **OR** the OSC (if activated) that caustic injection has begun.

Person contacted _____ Date/Time ____/____

NOTE: The caustic pump has an average pump rate of 1.2 gallons per minute. To pump the initial setting of 15 inches will require 1.5 hours.

☐ 3.1.10 Calculate the total amount of caustic (in gallons) to be added for the neutralization of the borated water added to the system by using CSM 5.2 (Enclosure 6.3).

☐ 3.1.11 Convert gallons from Step 3.1.10 to inches (in the 350 gallon tote bin) by dividing the number of gallons to be added by 8.1. Record the values below:

Gallons to be added _____ Inches to be added from the tote bin _____

☐ 3.1.12 Mark the calculated liquid level directly on the tote bin by measuring down from the original "current liquid level" mark made in Step 3.1.

☐ 3.1.13 **WHEN** the caustic tote bin level reaches the desired level (as marked in Step 3.1) **OR WHEN** the caustic tote bin is empty, STOP caustic addition pump using the switch located on the Chemical Addition Control Panel.

☐ 3.1.14 Close tote bin outlet valve.

☐ 3.1.15 Close CA-36 (Caustic Pump Suction Tell Tale) (Bottom of 1&2 Caustic Mix Tank downstream of CA-35, Elev 783).

☐ 3.1.16 Record time and volume added on Enclosure 5.5.

☐ 3.1.17 **IF** necessary, replace the caustic tote bin as follows:

- ☐ 3.1.17.1 Replace tote bin fill cap.
- ☐ 3.1.17.2 Disconnect empty tote bin from swagelock fitting on stainless flex hose.
- ☐ 3.1.17.3 **IF** necessary, move tote bins and remove dust cover from swagelock fitting on new tote bin.
- ☐ 3.1.17.4 Connect stainless flex hose to the new tote bin.
- ☐ 3.1.17.5 **IF** pumping is to continue, mark the tote bin per Section 3.1 for the amount to be added from the new tote bin and go to Step 3.1.5.

☐ 3.1.18 Notify OSC that caustic addition to the LPI is complete and no further additions are in progress at this time.

Person contacted _____ Date/Time _____/_____

☐ 3.1.19 After caustic addition is complete, allow LPI recirculation time of at least 2 hours.

☐ 3.1.20 **WHEN** authorized by the TSC/OSC, collect sample (per appropriate procedure) to determine the resultant pH of the reactor coolant.

☐ 3.1.21 **IF** pH is < 7.0,

- Calculate (refer to CSM 5.2, Enclosure 6.3) the amount of caustic (in gallons) to be added to complete the neutralization of the borated water-added to the system.
- Convert this number to inches (in the 350 gallon tote bin) by dividing the number of gallons to be added by 8.1 gallons/inch.
- Record the values below:

Gallons to be added: _____ Inches to be added from tote bin: _____

☐ 3.1.22 **IF** pH is > 7.0, go to Step 3.1.26.

☐ 3.1.23 Mark the current liquid level directly on the translucent tote bin container.

☐ 3.1.24 Measure down from this mark the number of inches calculated in Step 3.1.21 above. Mark this level directly on the tote bin.

☐ 3.1.25 Repeat Steps 3.1.1 through 3.1.22 until all necessary caustic (as determined by TSC/OSC) has been added.

☐ 3.1.26 After all necessary caustic has been added and upon authorization from the TSC/OSC, return the system to normal as follows:

☐ 3.1.26.1 Replace tote bin fill cap.

☐ 3.1.26.2 Disconnect empty tote bin from swagelock fitting on stainless flex hose.

☐ 3.1.26.3 For Unit 1 **only**, make alignments per Enclosure 5.3 to return valves to normal position.

☐ 3.1.26.4 For Unit 2 **only**, make alignments per Enclosure 5.4 to return valves to normal position.

4. References

4.1 Dwg. No. OFD-110A-1.8 Chemical Addition System (Primary Side Chemical Addition)

4.2 Dwg. No. OFD-102A-1.1 and OFD-102A-2.1 Low Pressure Injection System, Borated Water Supply and LPI Pump Suction.

4.3 CSM 5.2

4.4 ITS 5.4.1.a

4.5 SLC 16.13.7

5. Enclosures

5.1 Valve Alignment for Caustic Injection on Unit 1

5.2 Valve Alignment for Caustic Injection on Unit 2

5.3 Normal Valve Alignment for Caustic Injection System on Unit 1

5.4 Normal Valve Alignment for Caustic Injection System on Unit 2

5.5 Caustic Mixing and Injection Record

5.6 Unit 1&2 Caustic Pump Power Supplies

Enclosure 5.1

Valve Alignment for
Caustic Injection on Unit 1

NOTE: This enclosure is AP/EOP related.

Date_____

DV	*Init*	*Position*	*Valve No.*	*Valve Name*	*Location*
		Closed	2CA-98	Caustic to Unit #2 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-74
		Closed	1CA-58	Caustic to U1 LPI Suct Tell Tale (Chm)	Unit 1&2 LPI Hatch Area, AB, Elev 771, Col. T-72
		Open	1CA-39	Caustic to Unit #1 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm 118, Elev 771, Col. T-72
		Open	1CA-62	Caustic to Unit #1 LPI Block (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-72
		Open	1LP-51	LPI Sample Recirc Isolation (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 061, Elev 771, Col. T-71
		Open	CA-103	Caustic Recirc Line and Press Gauge Block	Downstream of 1&2 Caustic Pump and CA-37, Elev 783, Col. Q-67
		Closed	CA-96	Caustic Recirc Block	Recirc Line tapping off between CA-103 & CA-112 returning to Caustic Mix Tank, Elev 783
		Closed	CA-35	Caustic Pump Suction	Next valve after CA-34 Tank and upstream of Caustic Pump, Elev 783
		Closed	CA-37	Caustic Header to Waste Evap. Feed Tank Block	AB Hallway, Elev 783, near Col. P-74, 6 ft. overhead
		Open	CA-112	Caustic Pump Press Gauge Isol	First valve downstream of PG-27 (Pressure Gauge) behind Caustic Mix Tank on West Wall, Elev 783
		Open	CA-36	Caustic Pump Suction Tell Tale	Bottom of 1&2 Caustic Mix Tank downstream of CA-35, Elev 783

Enclosure 5.2
Valve Alignment for Caustic Injection System on Unit 2

NOTE: This enclosure is AP/EOP related.

Date_____

DV	*Init*	*Position*	*Valve No.*	*Valve Name*	*Location*
		Closed	1CA-39	Caustic to Unit #1 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm 118, Elev 771, Col. T-72
		Closed	2CA-58	Caustic to #2 LPI Pump Suct Tell Tale (Chm)	Unit 1&2 LPI Hatch Area, AB Rm 119, Elev 771, Col. T-74
		Open	2CA-98	Caustic to Unit #2 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-74
		Open	2CA-63	Caustic to Unit #2 LPI Block (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-74
		Open	2LP-51	LPI Sample Recirc Isolation (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 063, Elev 771, Col. T-71
		Open	CA-103	Caustic Recirc Line and Press Gauge Block	Downstream of 1&2 Caustic Pump and CA-37, Elev 783, Col. Q-67
		Closed	CA-96	Caustic Recirc Block	Recirc Line tapping off between CA-103 & CA-112 returning to Caustic Mix Tank, Elev 783
		Closed	CA-35	Caustic Pump Suction	Next valve after CA-34 Tank and upstream of Caustic Pump, Elev 783
		Closed	CA-37	Caustic Header to Waste Evap. Feed Tank Block	AB Hallway, Elev 783, near Col. P-74, 6 ft. overhead
		Open	CA-112	Caustic Pump Press Gauge Isol	First valve downstream of PG-27 (Pressure Gauge) behind Caustic Mix Tank on West Wall, Elev 783
		Open	CA-36	Caustic Pump Suction Tell Tale	Bottom of 1&2 Caustic Mix Tank downstream of CA-35, Elev 783

Normal Valve Alignment for Caustic Injection System on Unit 1

NOTE: This enclosure is AP/EOP related.

Date _____

DV	*Init*	*Position*	*Valve No.*	*Valve Name*	*Location*
		Closed	2CA-98	Caustic to Unit #2 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-74
		Closed	2CA-63	Caustic to Unit #2 LPI Block (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-74
		Closed	1CA-58	Caustic to U1 LPI Suct Tell Tale (Chm)	Unit 1&2 LPI Hatch Area, AB, Elev 771, Col. T-72
		Closed	1CA-39	Caustic to Unit #1 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm 118, Elev 771, Col. T-72
		Closed	1CA-62	Caustic to Unit #1 LPI Block (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-72
		Closed	1LP-51	LPI Sample Recirc Isolation (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 061, Elev 771, Col. T-71
		Open	CA-103	Caustic Recirc Line and Press Gauge Block	Downstream of 1&2 Caustic Pump and CA-37, Elev 783, Col. Q-67
		Open	CA-97	Caustic Recirc Block	Downstream of CA-96 and upstream of DW-120 on Caustic Mix Tank Recirc Line, Elev 783
		Open	CA-96	Caustic Recirc Block	Recirc Line tapping off between CA-103 & CA-112 returning to Caustic Mix Tank, Elev 783
		Closed	LWD-267	Caustic Tank Outlet Drain	Base of Caustic Mix Tank West Side, Elev 783
		Closed	CA-34	Caustic Mix Tank Outlet	First valve from bottom of Caustic Mix Tank and upstream of Caustic Pump, Elev 783 Col. Q-68
		Closed	CA-35	Caustic Pump Suction	Next valve after CA-34 Tank and upstream of Caustic Pump, Elev 783
		Closed	CA-37	Caustic Header to Waste Evap. Feed Tank Block	AB Hallway, Elev 783, near Col. P-74, 6 ft. overhead
		Open	CA-112	Caustic Pump Press Gauge Isol	First valve downstream of PG-27 (Pressure Gauge) behind Caustic Mix Tank on West Wall, Elev 783
		Closed	CA-36	Caustic Pump Suction Tell Tale	Bottom of 1&2 Caustic Mix Tank downstream of CA-35, Elev 783

Enclosure 5.4

Normal Valve Alignment for Caustic Injection System on Unit 2

NOTE: This enclosure is AP/EOP related.

Date_____

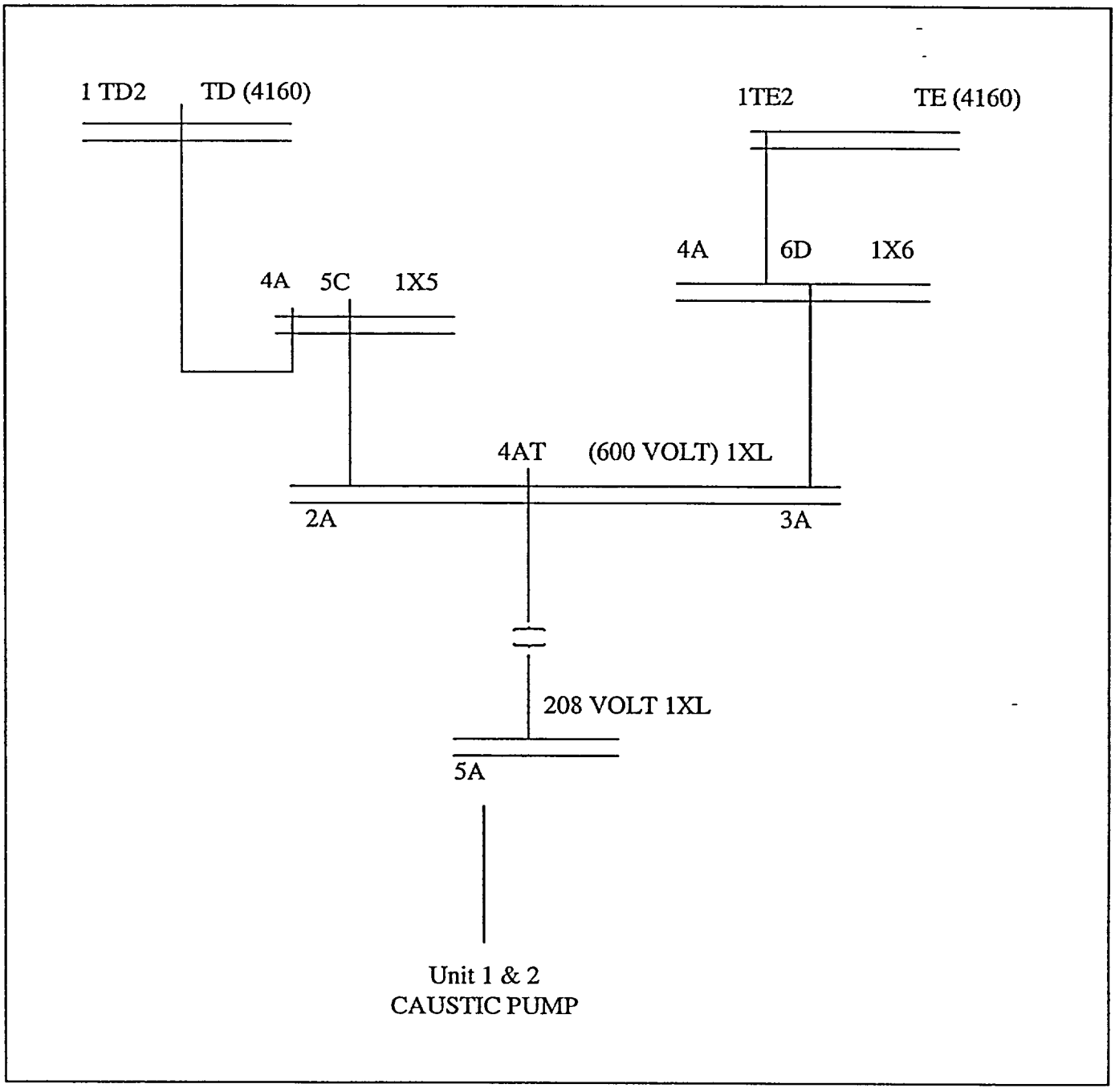
DV	*Init*	*Position*	*Valve No.*	*Valve Name*	*Location*
		Closed	1CA-39	Caustic to Unit #1 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm 118, Elev 771, Col. T-72
		Closed	1CA-62	Caustic to Unit #1 LPI Block (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-72
		Closed	2CA-58	Caustic to #2 LPI Pump Suct Tell Tale (Chm)	Unit 1&2 LPI Hatch Area, AB Rm 119, Elev 771, Col. T-74
		Closed	2CA-98	Caustic to Unit #2 LPI Block (Chm)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-74
		Closed	2CA-63	Caustic to Unit #2 LPI Block (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 119, Elev 771, Col. T-74
		Closed	2LP-51	LPI Sample Recirc Isolation (Ops)	Unit 1&2 LPI Hatch Area, AB Rm. 063, Elev 771, Col. T-71
		Open	CA-103	Caustic Recirc Line and Press Gauge Block	Downstream of 1&2 Caustic Pump and CA-37, Elev 783, Col. Q-67
		Open	CA-97	Caustic Recirc Block	Downstream of CA-96 and upstream of DW-120 on Caustic Mix Tank Recirc Line, Elev 783
		Open	CA-96	Caustic Recirc Block	Recirc Line tapping off between CA-103 & CA-112 returning to Caustic Mix Tank, Elev 783
		Closed	LWD-267	Caustic Tank Outlet Drain	Base of Caustic Mix Tank West Side, Elev 783
		Closed	CA-34	Caustic Mix Tank Outlet	First valve from bottom of Caustic Mix Tank and upstream of Caustic Pump, Elev 783 Col. Q-68
		Closed	CA-35	Caustic Pump Suction	Next valve after CA-34 Tank and upstream of Caustic Pump, Elev 783
		Closed	CA-37	Caustic Header to Waste Evap. Feed Tank Block	AB Hallway, Elev 783, near Col. P-74, 6 ft. overhead
		Open	CA-112	Caustic Pump Press Gauge Isol	First valve downstream of PG-27 (Pressure Gauge) behind Caustic Mic Tank on West Wall, Elev 783
		Closed	CA-36	Caustic Pump Suction Tell Tale	Bottom of 1&2 Caustic Mix Tank downstream of CA-35, Elev 783

Caustic Mixing and Injection Record

NOTE: This enclosure is AP/EOP related.

Date/Time of Injection	Gal NaOH

NOTE:
1. This enclosure is AP/EOP related.
2. Operations alternates the power logic as outlined. Verification will be required to establish which alignment is in use at the time of question.



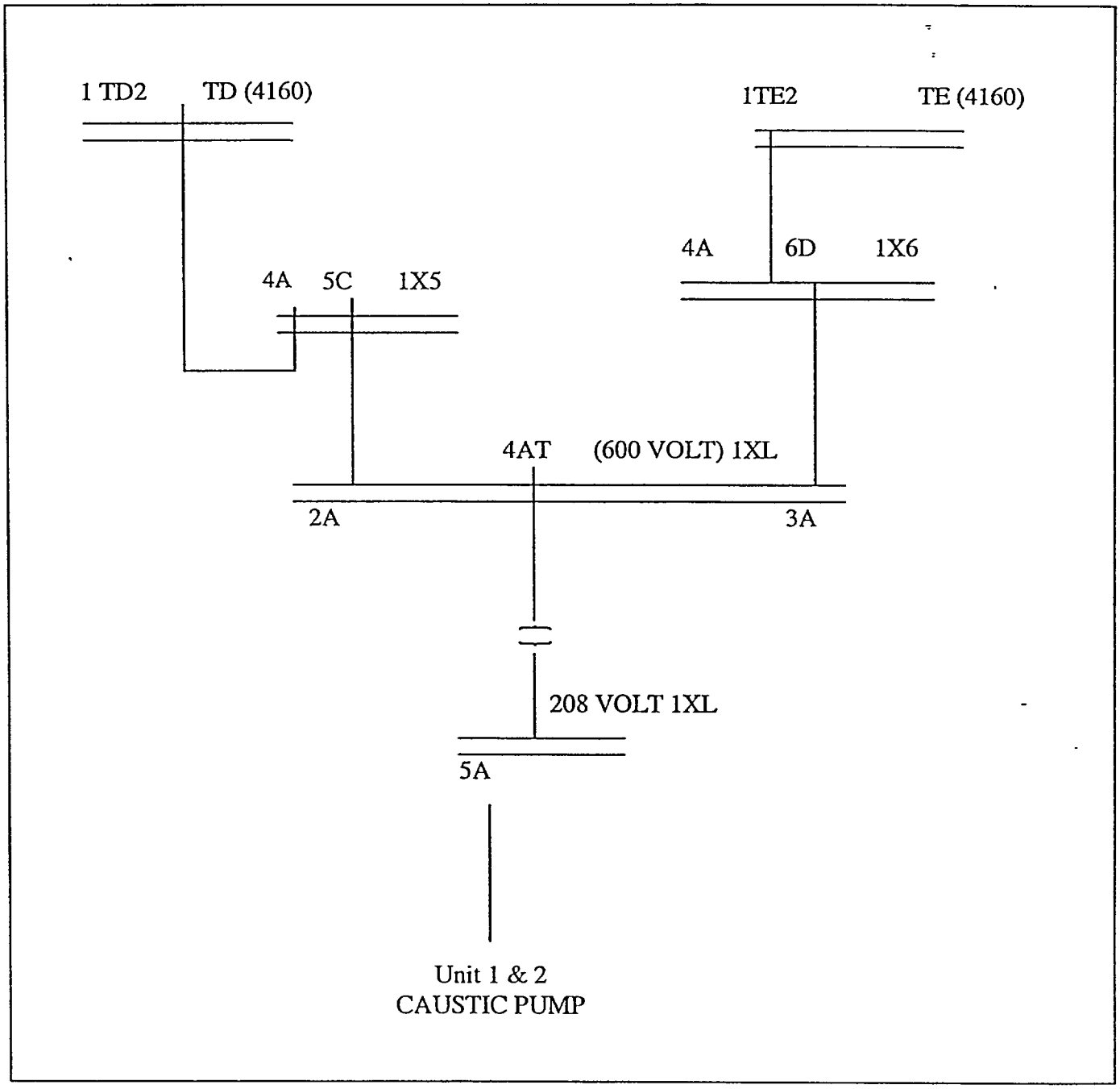
Enclosure 5.5

Caustic Mixing and Injection Record

NOTE: This enclosure is AP/EOP related.

Date/Time of Injection	Gal NaOH

NOTE:
1. This enclosure is AP/EOP related.
2. Operations alternates the power logic as outlined. Verification will be required to establish which alignment is in use at the time of question.



(R04-01)

Duke Power Company
PROCEDURE PROCESS RECORD

(1) ID No CP/3/A/2002/005
Revision No 15

Continuous Use

INFORMATION ONLY

PREPARATION

(2) Station Oconee Nuclear Station

(3) Procedure Title Post Accident Caustic Injection into the Low Pressure Injection System

(4) Prepared By Robert A Martin Date 7/24/02

(5) Requires NSD 228 Applicability Determination?
- ☐ Yes (New procedure or revision with major changes)
- ☑ No (Revision with minor changes)
- ☐ No (To incorporate previously approved changes)

(6) Reviewed By _____ (QR) Date 7/24/02

Cross-Disciplinary Review By _____ (QR) NA RN Date _____

Reactivity Mgmt. Review By _____ (QR) NA RN Date _____

Mgmt. Involvement Review By _____ (Ops. Supt.) NA RN Date _____

(7) Additional Reviews

QA Review By _____ Date _____

Reviewed By _____ Date _____

Reviewed By _____ Date _____

) Temporary Approval *(if necessary)*

By _____ (OSM/QR) Date _____

By _____ (QR) Date _____

(9) Approved By Bryan J. May Date 7/24/02

PERFORMANCE *(Compare with control copy every 14 calendar days while work is being performed.)*

(10) Compared with Control Copy _____ Date _____

Compared with Control Copy _____ Date _____

Compared with Control Copy _____ Date _____

(11) Date(s) Performed _____

Work Order Number (WO#) _____

COMPLETION

(12) Procedure Completion Verification

- ☐ Yes ☐ NA Check lists and/or blanks initialed, signed, dated, or filled in NA, as appropriate?
- ☐ Yes ☐ NA Required enclosures attached?
- ☐ Yes ☐ NA Data sheets attached, completed, dated, and signed?
- ☐ Yes ☐ NA Charts, graphs, etc. attached, dated, identified, and marked?
- ☐ Yes ☐ NA Procedure requirements met?

Verified By _____ Date _____

) Procedure Completion Approved _____ Date _____

(14) Remarks *(Attach additional pages, if necessary)*

Post Accident Caustic Injection into the Low Pressure Injection System

NOTE:
1. This **entire** procedure supports an AP or EOP action. The procedure will require AP/EOP validation per NSD 705.
2. A control copy of this procedure shall be routed to the Emergency Preparedness Team within 3 working days after any approved changes.

1. Purpose

1.1 This procedure is to provide instruction for caustic addition into the LPI System during a Loss of Coolant Accident. (LOCA)

1.2 Principle

Caustic is injected into the LPI System during a LOCA to neutralize the borated water used in the Reactor Building Emergency Spray System to pH 7.0 - 8.0.

The neutralization will inhibit the generation of hydrogen gas and promote a higher partition factor for iodine.

2. Limits and Precautions

☐ 2.1 The following safety equipment shall be worn when connecting/disconnecting caustic tote bins:

2.1.1 Chemical goggles

2.1.2 Face shield

2.1.3 Corrosive resistant suit, neoprene or chemrel

2.1.4 Corrosive resistant boots, neoprene or PVC

2.1.5 Corrosive resistant gloves, neoprene or PVC

☐ 2.2 Chemical hazards shall be known prior to use. For additional information, refer to the MSDS sheets.

☐ 2.3 Under accident conditions, valve alignments shall **NOT** be made and injection shall **NOT** begin without prior authorization from the Operations Emergency Coordinator **OR** the Technical Support Center (TSC) / Operational Support Center (OSC)!

NOTE: An initial caustic add of 15 inches will neutralize an RCS inventory of 80,000 gallons with a boron concentration of 1800 ppm. This is a conservative initial add to allow immediate response to a large break LOCA.

☐ 2.4 An initial caustic add of 15 inches can be made without performing CSM 5.2, Enclosure 6.3 (Caustic Addition Calculations).

☐ 2.5 In the event of caustic spill, call 4911.

☐ 2.6 ITS 5.4.1.a and SLC 16.13.7 require that pH be measured AND that the addition of caustic to Reactor Coolant commence within 30 minutes AFTER switchover to recirculation mode of core cooling to adjust pH to a range of 7.0 to 8.0 WITHIN 24 hours.

During recirculation mode, long-term core cooling is provided by injection of water from the Reactor Building Emergency Sump to the core by the Low Pressure Injection (LPI) pumps (3 LP-19 and 3 LP-20 are open). Switchover to recirculation mode is accomplished with minimal level in the BWST.

☐ 2.7 Safety and caustic addition equipment is stored in the brown storage container located in the Auxiliary Building, Unit 1 & 2 Chemical Addition Area. The following equipment should be retrieved for Caustic Addition:

Chemical Goggles	Tape Measure
Face Shield	Marking Pen (to mark level on Tote Bin)
Corrosive resistant suit	Bung Wrench
Corrosive resistant gloves	Leather Gloves

☐ 2.8 Keys to the brown storage container are stored with the caustic addition procedure in the OSC Chemistry Emergency Procedure Files and in the filing cabinet located in the Primary Chemistry lab office. All personnel in Primary Chemistry and Radwaste have also been issued individual keys.

☐ 2.9 Power to the caustic addition pump is provided through 3XL located near the LPI Hatch Area. For power supply diagram, see Enclosure 5.4.

3. Procedure

3.1 Upon notification from Operations Emergency Coordinator **OR** TSC / OSC, take the following actions to align the caustic addition system to the appropriate unit:

NOTE: The following steps may be performed simultaneously to conserve time.

- ☐ Verify eyewash and safety shower operable.
- ☐ Mark the current liquid level directly on the translucent tote bin container.
- ☐ Measure down from the liquid level mark 15 inches and mark this level directly on the tote bin.
- ☐ **IF** necessary, move the tote bin into position.
  - ☐ Remove dust cover from Swagelock fitting on tote bin.
  - ☐ Remove dust cover from Swagelock fitting at 3CA-36 (Caustic Pump Suction Tell Tale) (AB Elev 771 at base of Unit 3 NaOH pump).

☐ 3.1.1 Make valve alignments per Enclosure 5.1 to allow caustic injection into the Low Pressure Injection (LPI) pump suction on Unit 3.

NOTE: Protective clothing shall be worn prior to Step 3.1.2.

☐ 3.1.2 Connect stainless steel flex hose to the Swagelock quick-connect fitting upstream of 3CA-36 (Caustic Pump Suction Tell Tale). (AB 771 at base of Unit 3 NaOH pump)

☐ 3.1.3 Connect stainless steel flex hose to the Swagelock fitting on the tote bin.

☐ 3.1.4 Vent the caustic tote bin by removing the tote bin fill cap.

☐ 3.1.5 Open the caustic tote bin outlet valve.

☐ 3.1.6 Notify Operations **OR** the OSC (if activated) that valve alignments for caustic injection are complete and ready to be initiated.

Person contacted _____ Date/Time ____/____

☐ 3.1.7 **WHEN** notified by Operations, start the caustic addition pump at maximum flow setting. The caustic pump switch is located on the Chemical Addition Control Panel. The maximum pump capacity is approximately 2 gallons per minute.

NOTE: Use low dose waiting area as possible during addition

☐ 3.1.8 Notify Operations **OR** the OSC (if activated) that caustic injection has begun.

Person contacted _____ Date/Time _____/_____

NOTE: The caustic pump has an average pump rate of 1.2 gallons per minute. To pump the initial setting of 15 inches will require 1.5 hours.

☐ 3.1.9 Calculate the total amount of caustic (in gallons) to be added for the neutralization of the borated water added to the system by using CSM 5.2 (Enclosure 6.3).

☐ 3.1.10 Convert gallons from Step 3.1.9 to inches (in the 350 gallon tote bin) by dividing the number of gallons to be added by 8.1. Record the values below:

Gallons to be added _____ Inches to be added from the tote bin _____

☐ 3.1.11 Mark the calculated liquid level directly on the tote bin by measuring down from the original "current liquid level" mark made in Step 3.1.

☐ 3.1.12 **WHEN** the caustic tote bin level reaches the desired level (as marked in Step 3.1) **OR WHEN** the caustic tote bin is empty, stop caustic addition pump using the switch located on the Chemical Addition Control Panel.

☐ 3.1.13 Close tote bin outlet valve.

☐ 3.1.14 Close 3CA-36 (Caustic Pump Suction Tell Tale) (AB Elev. 771 at base of Unit 3 NaOH pump).

☐ 3.1.15 Record time and volume added on Enclosure 5.3.

☐ 3.1.16 **IF** necessary, replace the caustic tote bin as follows:

☐ 3.1.16.1 Replace tote bin fill cap.

☐ 3.1.16.2 Disconnect empty tote bin from Swagelock fitting on stainless flex hose.

☐ 3.1.16.3 **IF** necessary, move tote bins and remove dust cover from Swagelock fitting on new tote bin.

☐ 3.1.16.4 Connect stainless flex hose to the new tote bin.

☐ 3.1.16.5 **IF** pumping is to continue, mark the tote bin per Section 3.1 for the amount to be added from the new tote bin and go to Step 3.1.4.

☐ 3.1.17 Notify OSC caustic addition to U-3 LPI is complete and no further additions are in progress.

Person contacted _____ Date/Time _____/_____

☐ 3.1.18 After caustic addition is complete, allow LPI recirculation time of 2 hours.

☐ 3.1.19 **WHEN** authorized by the TSC/OSC, collect sample (per appropriate procedure) to determine the resultant pH of the reactor coolant.

☐ 3.1.20 **IF** pH is < 7.0:

- Calculate (refer to CSM 5.2, Enclosure 6.3) the amount of caustic (in gallons) to be added to complete the neutralization of the borated water added to the system.
- Convert this number to inches (in the 350 gallon tote bin) by dividing the number of gallons to be added by 8.1 gallons/inch.
- Record the values below:

Gallons to be added: _____ Inches to be added from tote bin: _____

☐ 3.1.21 **IF** pH is > 7.0, go to Step 3.1.25.

☐ 3.1.22 Mark the current liquid level directly on the translucent tote bin container.

☐ 3.1.23 Measure down from this mark the number of inches calculated in Step 3.1.20 above. Mark this level directly on the tote bin.

☐ 3.1.24 Repeat Steps 3.1.1 through 3.1.21 until all necessary caustic (as determined by TSC/OSC) has been added.

☐ 3.1.25 After all necessary caustic has been added and upon authorization from the TSC/OSC, return the system to normal as follows:

☐ 3.1.25.1 Replace tote bin fill cap.

☐ 3.1.25.2 Disconnect empty tote bin from Swagelock fitting on stainless flex hose.

☐ 3.1.25.3 Make alignments per Enclosure 5.2 to return valves to normal position.

4. References

4.1 Dwg. No. OFD-110A-3.8 Chemical Addition System (Primary Side Chemical Addition)

4.2 Dwg. No. OFD-102A-3.1, Low Pressure Injection System, Borated Water Supply and LPI Pump Suction.

4.3 CSM 5.2

4.4 ITS 5.4.1.a

4.5 SLC 16.13.7

5. Enclosures

5.1 Valve Alignment for Caustic Injection on Unit 3

5.2 Normal Valve Alignment for Caustic Injection System on Unit 3

5.3 Caustic Mixing and Injection Record

5.4 Unit 3 Caustic Pump Power Supplies

Enclosure 5.1

Valve Alignment for
Caustic Injection on Unit 3

NOTE: This enclosure is AP/EOP related.

Date_____

DV	*Init*	*Position*	*Valve No.*	*Valve Name*	*Location*
		Open	3CA-103	Caustic Recirc Line & Press Gauge Block	AB Rm. 150, at Caustic Mix Tank north side downstream of PG27 & upstream of 3CA-103
		Closed	3CA-96	Caustic Recirc Block	AB Elev 771 at Unit 3 NaOH Pump Discharge
		Closed	3CA-35	Caustic Pump Suction	AB Elev 771 at base of Unit 3 NaOH pump
		Open	3CA-36	Caustic Pump Suction Tell Tale	AB Elev 771 at base of Unit 3 NaOH pump
		Open	3CA-112	Caustic Pump Pressure Gauge Isolation	AB Elev 771 adjacent to but west of Unit 3 NaOH mix tank
		Closed	3CA-58	Caustic to #3 LP Pump Suction Tell Tale	AB Elev 783 Col. Q-91, near CC Cooler Room
		Open	3CA-39	Caustic to Unit #3 LP Block (Chm)	AB Hall, Elev 783 Col. Q-91, near CC Cooler Room
		Open	3CA-62	Caustic to Unit #3 LPI Block (OPS)	AB Elev 783 Col. Q-91, near CC Cooler Room
		Open	3LP-51	LPI Sample Recirc. Isolation Valve (Ops)	AB Elev 783 Col. R-90 near CC Cooler Room

Enclosure 5.2

Normal Valve Alignment for Caustic Injection System on Unit 3

NOTE: This enclosure is AP/EOP related.

Date_____

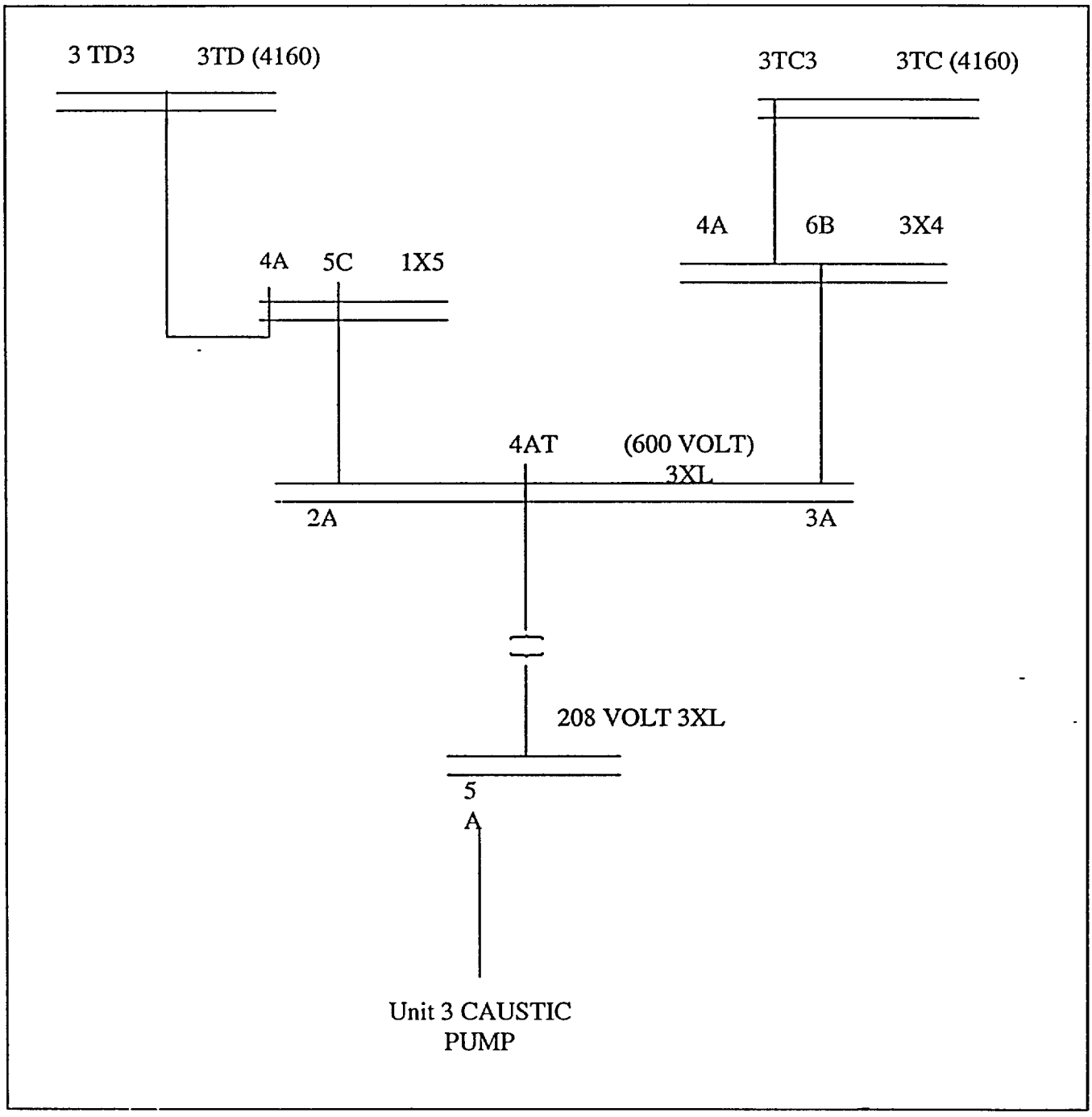
DV	*Init*	*Position*	*Valve No.*	*Valve Name*	*Location*
		Open	3CA-103	Caustic Recirc Line & Press Gauge Block	AB Rm. 150, at Caustic Mix Tank north side downstream of PG27 & upstream of 3CA-103
		Open	3CA-97	Caustic Recirc Block	AB Elev 771 overhead at Unit 3 NaOH mix tank
		Open	3CA-96	Caustic Recirc Block	AB Elev 771 at Unit 3 NaOH Pump Discharge
		Closed	3LWD-267	Caustic Tank Outlet Drain	AB Elev 771 at tank drain pipe of Unit 3 NaOH pump
		Closed	3CA-34	Caustic Mix Tank Outlet	AB Elev 771 at base of Unit 3 NaOH pump
		Closed	3CA-35	Caustic Pump Suction	AB Elev 771 at base of Unit 3 NaOH pump
		Closed	3CA-36	Caustic Pump Suction Tell Tale	AB Elev 771 at base of Unit 3 NaOH pump
		Open	3CA-112	Caustic Pump Pressure Gauge Isolation	AB Elev 771 adjacent to but west of Unit 3 NaOH mix tank
		Closed	3CA-58	Caustic to #3 LPI Pump Suct Tell Tale	AB Elev 783 Col. Q-91, near CC Cooler Room
		Closed	3CA-39	Caustic to Unit #3 LPI Block (Chm)	AB Hall, Elev 783 Col. Q-91, near CC Cooler Room
		Closed	3CA-62	Caustic to Unit #3 LPI Block (OPS)	AB Elev 783 Col. Q-91, near CC Cooler Room
		Closed	3LP-51	LPI Sample Recirc. Isolation Valve (Ops)	AB Elev 783 Col. R-90 near CC Cooler Room

NOTE: This enclosure is AP/EOP related.

Date/Time of Injection	Gal. NaOH

NOTE: 1. This enclosure is AP/EOP related.

2. Operations alternates the power logic as outlined. Verification will be required to establish which alignment is in use at the time of question.



INFORMATION ONLY

CHEMISTRY MANUAL 5.1
EMERGENCY RESPONSE GUIDELINES

REVISION NUMBER	ISSUE DATE
Original	10/25/83
1	09/27/95
2	11/30/95
3	01/24/96
4	03/14/96
5	09/16/96
6	10/31/96
7	11/26/96
8	01/02/97
9	09/22/97
10	11/20/97
11	03/12/98
12	06/15/98
13	08/24/98
14	02/04/99
15	05/27/99
16	09/29/99
17	03/27/00
18	12/05/00
19	02/22/01
20	04/11/02
21	04/16/02

Prepared by: Lori T Clark Date: 5/23/02

10CFR50.59 required: Yes ✓ No _____

Approval: Dale E White SrDLW Date: 7-29-02

Control Copies delivered to Emergency Planning: _____

Date: _____

DUKE POWER COMPANY OCONEE CHEMISTRY MANUAL

Emergency Response Guidelines

NOTE: Seven Control Copies and one Information Only copy of this CSM shall be routed to the Emergency Preparedness Team within three (3) working days following any approved changes/modifications.

1. Purpose

1.1 To identify members of the Chemistry Emergency Response Organization and their responsibilities.

1.2 Provide preplanned responses to emergency situations that may arise.

2. Chemistry Emergency Response Organization

2.1 The positions identified in Enclosure 6.1 may be filled by personnel identified in Enclosure 6.2.

2.2 Chemistry Manager, Chemistry Team Leader or qualified Scientists may serve as Chemistry Manager in the OSC as identified in Enclosure 6.2. During backshift, holidays and weekends the Radwaste or Primary shift/coverage person will be the Chemistry Single Point of Contact until relieved.

2.3 A list of alternates for other positions is identified in Enclosure 6.2. These personnel may be designated by the Chemistry Manager as essential or non-essential as the emergency condition or event dictates.

2.4 The responsibilities of the Chemistry Emergency Response Organization are contained in Enclosure 6.3.

2.5 Once the OSC is activated for emergency response, all activities of field teams prior to, during, and thereafter become the responsibility of the OSC to coordinate and control. Upon the activation of the OSC all chemistry activities currently in progress should be turned over to the OSC for coordination. The turnover should at a minimum include:

- Emergency Job(s) in the field
- Communication capability with the field team
- Emergency equipment out of service/job description
- Status of plant including power availability

If approval to continue is given, an OSC task sheet should be submitted to document the activity(s).

2.6 The SPOC Supervisor is responsible for assigning tasks and managing all resources during the first 75 minutes of a back shift drill and/or emergency. If Chemistry management is not available, the SPOC Supervisor (Interim OSC Manager) will direct the Chemistry resources. If Chemistry management arrives in the OSC during the 75 minutes, then Chemistry management will manage Chemistry resources.

2.7 When calling in personnel who are off site, determine Fitness for Duty per Enclosure 6.4.

2.8 The Chemistry Emergency Response Organization work schedule should be established as the emergency condition or event dictates.

2.9 The Chemistry Emergency Response Organization should use Enclosure 6.5 and 6.6 to assist in planning sampling, analysis, and chemical addition activities during an emergency situation.

2.10 If G.O. Chemistry support is needed, contact one of the following per the Chemistry Emergency phone list in the OSC file:

R. W. Eaker	M. K. Johnson
D. P. Rochester	P. W. Downing

2.11 Expectations for Communication in the OSC:

2.11.1 Use the 4 communication techniques which help reduce errors:

- Communications will be directed.
- Use repeat backs (I send, you repeat, I confirm).
- Radio / telephone communications should include name and location.
- Use the phonetic alphabet for train designations.

2.11.2 Teams dispatched from the OSC will take a radio or have access to a radio. Chemistry staff in the OSC will have access to a radio.

2.11.3 Radio communications will be verified. If radio communication **CANNOT** be made, the dispatched team will call Chemistry Staff in the OSC at 3858 or 3495 to determine how communications will be handled.

2.11.4 Prior to the team leaving the OSC, specify when communications will be required (e.g., when the team reaches the task area, every 30 minutes, when results are obtained, etc.).

2.11.5 Tasks are to be completed as directed from the OSC. Should conditions change, notify Chemistry Staff in the OSC immediately. Do NOT go off on another task without direction from the OSC.

3. Chemistry Response to Site Assembly During Normal Working Hours

(Monday through Thursday excluding holidays)

3.1 Inside the Protected Area:

- Personnel shall assemble at their respective Chemistry office.
- Upon arriving at assembly location,
  - Card in (swipe security badge)
  - Report accountability to Team Leader or designee
  - Remain in the assembly location until given further instructions by the Emergency Coordinator.
- Personnel who assemble at an alternate Chemistry office shall:
  - Card in (swipe security badge)
  - Report accountability to their Team Leader or designee
  - Remain in the assembly location until given further instructions by the Emergency Coordinator.
- Personnel working in the RCA/RCZ who are wearing protective clothing shall:
  - Proceed to the change room
  - Frisk appropriately
  - Card in (swipe security badge)
  - Contact their Team Leader or designee to report their location
  - Wait for further instructions
- Personnel who CANNOT reach their card reader / assembly location within 30 minutes of the Site Assembly alarm shall:
  - Immediately call their Team Leader or designee
  - Proceed to their card reader / assembly location as soon as possible

- Personnel engaged in critical work activities: (e.g., resin bed regeneration, valve / equipment operation related to the event, critical path work, work of a sensitive nature associated with the Security Plan, Fire Plan, or Nuclear Safety)
    - must contact their Team Leader or designee to provide their names, work location, nature of work, estimated time to completion, and any other relevant information.
    - Team Leaders shall relay pertinent information through the Chemistry Manager to the OSC Coordinator/Manager, who then assumes responsibility for the industrial and radiological safety of the workers.
    - For drills, such arrangements may be made in advance by location management and Emergency Planning.
- Team Leaders or designee will report location and numbers to the Administrative Specialist at ext. 3856.

3.2 Outside the Protected Area

- Environmental Chemistry personnel shall:
    - Assemble in the Environmental Chemistry office area.
    - Report their accountability to their Team Leader or designee.
    - Team Leader or designee will provide location and numbers to the Administrative Specialist at ext. 3856.
    - Personnel shall not enter the Protected Area unless they are responding to the OSC and shall keep their Team Leader or designee informed of their location until the Emergency Coordinator terminates the Site Assembly.

3.3 The Administrative Specialist will report accountability to the Security Shift Supervisor at ext. 5050 no later than 20 minutes after the initiation of Site Assembly. She will leave a message stating her name, department name, number and names of missing personnel.

3.4 When personnel accountability has been completed as part of the Site Assembly, one of the following will occur:

3.4.1 If the Assembly was a test of response time and accountability procedures or if the requirement for an assembly no longer exists, permission to return to normal duties will be given by the Operations Shift Manager/Emergency Coordinator.

3.4.2 Plant conditions may require activation of the Site Emergency Response Organization. The notification to establish the Technical Support Center (TSC) and Operational Support Center (OSC) should be made over the PA system. The Chemistry Manager/Alternate should then implement the Organization outlined in Enclosure 6.1.

3.4.3 Other instructions may be given by the Operations Shift Manager / Emergency Coordinator.

4. Chemistry Response to Site Assembly During Backshifts, Weekends, and Holidays

4.1 All Chemistry personnel should assemble at their normal office area or any other Chemistry Assembly point, card in (swipe their badge), and report their location to the Radwaste Control Room at ext. 3230 or Primary at 2323. The Radwaste or Primary shift/coverage person should account for all Chemistry personnel on site. The accountability should be reported by calling ext. 5050 with name, location, and number of people accounted for including names of any personnel presently not accounted for. All jobs in progress should be safely secured before reporting.

4.2 When personnel accountability has been completed as part of a Site Assembly one of the following may occur:

4.2.1 If the Assembly was a test of response time and accountability procedures or if the requirement for an assembly no longer exists, permission to return to normal duties should be given by the Operations Shift Manager/Emergency Coordinator.

4.2.2 Plant conditions may require activation of the Site Emergency Response Organization. The notification to establish the TSC/OSC shall come from the Operations Shift Manager/Emergency Coordinator. The Radwaste/Primary shift/coverage person will establish the Chemistry Organization and act as Chemistry Single Point of Contact until relieved by Chemistry Manager or designee.

4.2.3 Other instructions may be given by the Operations Shift Manager/ Emergency Coordinator.

5. Chemistry Response to Site Evacuation Announcement

NOTE:	A Site Assembly alarm will always precede a Site Evacuation Announcement.

5.1 Based on plant conditions or radiological conditions, the Emergency Coordinator makes a determination that Site Evacuation / Relocation is warranted.

5.2 TSC requests OSC personnel to prepare for Site Evacuation / Relocation.

5.3 Chemistry management will identify essential / non-essential personnel and provide information to Group Evacuation Coordinator at ext. 3856.

5.4 TSC Offsite Communicator makes PA announcement to initiate Site Evacuation / Relocation.

5.5 Group Evacuation Coordinator accesses Evacuation / Relocation instructions through the DAE (Duke Application Environment) and coordinates evacuation / relocation of assigned personnel by notifying Team Leaders or designee.

5.6 Personnel being relocated to Oconee Training Center or Oconee Complex should notify the Group Evacuation Coordinator at ext. 3856 of their location and a number where they can be reached. The Group Evacuation Coordinator will then notify TSC/OSC/EOF Managers.

6. Enclosures

6.1 Chemistry Emergency Response Organization

6.2 Designation of Essential Chemistry Personnel

6.3 Responsibilities of Emergency Response Organization

6.4 Fitness For Duty Questions for Call Outs (if needed)

6.5 Post Accident Sampling and Analysis Checklist

6.6 Post Accident Chemical Addition Checklist

Enclosure 6.1
Chemistry Emergency Response Organization
(Minimum Staffing)

NOTE:	OSC - Operational Support Center - the area in the back of the Unit 3 Control Room.
	* - 75 minute response time

OSC

Chemistry Manager * (one)

(phone: ext. 3495)

OSC

Chemistry Area Manager (one)

(phone: ext. 3858)

OSC

Chemistry Staff Support (one)

OSC

Chemistry Specialist (five)

1. Operational Support Center (OSC)

NOTE: For Initial Response, one Chemistry Manager **OR** Area Manager is all that is required to respond. For extended drills and all emergencies, two persons are required.

1.1 Chemistry Manager / Area Manager (one) - OSC phone 3495

Bryon Norris	Dean Cantrell
Rick Wright	Amanda Breland
Dale White	Andy Perry

NOTE: Two Staff persons will be called out per the Community Alert Network System.

1.2 Chemistry Staff Support (one) - OSC phone 3858

Dedrick Wald	Steve Davenport
Ellen Morris	Keith Beddingfield
Garen Denard	Davis Harrelson
Mark Sanders	Ann Clark
Travis Rollins	

NOTE: Only five technicians are required although as many as seven may respond (includes two shift persons (minimum staffing requirements) plus five persons to be called by the Community Alert Network System).

Included in the minimum staffing is the requirement that the qualifications of the two shift persons in combination will allow RCS sampling, PALS operation, and Caustic addition.

1.3 Chemistry Technicians / Specialists (five)

Secondary	Environmental	Primary	Radwaste
Lance Young	Mike McCoy	Sherri Lackey	Roy Hanks
Saverne Williams	Rick Morris	Dennis Earle	Sharon Strickland
Ida Huff	Jac Cashin	Gina Roach	Greg Aldrich
Lawrence Nesbitt	Ronnie Tucker	Charlie Hendricks	On Tran
Skip Fletcher	Peri Smith	Dana Gaillard	Ron Sager
Lynette Wright	Gary Barker	Vivian Howell	Wayne Evans
E. T. Moss	Stephen Johannes	Jake Lamey	
Harold Bruce			
Luke Calvert			

1. Responsibilities of the Chemistry Manager

1.1 Set up the Chemistry Emergency Response Organization for OSC and Chemistry Office. Designate non-essential personnel.

NOTE:	Appropriate procedures are located in OSC in the identified file cabinet.

1.2 Keep the OSC Coordinator informed of current status of Chemistry areas of responsibility.

1.3 Inform OSC Coordinator of any Chemistry Emergency Response Activities initiated prior to the activation of OSC.

1.4 Maintain assessment of the emergency and recovery efforts and identify trends and conditions that have the potential to cause changes in the chemical parameters of the emergency situation.

1.5 Participate in the development of recovery programs in Chemistry areas of responsibility.

1.6 Use Enclosures 6.5 and 6.6 as needed to plan sampling, analysis and/or chemical addition activities.

1.7 IF liquid radioactive releases are in progress, classify the release for the OSC/TSC.

- Releases $\leq$ 10 EC are within normal limits.
- Releases > 10 EC are above normal limits.

2. Responsibilities of the Radwaste/Primary Shift/Coverage Person on Holidays, Weekends, Backshift

2.1 Serve as Single Point of Contact for Chemistry until relieved.

2.2 Account and report for all Chemistry personnel on-site during a Site Assembly. The accountability should be reported to Security at ext. 5050 within 20 minutes and should include name, location, and number of people accounted for including names of any personnel presently not accounted for.

2.3 Upon implementation of the Site Emergency Response, report to the Operational Support Center (OSC) and provide immediate support to the Operations Shift Manager.

NOTE:	Appropriate procedures are located in the OSC in the file cabinet labeled Chemistry procedures.

2.4 Inform OSC Coordinator of any Chemistry Emergency Response Activities prior to the activation of OSC.

2.5 IF radioactive releases are in progress, classify the release for the OSC/TSC.

- Releases ≤ 10 EC are within normal limits.
- Releases > 10 EC are above normal limits.

2.6 No persons will need to be called out. One (1) Chemistry Manager/Alternate will always be on duty and will respond when their emergency response pager is automatically actuated. Five (5) technicians/specialists and two (2) area Staff support persons and one (1) Team Leader will be called out by the automated "Community Alert Network System".

2.7 In the event the Community Alert Network System fails or is out-of-service, Call Outs for the five technicians/specialists may be requested. Persons have the responsibility to respond to a call out (Management Procedure "Overtime, Call-Outs and 16-Hour Provision").

- Fitness for duty must be determined by asking the questions listed in Enclosure 6.4.
- Two Staff persons from the Duty list should be paged a second time through the Switchboard Operator to please report to the OSC.

3. Responsibilities of the Chemistry Staff Support

3.1 Keep Chemistry personnel informed of current status of the emergency situation and recovery effort.

3.2 Implement control measures to operate the laboratory during emergency conditions.

3.3 Use Enclosures 6.5 and 6.6 as needed to plan sampling, analysis, and/or chemical addition activities.

3.4 Conduct pre-job briefings to:

3.4.1 Ensure employees are sufficiently familiar with the task to efficiently perform it under the anticipated conditions.

3.4.2 Ensure materials, parts, tools, and equipment necessary to perform the task are proper for the job, are readily available, have electric or pneumatic power sources available, and are familiar to workers.

3.4.3 Ensure workers assigned to the task have sufficient remaining exposure to contribute significantly to its completion and necessary requests for dose extensions are submitted in a timely manner and with proper justification.

3.4.4 Coordinate work activities with those of other work groups to achieve maximum efficiency in the task as a whole and to minimize the potential for unnecessary exposure due to poor communications or lack of proper planning/scheduling.

4. Responsibilities of Chemistry Technicians

4.1 Follow applicable emergency procedures unless directed to do otherwise by the Chemistry Manager.

4.2 Comply with requirements and special instructions of the applicable Radiation Work Permit (RWP), warning sign or barrier concerning radiation/contamination control unless directed to do otherwise by Radiation Protection or Chemistry Manager.

4.3 Know location of radiation sources and their dose rates at the task location or accesses. Utilize Low Exposure Waiting Areas where applicable. This information is to be provided by Radiation Protection personnel.

4.4 Ensure you are sufficiently familiar with the task to efficiently perform it under the anticipated conditions. Pre-job briefings should be conducted to ensure your complete understanding of the job. (Repeat any instructions given.)

4.5 Ensure you have sufficient remaining exposure to contribute significantly to the completion of the assigned task.

5. Training for Emergency Response Organization

NOTE:	Emergency Response Training Module (OC-1818) was replaced with UALIIB (Radiation Worker Training).

5.1 Chemistry Manager / Team Leader

- Initial Chemistry Emergency Response Training (OC3704)
- Participate in at least one drill / two years (HS0537)
- Initial Training - OSC Facility Specific (OC7099)
- Chemistry Specific Emergency Plan / Response Yearly Update (OCC043)

5.2 Staff

- Initial Chemistry Emergency Response Training (OC3704)
- Participate in at least one drill / two years (HS0537)
- Initial Training - OSC Facility Specific (OC7099)
- Chemistry Specific Emergency Plan / Response Yearly Update (OCC043)

5.3 Technicians

- Initial Chemistry Emergency Response Training (OC 3704)
- Initial Training - OSC Facility Specific (OC 7099)
- Chemistry Specific Emergency Plan / Response Yearly Update (OCC043)

1. Employees who acknowledge consumption of alcohol within 5 hours must be evaluated by supervision upon reporting to work. Evaluation may be by observation or breathalyzer.

2. IF the answer to the first question is no, the other questions should NOT be asked.

3. These questions apply to anyone being called out to work in the Protected Area of the plant, regardless of position or whether his/her name appears on a "duty list". Documentation of the phone call is NOT required by the Fitness for Duty "rule". However, if the call out results in a questionable situation, you may want this information documented.

The following questions MUST be asked to determine Fitness for Duty:

1. *Have you consumed alcohol in the last 5 hours?*
2. *What did you have?*
3. *How much did you have?*
4. *Can you perform your job unimpaired?*
5. *Can you drive?*

Enclosure 6.5
Post Accident Sampling
and Analysis Checklist

NOTE: Do NOT use this Enclosure for documentation.

Date: _____ Time: _____ Unit: _____

_____ Sample requested by TSC.

Sample from:

Normal		PALSS		Appendix R	
RCS - Pri. Sample Hood	____	RCS "J-Leg"	____	RCS "J-Leg"	____
RCS - Wst. Sample Hood	____	HPI Letdown	____		
LPI - Wst. Sample Hood	____	LPI Pump Disch.	____		

_____ Determine analysis / analyses to be performed and list below:

_____ _____ _____

_____ _____ _____

_____ Initiate OSC Task Work Sheet.

Procedures / Lab Methods to be used:

_____	CP/0/B/2001/008	Chemical Safety Equipment and Spill Control Response
_____	CP/1/A/2002/001	Unit One Primary Sampling System
_____	CP/2/A/2002/001	Unit Two Primary Sampling System
_____	CP/3/A/2002/001	Unit Three Primary Sampling System
_____	CP/1/A/2002/004 C	Operating Procedure for the Post Accident Liquid Sampling (PALS) System (EP)
_____	CP/2/A/2002/004 C	Operating Procedure for the Post Accident Liquid Sampling (PALS) System (EP)
_____	CP/3/A/2002/004 C	Operating Procedure for the Post Accident Liquid Sampling (PALS) System (EP)
_____	CP/1/A/2002/004 E	Unit 1 Reactor Coolant Sampling during an Appendix "R" Accident
_____	CP/2/A/2002/004 E	Unit 2 Reactor Coolant Sampling during an Appendix "R" Accident
_____	CP/3/A/2002/004 E	Unit 3 Reactor Coolant Sampling during an Appendix "R" Accident
_____	CP/1&2/A/2002/005	Post Accident Caustic Injection into the Low Pressure Injection System
_____	CP/3/A/2002/005	Post Accident Caustic Injection into the Low Pressure Injection System
_____	CP/0/B/2005/021	Composite Sampling of #3 CTP for Radioactivity
_____	CP/1/B/3002/002	Unit One Chemical Additions for Secondary Systems for Normal Operating Conditions
_____	CP/2/B/3002/002	Unit Two Chemical Additions for Secondary Systems for Normal Operating Conditions
_____	CP/3/B/3002/002	Unit Three Chemical Additions for Secondary Systems for Normal Operating Conditions
_____	CP/0/B/5200/012	Turbine Building Sump Monitor Tank Operation
_____	CP/0/B/5200/045	Liquid Waste Release from RWF
_____	LM/O/P003C	Determination of Boron by Manual Colorimetric Titration Using Phenolphthaline Indicator (EP)
_____	LM/O/P004	Determination of Chloride by Specific Ion Electrode
_____	LM/O/P919	Boron Analysis by Mettler DL-58 Boron Titration (EP)
_____	CSM 3.8	Secondary Lab Sampling Frequencies, Specifications, and Corrective Actions
_____	CSM 3.10	Primary Lab Sampling Frequencies, Specifications, and Corrective Actions
_____	CSM 5.1	Emergency Response Guideline
_____	CSM 5.2	Post Accident Procedure Use Guidelines

_____ Obtain applicable RIA readings from the Data Acquisition System or Control Room Liason:

RIA	Reading	RIA	Reading
RIA-4	_____mR/hr	RIA-32	_____CPM
RIA-8	_____mR/hr	RIA-57	_____R/hr
RIA-10	_____mR/hr	RIA-58	_____R/hr
RIA-13	_____mR/hr		

SYSTEM SAMPLING:

_____ Notify Operations Liaison an RP of support needs.

_____ Determine number of Chemistry personnel required for sampling and analysis:

Sampling: _____ Analysis: _____

_____ Ensure assigned personnel have sufficient remaining exposure to complete assigned tasks by obtaining Dose Extensions as required.

_____ Determine sample transporter to be used and its location.

_____ Conduct planning session with Chemistry, RP, and Operations personnel involved in sampling to identify / define specific roles and responsibilities:

_____ A. Designate Chemistry personnel to perform sampling.

_____ B. Designate Chemistry personnel to support sampling at the RCZ / control point.

_____ C. Identify Chemistry and RP personnel assigned to perform analysis.

_____ D. Determine required respiratory equipment and protective clothing.

_____ E. Determine required equipment to support sampling (eg; radios, sample bottles, flashlights, etc.).

_____ F. Establish Low Dose Waiting Areas / control points.

_____ G. Determine stay-time(s) at PALS Panels.

_____ H. Determine "best" route for sample transport.

_____ Obtain equipment required to support sampling.

_____ Obtain keys required for sampling (located in the Chemistry OSC Emergency Procedures Cabinet).

_____ Establish and maintain stay-time log at the RCZ / control point.

ANALYSIS:

_____ Determine additional RP support required during analysis.

_____ Determine need to prepare back-up lab for analysis (RW Facility Lab).

_____ Obtain and label carboys for storing / handling liquid waste.

_____ Obtain lead shielding and prepare Chemistry Lab for analysis.

_____ Ensure analytical instruments are standardized prior to use.

_____ Ensure sufficient quantities of reagents are available; prepare as needed.

_____ Conduct planning session with Chemistry and RP personnel involved in analysis to identify / define specific roles and responsibilities:

_____ A. Designate Chemistry personnel required to perform specific analyses.

_____ B. Determine respiratory equipment and protective clothing requirements.

_____ C. Use Breathing Air Cylinders and set-up Air Line Header for Lab if respiratory equipment is required.

NOTE: Do **NOT** use this Enclosure for documentation.

This is a time-critical task. Caustic addition must be initiated within 30 minutes of recirc mode operation.

Date: _____ Time: _____ Unit: _____

_____ Caustic addition requested.

_____ Initiate OSC Task Work Sheet (when appropriate)

Procedures / Lab Methods to be used:

_____	CP/1&2/A/2002/005	Post Accident Caustic Injection into the Low Pressure Injection System
_____	CP/3/A/2002/005	Post Accident Caustic Injection into the Low Pressure Injection System
_____	CP/0/B/2001/008	Chemical Safety Equipment & Spill Control Response
_____	CSM 5.2	Post Accident Procedure Use Guidelines

_____ Verify LPI System is in service and taking suction from the Reactor Building Emergency Sump.

_____ Obtain the following applicable RIA readings from the Data Acquisition or the Control Room. Refer to Enclosure 6.2 of CSM 5.2 for RIA information.

RIA	Reading	RIA	Reading
RIA-12	_____mR/hr	1RIA-32-12	_____CPM
3RIA-19	_____mR/hr	3RIA-32-3	_____CPM
1RIA-32-3	_____CPM	3RIA-32-5	_____CPM
1RIA-32-10	_____CPM	RIA-57	_____CPM
1RIA-32-11	_____CPM	RIA-58	_____CPM

_____ Notify RP, Operations Liaison, and OSC Coordinator of support needs.

_____ Determine number of Chemistry personnel required for addition:
required _____ (minimum of two)

_____ Ensure assigned personnel have sufficient remaining exposure to complete assigned tasks. Obtain Dose Extensions as required.

____ Time permitting, conduct planning session with Chemistry, RP, Operations, and OSC personnel involved in addition to identify/define specific roles and responsibilities:

_____ A. Designate Chemistry personnel to perform addition.

_____ B. Designate additional OSC personnel to transport caustic.

_____ C. Designate Chemistry or OSC personnel to support addition at the RCZ/control point.

_____ D. Determine required respiratory equipment, protective clothing, and any additional RP requirements.

_____ E. Determine required equipment to support addition (eg; radios, chemical resistant suits, flash lights, etc.).

_____ F. Establish Low Dose Waiting Areas/control points (as required).

_____ G. Determine stay time(s) at caustic addition area (as required).

_____ H. Identify potential safety hazards to team members (eg; heat stress. caustic spill control, caustic hazards, etc.).

_____ Obtain equipment required to support addition.

_____ Establish and maintain stay time log at the RCZ/control point (as required).

INFORMATION ONLY

CHEMISTRY MANUAL 5.2
POST ACCIDENT PROCEDURE USE GUIDELINES

REVISION NUMBER	ISSUE DATE
Original	07/15/82
1	10/25/95
2	01/20/97
3	04/07/97
4	11/20/97
5	08/17/98
6	03/16/99
7	12/28/99
8	09/18/00
9	04/11/02
10	

Prepared by: Rick Lyle Date: 2/26/02

10CFR50.59 required: Yes ✓ No _____

Approval: Debbie White for BLN Date: 9-29-02

Control Copies delivered to Emergency Planning: _____

Date: _____

DUKE POWER COMPANY OCONEE CHEMISTRY MANUAL

Post Accident Procedure Use Guidelines

1. Purpose

NOTE:
1. NSD 228 Applicability Determination and a 50.59 screening is required to make major changes to this section. Minor changes per NSD 703 can be made without a Applicability Determination.

2. Seven Control copies and one Information Only copy of this CSM shall be routed to the Emergency Preparedness Team within three (3) working days following any approved changes/modifications.

This section provides guidelines on the administration and use of chemistry post accident procedures and the precautions that should be observed during the use of these procedures. Special attention is given to limits and precautions associated with the execution of a procedure during a projected accident. Personnel requirements and procedure work locations will be given for personnel exposure consideration. Also, a listing of RIAs of interest to Chemistry for planning and assessment activities is included in Enclosures 6.1 and 6.2. This information is intended only as guidelines with the knowledge that an actual accident situation may deviate greatly from a projected scenario.

2. Guidelines

2.1 Limits and Precautions

NOTE: These Limits and Precautions do not apply to the task for Addition of Caustic to the LPI (RCS) System. This task is a "time critical task" and therefore is not subject to the below Limits and Precautions.

2.1.1 Valve alignments should **NOT** be made and samples should **NOT** be taken without prior authorization from the TSC/OSC.

2.1.2 Do **NOT** attempt any phase of sampling or analysis without Radiation Protection coverage.

2.1.3 ALL personnel will need prior authorization from the OSC to exceed any exposure limit.

2.1.4 Radiation levels of the sampling and analysis area should be measured continuously during all phases of sampling, sample preparation, and analysis.

2.1.4.1 Air activity should be determined by use of installed air monitors or through the use of portable air sampling equipment.

2.1.4.2 Area dose rates should be established by the use of installed radiation monitors or by portable radiation survey instruments.

2.1.4.3 Portable shielding, remote handling equipment, video equipment, etc., should be used where practical during sample preparation and sample analysis.

2.1.4.4 All personnel working in the lab area and transporting samples shall monitor their personal dosimetry frequently to avoid exceeding maximum dose limits.

2.1.5 The post accident analysis should be done in a fume hood and/or other precautions should be taken to avoid the release of gaseous activity.

2.1.6 Radiation exposure to an individual during all phases of sampling should be limited so as not to exceed an annual accumulative exposure of 2 rem whole body; 50 rem skin of whole body; 50 rem extremities; or 15 rem eye respectively. All personnel will need prior authorization from the TSC/OSC to knowingly exceed any exposure limit. The exposure received may require an occupational exposure penalty and/or a medical decision as to whether an individual can continue in radiation work.

2.2 Waste Disposal

2.2.1 Determine by detailed planning meeting, the exact course of action to be taken. Under no condition should liquid or solid wastes be disposed of without prior specific RP directions.

2.2.2 Designate a sealable carboy as the "Post Accident Lab Waste" container. This container should be shielded and used as an interim liquid waste disposal container for all liquid analytical waste.

2.2.3 Request RP to designate an area where the "RCS Flush" bottle(s), "RCS Sample" bottle(s) and "Post Accident Lab Waste" container may be stored until final disposal.

2.2.4 In the event an area is grossly contaminated and cannot be decontaminated, evaluate the need for shielding or protective covering to prevent the spread of airborne activity.

2.3 Procedures

2.3.1 CP/1,2,3/A/2002/001 - Unit One, Two, or Three Primary Sampling System

Description - Defines the steps necessary to sample tanks, systems, etc., associated with the primary system to determine various chemical concentrations and radioactive isotopes.

Personnel - One (1) Chemistry technician - to sample
One (1) RP technician

Precautions - Personnel should expect high dose rates and possible airborne activity. Use applicable RIA's listed in Enc. 6.1 and 6.2. Some sample points will be at system pressure.

CAUTION: If the hydrogen purge unit is in service on Unit 2 or 3 the ventilation flow path for the Primary and waste sample hoods has been isolated. The hydrogen purge unit will typically not be placed into service for about 7 days after a LOCA and then only if the hydrogen recombiner is out of service. The hydrogen purge unit must be secured prior to sampling.

Use - This procedure should be used to obtain reactor coolant samples when possible. Other primary systems and tanks such as LPI, BWST, SFP, etc. can be sampled using these procedures.

Location - Third floor Aux building - Primary sample hoods; First floor Aux building - Waste sample hoods

2.3.2 CP/1,2,3/A/2002/004 C - Operating Procedure for the Post Accident Liquid Sampling System (PALSS)

Description - Outlines method to sample primary coolant using the remotely operated PALSS sampling system. System can sample from RCS "J-Leg", LPI Pump Discharge, and HPI Letdown.

Personnel - One (1) Chemistry technician - panel operation
One (1) person to communicate with control room for LP-65 (if required)
One (1) Radiation Protection technician.

Precautions - Because of location of sample panels, personnel may be in high radiation area with airborne activity. Evaluate shuttle of personnel to and from lower dose areas. Use the readings from applicable RIAs listed in Enc. 6.1 and 6.2 to plan sampling activities.

Use - This procedure should be used to sample primary coolant when significant fuel damage is expected. System is designed to limit personnel exposure during sampling. Sample point for RCS "J-Leg" needs flow through that loop to ensure representative sample. If significant loss of coolant has occurred, need to also sample LPI Pump Discharge.

Location - First floor auxiliary building Near 1 & 2 Waste Disposal Hood - Units 1 & 2; Near 3 Waste Disposal Hood - Unit 3

2.3.3 CP/1,2,3/A/2002/004E - Unit One, Two or Three Reactor Coolant Sampling During an Appendix "R" Accident

Description - This procedure provides instruction on sampling the RCS via an ice cooled sampler installed on the discharge side of valve 1, 2, 3 RC-179 of the affected unit during an Appendix "R" accident situation.

Personnel - Two (2) Chemistry Technicians
One (1) Radiation Protection Technician
Two (2) I&E Technicians

Precautions - Personnel should expect normal dose rates and a high probability of airborne activity due to fission gas release during sample flush to floor drain. Sample temperature & pressure will be very high & if not cooled properly will flash to steam.

Use - This procedure should only be used during an Appendix "R" fire when all power is lost. It should be considered the last alternative for Reactor coolant sampling.

Location - Unit 1, 2, 3 LPI Pump rooms

2.3.4 CP/1&2,3/A/2002/005 - Post Accident Caustic Injection Into the Low Pressure Injection System

NOTE:	This is a "time critical task" and must be initiated immediately when recirculation mode off the RBES has been established.

Description - Outlines the method used to raise the pH of the primary coolant to ≈ 7.0 - 8.0 following a LOCA. Caustic additions will improve the iodine liquid partition factor and inhibit hydrogen gas formation. Use Enc. 6.3 to calculate quantity of caustic required for addition.

Personnel - Two (2) Chemistry technicians (desirable, but not required)
One (1) Radiation Protection tech (desirable, but not required)
Two (2) additional OSC personnel to move Caustic (desirable, but not required)

Precautions - High radiation areas and airborne activity may be a concern. Use readings from applicable RIAs listed in Enc. 6.1 and 6.2 to plan addition. Establish Low Dose Waiting Areas as needed. Heat Stress conditions may also be a concern.

Use - This procedure should be used when a significant loss of coolant to the Reactor Building has occurred and there is concern about an Iodine release and/or hydrogen gas formation. The LPI System MUST be in service and taking suction from the emergency sump.

Location - Units 1&2 - 2nd floor of the Aux. Bldg, Chemical Addition Area
Unit 3 - 1st floor of the Aux Bldg, Chemical Addition Area

2.3.5 LM/O/P003C - Determination of Boron by Manual Colorimetric Titration Using Phenolphthaline Indicator

Description - Outlines the use of manual potentiometric titrations to determine boron concentration. The range for this analysis is between 100 and 2500 ppm. Samples with concentrations greater than 1000 ppm must be diluted for dose and time considerations.

Personnel - One (1) Chemistry technician
One (1) Radiation Protection technician

Precautions - Personnel should expect high dose rates and possible airborne activity. Use the readings from applicable RIAs listed in Enc. 6.1 and 6.2 to determine if the Primary Lab is available for use.

Use - This procedure should be used to analyze for boron whenever conditions have resulted in the loss of the normal analytical instrumentation, such as an Appendix "R" Accident.

Location - Rooms 329 and 330.

2.3.6 LM/O/P919 - Boron Analysis By Mettler DL-58 Titration

Description - This method covers the precise determination of boron concentration in the 0.2 – 10,000 ppm range in high purity water (RCS) using the Mettler DL-58 Titration System.

Personnel - One (1) Chemistry technician
One (1) Radiation Protection technician

Precautions - Personnel should expect high dose rates and possible airborne activity. Use the readings from applicable RIAs listed in Enc. 6.1 and 6.2 to determine if the Primary Lab is available for use.

Use - This procedure should be used as the primary method for determining boron concentration.

Location - Rooms 329 and 330.

2.3.7 LM/O/P914 - Ion Analysis - DX-500 IC

Description - Outlines the use of ion chromatograph in determination of chloride concentration in primary coolant when fuel failure is expected.

Personnel - One (1) Chemistry technician
One (1) Radiation Protection technician

Precautions - Personnel should expect high dose rates and possible airborne activity. If too much dilution is required based on dose consideration, then this procedure could not be utilized. Use the readings from applicable RIAs listed in Enc. 6.1 and 6.2 to determine if the Dionex Lab is available for use.

Use - This procedure should be used when dose consideration allows a reasonable expectancy of being able to detect chloride at the dilution required.

Location - Room 330.

2.3.8 LM/O/P008 - The Determination of Hydrogen Using the Carle or SRI Gas Chromatographs

Description - This procedure covers the use of the Carle Series and the SRI Series Analytical Gas Chromatographs to determine the concentration of hydrogen in gas samples.

Personnel - One (1) Chemistry technician
One (1) Radiation Protection technician

Precautions - Personnel should expect high dose rates and possible airborne activity. Use the readings from applicable RIAs listed in Enc. 6.1 and 6.2 to determine if the Primary Lab is available for use.

Use - This procedure should be used in an accident situation to analyze for hydrogen concentration.

Location - Rooms 329 and 330.

2.3.9 LM/O/G004 - Determination of Gamma Isotopic Activity

Description - Outline of method used to prepare sample for gamma isotopic analysis.

Personnel - One (1) Chemistry technician
One (1) Radiation Protection technician

Precautions - Personnel should expect high dose rates and possible airborne activity. Utilize remote handling when possible. Use the readings from applicable RIAs listed in Enc. 6.1 and 6.2 to determine if the Primary Lab and Count Room are available for use.

Use - This procedure should be used when a gamma isotopic analysis is required.

Location - Rooms 329 and 330.

3. Additional Information

3.1 Tank volumes:

Quench Tank	5,834 gallons
BWST	388,000 gallons
CBAST	22,440 gallons
BAMT	2,500 gallons
BHUT	82,000 gallons
LDST	4,488 gallons (31.26 gal/in)
CFT	10,470 gallons
SFP (1&2)	546,000 gallons
SFP (3)	374,000 gallons
LiOH	30 gallons
NaOH	100 gallons
MWT	20,200 gallons
HAWT	2,000 gallons
LAWT	3,000 gallons
CTP 1	1,300,000 gallons
CTP 2	1,100,000 gallons
CTP 3	3,000,000 gallons
CTP 3 (weir down)	4,900,000 gallons

3.2 System Volumes:

RCS (cold/hot)	88,000/60,000 gallons
Reactor Building	1,910,000 ft^3 free volume
CST	30,000 gallons
Waste Gas	23,800 ft^3
Hotwell	150,000 gallons
OTSG (Secondary Side)	28,000 gallons

3.3 Cooler Supplies:

Quench Tank	-	CC
Decay Heat	-	LPSW
Letdown	-	CC
Seal Return	-	RCW
RBCU	-	LPSW
CC	-	LPSW
RCW	-	CCW
Pri Sample	-	RCW
PALSS	-	RCW

4. Suggested Actions

4.1 Normal Operating Conditions:

Observation: Loose part or mechanical failure has caused suspected loss of some fuel integrity.

Actions:

- Do not over react, close coordination with OPS and RP will be necessary to understand where and how to sample coolant.
- First find out exact status of unit (subcritical, pressure, temperature, # of RCP on, letdown flow rate, area monitor readings?)
- If the unit is shutdown, then remember that samples will show normal coolant fission product spiking - must compare to earlier unit trip results.
- Have RP survey letdown piping (if in service) and compare to normal values before deciding which method to use in sampling.

- For truly mechanical damage, gap activity isotope should increase (Xenons, Kryptons, iodines) with much smaller increases in (Strontium, Barium, Cesium, less mobile isotopes).

- With gap activity release, degassing of coolant fission gases will be much more pronounced. Appropriate respiratory protection should be considered while sampling.

4.2 Overheat Condition Without Fuel Melt

Observation: RB pressure and temperature increase. Suspect loss of coolant to Reactor Building.

Actions:

- If $\overline{ES}$ actuation occurs, then letdown will be automatically secured thus rendering normal sample point useless (Ops may manually override)

- Make immediate plans to move necessary equipment to RW facility or Environmental lab for chemical analysis of boron and pH. Dose rates may render Primary lab useless.

- Before deciding which sample location to use, a careful evaluation of all data should be performed.

  1. Boron concentration can be calculated based on injection volumes and known concentrations.

  2. RIA readings from RIA 57, 58 can closely estimate failed fuel percentage without need for sampling.

  3. If recirculation of water through vessel is not available, the PALS J-leg sample will not be representative.

  4. Core exit thermocouple readings and mapping can aid in estimating area and extent of core damage.

- If electrical system load shed has occurred, then many of the normal power supplies to the Chemistry group may be unavailable without Operations assistance.

4.3 Fuel Melt

Actions:

- All of Section 4.2 action items are applicable.
- Expect higher levels of Barium, Strontium and Praesyodimium from fuel matrix loss.
- Expect high suspended solids in any sampling attempted.
- Both hydrogen percentage and RIA 57, 58 readings can and should be used in lieu of sampling, at least until dose levels have significantly dropped.
- Boron as a criticality concern should be minimal - weighing the small benefit of a sample versus the extreme risk to an individual(s) should be considered.

5. References

5.1 ONS Post Accident Procedures

5.2 ONS OFD Drawings

5.3 ONS UFSAR

5.4 ONS ITS

6. Enclosures

6.1 RIAs of Interest to Chemistry

6.2 Location of Sample Points for Multipoint RIAs

6.3 Caustic Addition Calculations

6.4 E, A and R Values for 1% Failed Fuel and DBA

6.5 Technical Basis for Caustic Addition Calculations

6.6 Quarterly Inspection of Post Accident Equipment

RIA #	RANGE	LOCATION	INFORMATION USED FOR
1RIA-4 2RIA-4 3RIA-4	0 1 - 10e7 mR/hr	Reactor Building Entrance/ Personnel Hatch	Indicates a LOCA with moderate to severe fuel damage; 2RIA-4 is located near the Primary Lab and Count Room - Readings used to assess the need to prepare alternate labs
RIA-8	0.1 - 10e7 mR/hr	Primary Chemistry Lab	Used to assess the need to prepare the alternate Primary Lab and/or Count Room
1RIA-10 2RIA-10 3RIA-10	0.1 - 10e7 mR/hr	Unit 1 Primary Sample Hood Unit 2 Primary Sample Hood Unit 3 Primary Sample Hood	Used for planning sampling. Readings will be high once sampling is started if significant fuel damage has occurred
1RIA-12 3RIA-12	0.1 - 10e7 mR/hr	Unit 1&2 Boric Acid Mix Tank Unit 3 Boric Acid Mix Tank	Readings used for planning chemical additions (ie: Caustic Additions)
1RIA-13 3RIA-13	0.1 - 10e7 mR/hr	Unit 1&2 Waste Sample Hood Unit 3 Waste Sample Hood	Used for planning sampling activities from the PALS. Readings may be high if significant fuel damage has occurred
1RIA-15 3RIA-15	0.1 - 10e7 mR/hr	Unit 1&2 HPI Pump Room Unit 3 HPI Pump Room	Provide preliminary indications of significant fuel damage
1RIA-16,17 2RIA-16,17 3RIA-16,17	0.01 - 10e3 mR/hr	Unit 1 'A & B' Main Steam Lines Unit 2 'A & B' Main Steam Lines Unit 3 'A & B' Main Steam Lines	Readings > background from these RIAs are indications of primary/secondary steam generator tube leaks
3RIA-19	0.1 - 10e7 mR/hr	Laundry and Hot Shower Tank Room	Used for planning Unit 3 caustic; readings may be high if significant fuel damage has occurred due to being near LDST
1RIA-31 3RIA-31	10 - 10e6 CPM	Behind air compressors in Turbine Building Basement, west of Unit 2 Powdex North of sewage ejectors at Unit 3, west wall of Turbine Building	Multipoint RIA that monitors LPSW effluents from LPI Cooler, and CC Cooler. Readings > background indicate a primary coolant leak into the LPSW System. See Enc. 6.2 for sample point locations.
1RIA-32 3RIA-32	10 - 10e6 CPM	Monitor on first floor of Aux Building; sample points are located in various room/areas throughout the Aux Building	Multipoint RIA that measures airborne activity levels in various locations (up to 24) through the Aux Building. Used to plan sampling and chemical addition activities. See Enc. 6 2 for sample point locations.

RIA #	RANGE	LOCATION	INFORMATION USED FOR
1RIA-35 2RIA-35 3RIA-35	10 - 10e6 CPM	Behind air compressors in Turbine Building Basement, west of Unit 2 Powdex Same location as 3RIA-31	Monitors LPSW discharge from the Building. Readings > background are indicators of primary coolant leak into the LPSW System; RIA-31 readings will increase also.
1RIA-40 2RIA-40 3RIA-40	10 - 10e6 CPM	Unit 1 CSAE Off Gas Discharge Unit 2 CSAE Off Gas Discharge Unit 3 CSAE Off Gas Discharge	Monitors CSAE Off Gas effluent to each unit vent. Indicates steam generator tube leaks.
1,2,3 RIA-57&58	1 - 10e7 R/hr	Unit 1 Reactor Building Unit 2 Reactor Building Unit 3 Reactor Building	Measures activity in the Rx building during a LOCA. Readings from these RIAs can be related to % failed fuel.

1RIA-31 SAMPLE POINTS

1RIA-31-1	LPI/Decay Heat Cooler 1A Outlet
1RIA-31-2	LPI/Decay Heat Cooler 1B Outlet
1RIA-31-3	RB Component Cooler 1A Outlet
1RIA-31-4	RB Ventilation (Cooling) Unit 1A Outlet
1RIA-31-5	RB Ventilation (Cooling) Unit 1B Outlet
1RIA-31-6	RB Ventilation (Cooling) Unit 1C Outlet
1RIA-31-7	LPI/Decay Heat Cooler 2A Outlet
1RIA-31-8	LPI/Decay Heat Cooler 2B Outlet
1RIA-31-9	RB Component Cooler 2B Outlet
1RIA-31-10	RB Ventilation (Cooling) Unit 2A Outlet
1RIA-31-11	RB Ventilation (Cooling) Unit 2B Outlet
1RIA-31-12	RB Ventilation (Cooling) Unit 2C Outlet

3RIA-31 SAMPLE POINTS

3RIA-31-1	LPI/Decay Heat Cooler 3A Outlet
3RIA-31-2	LPI/Decay Heat Cooler 3B Outlet
3RIA-31-3	RB Component Cooler 3B Outlet
3RIA-31-4	RB Ventilation (Cooling) Unit 3B Outlet
3RIA-31-5	RB Ventilation (Cooling) Unit 3A Outlet
3RIA-31-6	RB Ventilation (Cooling) Unit 3C Outlet

1RIA-32 SAMPLE POINTS

1RIA-32-1	Unit 1 Pipe Rooms; Elevation 758 and 771
1RIA-32-2	Unit 2 Pipe Rooms; Elevation 758 and 771
1RIA-32-3	Spent Resin Storage Tanks, Condensate Test Tanks, Unit 1 Letdown Storage Tank, Boric Acid Mix Tank
1RIA-32-4	RC Bleed Evaporator Room, Unit 1&2 Miscellaneous Waste Holdup Tank, Unit 2 Letdown Storage Tank
1RIA-32-5	Waste Drumming Area
1RIA-32-6	Miscellaneous Waste Evaporator Room
1RIA-32-7	Unit 1 RC Bleed Transfer Pump, Unit 1 RC Bleed Holdup Tanks, Unit 1 Concentrated Boric Acid Storage Tank
1RIA-32-8	Unit 2 RC Bleed Transfer Pump, Unit 2 RC Bleed Holdup Tanks, Unit 2 Concentrated Boric Acid Storage Tank
1RIA-32-10	Waste Gas Compressor, RC Bleed Evaporator Feed Tank
1RIA-32-11	Unit 1 Pipe Rooms; Elevations 783-796
1RIA-32-12	Unit 2 Pipe Rooms; Elevations 783-796

3RIA-32 SAMPLE POINTS

3RIA-32-1	Unit 3 Pipe Rooms; Elevation 758 and 771
3RIA-32-2	Unit 3 Pipe Rooms; Elevations 783-796
3RIA-32-3	RB Component Coolers, Letdown Filters, Hatches, Waste Gas Compressor Room, Waste Gas Decay Tanks
3RIA-32-4	Unit 3 RC Bleed Holdup Tanks, Unit 3 Concentrated Boric Acid Storage Tank, Unit 3 Miscellaneous Waste Holdup Tank Area
3RIA-32-5	High Activity Spent Resin Storage Tank, Boric Acid Mix Tank and Pumps, Spent Resin Storage Tank Area

1. Initial Conditions for Injection

1.1 An emergency is in effect due to a LOCA.

1.2 The Low Pressure Injection (LPI) system is in operation with the LPI pumps taking suction from the BWST.

1.3 The Reactor Building Emergency Spray system may or may not be in operation from the BWST through the spray headers.

1.4 The addition of caustic SHALL begin WITHIN thirty (30) minutes AFTER switchover to the recirculation mode of core cooling. The recirculation mode is in effect whenever the suction for the LPI pumps' is aligned to the Reactor Bldg. Emergency Sump.

1.5 The addition of caustic will be made upon authorization of the TSC/OSC, or upon notification by Operations when the TSC/OSC has not yet been activated.

2. Bases for Caustic Addition Calculations

2.1 Calculations for the amount of caustic required for neutralization of the borated water are dependent on:

2.1.1 An accurate estimation of the volume of borated water being used as the core flooding coolant;

2.1.2 The boron concentration of the core flooding coolant;

2.1.3 One (1) pound of caustic neutralizing seventeen (17) pounds of H_3BO_3 to a pH of 7.5.

2.2 If the total volumes of the CFTs and BWST are used, then the maximum amount of caustic required for neutralization of the borated water to a pH of 7.5 is 700 gallons. The amount of 700 gallons has been calculated with the following considerations:

2.2.1 Both CFTs and the BWST have a total volume of 403,000 gallons with a boron concentration of 2300 ppm;

2.2.2 The RCS has a volume of 88,000 gallons with a boron concentration of 1000 ppm.

2.3 Boric Acid for the purposes of these calculations behaves as a simple monoprotic acid.

3. Calculations of the Amount of Caustic required for Neutralization to a pH of 7.5 Based on Core Flooding Coolant Boron Content.

NOTE: Calculate the quantity of caustic as outlined below or use the computer program by opening DAE, Department Applications, Nuclear Generation, Oconee Desktop; Oconee Information Library; Chemistry Information Library; CUG-S-19-Caustic.

Date _____ Time _____ Unit _____ By _____

CFT 'A' Boron _____ CFT 'B' Boron _____ RCS Boron _____

BWST Boron _____ BWST Vol. dumped to RCS _____

3.1 The 2 CFT's have a total volume of 15,000 gal. Average the most recent boron results for the A&B CFT's and enter the average into the equation below. Calculate the (lbs of) H_3BO_3 in the CFT's:

$$\text{Lbs. CFT } H_3BO_3 = \frac{(\_\_\_\_\text{ ppm})(15{,}000 \text{ gal})(8.34 \text{ lbs/gal})}{(1 \times 10^6)(0.175)} = \_\_\_\_$$

3.2 The RCS has a volume of 88.000 gal. Calculate the lbs. H_3BO_3 in the RCS:

$$\text{Lbs. RCS } H_3BO_3 = \frac{(\_\_\_\_\text{ ppm})(88{,}000 \text{ gal})(8.34 \text{ lbs/gal})}{(1 \times 10^6)(0.175)} = \_\_\_\_$$

3.3 The BWST has a total volume of 388,000 gal. Obtain from Operations an estimate of the volume of borated water that has been dropped from the BWST: _____ gal. Calculate the lbs. H_3BO_3 added to the core from the BWST:

$$\text{Lbs. BWST } H_3BO_3 = \frac{(\_\_\_\_\text{ ppm})(\_\_\_\_\text{ gal})(8.34 \text{ lbs/gal})}{(1 \times 10^6)(0.175)} = \_\_\_\_$$

3.4 Calculate the Gal. NaOH required to adjust the borated water of the CFT's and the RCS to 7.5.

$$\text{Gal. 35\% NaOH required} = \frac{(1 \text{ lb NaOH})(\text{lbs CFT } H_3BO_3 + \text{lbs RCS } H_3BO_3 + \text{lbs BWST } H_3BO_3)(1 \text{ Gal 35\% NaOH})}{(17 \text{ lbs } H_3BO_3)(4 \text{ lbs NaOH})}$$

= _____ Gallons

3.5 For the initial caustic addition, it is recommended that only half of the calculated amount should be added. Note that if using the computer program to calculate the initial addition, the results have already been halved. This is clearly stated by the computer program. Record the actual amount to be added below.

Amount of 35% NaOH to add _____ gallons.

4. Calculation of the amount of 35% caustic required for neutralization of a pH between 7.0 and 8.0 based on core flooding coolant actual pH.

NOTE: Calculate as outlined below or use the computer program by opening DAE, Department Applications, Nuclear Generation, Oconee Desktop; Oconee Information Library; Chemistry Information Library; CUG-S-19-Caustic.

Date _____ Time _____ Unit _____ By _____

4.1 Core Coolant pH _____.

4.2 Core Coolant Boron Concentration (approximately) in ppm is _____.

4.3 Core Coolant Volume (RCS, BWST vol. dumped, CFTs) in gallons is _____.

4.4 Calculate the volume of 35% NaOH required to adjust the core coolant water to a pH between 7.0 and 8.0.

35% NaOH = $((4.7 \times 10^{-6} - 1.6 \times 10^{-13}/10^{-pH})$ppm B $-10^{-pH} + 10^{pH-14}) * V * 0.0829$ to Add

Where,

Gallons	=	Volume in gallons of 35% NaOH to add to the Reactor Coolant
B	=	Reactor Coolant boron concentration in ppm
V	=	Volume of reactor cooling water (including BWST, CFT, etc.) in gallons
8.29×10^{-2}	=	Conversion Factor
pH	=	Actual measured pH of reactor coolant water.
Gals 35% NaOH	=	_____ Gallons

NOTE:
1. This volume does not account for the associated piping volume between the caustic injection tank and the suction of the low pressure injection pump.
2. If reactor coolant pH is between 7.0 and 8.0, this formula "MAY" produce a negative number which means that no caustic addition is necessary.

Enclosure 6.4
E, A and R Values for
1% Failed Fuel and DBA

1% Failed Fuel:

$\bar{E}$ ~ 0.34 MeV/dis.

A ~ 0.293 mCi/ml

R = 0.18 mR/hr-mCi at lm for $\bar{E}$ ~ 0.34 MeV

100% Failed Fuel or Design Basis Accident (DBA):

$\bar{E}$ ~ 1.14 MeV/dis.

A ~ 1.324×10^5 uCi/mL

R = 0.58 R/hr-Ci at lm for $\bar{E}$ ~ 1.14 MeV

A direct proportion should exist between $\bar{E}$ and R for any failed fuel value > 1% and < 100%.

Initial Addition Based on Pounds of Boric Acid:

The initial addition is based on the ability of one pound of caustic to neutralize 17 pounds of boric acid. This value was calculated using the methodology described in the Babcock & Wilcox Water Chemistry Manual (BAW-1385), Section 8 (1990 revision) and was confirmed by benchtop titration studies. Please reference Memo to File, dated 1-24-96, "Results of Caustic Titration Study", File #OS-715.00 for further details.

Subsequent Additions Based on Measured pH:

The basic assumption is that boric acid (H_3BO_3) behaves as a simple monoprotic acid versus the complex monoprotic acid that it is. Thus, it was assumed that when boric acid is placed in water only the H_2BO_3 borate ion is produced. Typically, boric acid in water will produce 3 to 4 different borate ions (Ref.: B&W or Westinghouse literature on boric acid). The equation will therefore read as follows:

$$H_3BO_3 \;<\!\!-\!\!>\; H^+ + H_2BO_3^-$$

where the acid dissociation constant (K_a) equation would be

$$K_a = \frac{\{H_2BO_3^-\}\{H^+\}}{\{H_3BO_3\}} \qquad \text{(Eqn. 1)}$$

The pH equations for the hydrogen and hydroxyl ion are as follows:

$$pH = -\text{Log}\{H^+\} \qquad \text{(Eqn. 2)}$$

$$10^{-14} = \{H^+\}\{OH^-\} \qquad \text{(Eqn. 3)}$$

For calculation simplification purposes, it is assumed that the only species contributing to the neutralization equation listed below are NaOH, H_3BO_3, and H_2O:

$$\{Na^+\} + \{H^+\} - \{OH^-\} - \{H_2BO_3^-\} = 0 \qquad \text{(Eqn. 4)}$$

By substituting Equations 1, 2, and 3 above into equation 4 and solving for the sodium ion concentration, the amount of caustic added to the reactor coolant water can be determined given the system pH. The equation would be:

$$\{Na^+\} = K_a\{H_3BO_3\}/(10^{-pH}) + 10^{14-pH} - 10^{-pH} \qquad \text{(Eqn. 5)}$$

Since it is desired to adjust the system pH to a point between 7.0 and 8.0, then the desired amount of sodium necessary to achieve a system pH of 7.5 can be determined by solving equation 5 above for a pH equal to 7.5. Therefore, subtracting the sodium concentration calculated at the actual system pH from the sodium concentration at the desired pH of 7.5 yields the amount of sodium necessary for pH adjustment.

At a pH of 7.0, the terms 10^{-pH} and 10^{14-pH} cancel each other. This leaves the following equation:

$$\{Na^+\} = (K_a'\{H_3BO_3\}/(10^{-pH'})) - (K_a\{H_3BO_3\}/(10^{-pH}) + 10^{pH-14} - 10^{-pH}) \quad \text{(Eqn. 6)}$$

where " ' " represents the terms for when pH is 7.0.

Substituting A for the term $K_a'/(10^{-pH'})$ and B for K_a the above equation becomes,

$$\{Na^+\} = (A - B/(10^{-pH}))\{H_3BO_3\} - 10^{pH-14} + 10^{-pH} \quad \text{(Eqn. 7)}$$

Next, using conversion factors and solving for sodium in terms of gallons of 35% NaOH to add, the equation becomes,

$$\text{35\% NaOH to Add (Gallons)} = ((A-B/(10^{-pH}))\text{ppm B} - 10^{pH-14} + 10^{-pH}) * V * 0.0829 \quad \text{(Eqn. 8)}$$

where,
- ppm B = boron concentration of reactor cooling water
- V = volume of reactor cooling water to pH adjust, gallons
- pH = pH of reactor cooling water after making initial caustic add
- 0.0829 = conversion factor
- A & B = coefficients for boric acid dissociation constants at 25° C.

The 0.0829 conversion factor came from the conversion of Na ion concentration to gallons of 35% NaOH. The number was reached by the following equations:

Gallons 35% NaOH = (moles Na / liters soln.) * (gals soln.) * (1 mole NaOH / 1 mole Na) 35% * (3.785 liters soln. / 1 gal soln.) * (40.01 gms NaOH / 1 mole NaOH) * (100 gms soln. / 35 gms NaOH) * (1 cubic centimeter / 1.38 gms) * (1 liter 35% naOH / 1000 cubic centimeters 35% NaOH) * (1 gal 35% NaOH / 3.785 liters 35% NaOH)

Gallons 35% NaOH = (moles Na / liters soln.) * (gals soln.) * 0.0829
(liter soln. * gal 35% NaOH) / (gal soln. * moles Na)

The initial guesses for the A and B coefficients were calculated from apparent monoprotic dissociation constants using a pH - specific conductivity computer program. The initial coefficients were $A = 9 \times 10^{-6}$ and $B = 3.09 \times 10^{-13}$. Laboratory data was then utilized to fine tune the coefficients. Titrations of various boron concentrations resulted in coefficients $A = 4.7 \times 10^{-6}$ and $B = 1.6 \times 10^{-13}$. Thus, the formula for calculating the quantity of caustic to add based on pH as shown in Enc. 6.3 is:

$$\text{35\% NaOH to Add} = ((4.7 \times 10^{-6} - 1.6 \times 10^{-13}/10^{-pH})\text{ppm B} \quad \text{(Eqn. 9)}$$
$$-10^{-pH} + 10^{pH-14}) * V * 0.0829$$

Reference: Memo to File, dated 5/29/89, "pH Adjustment of Reactor Coolant During a LOCA Using Sodium Hydroxide", File #OS-715.00.

Enclosure 6.6
Quarterly Inspection of
Post Accident Equipment

1. **Caustic addition equipment stored in the brown cabinet in AB, 2nd floor ~10 ft North of 1 & 2 Chemical Addition Area:**

Goggles	Face shield	Bung Wrench
Corrosive suit	Gloves	Flashlight
Boots	Stainless steel flex hose	
Tank to valve adapter	Tape measure	

2. **Appendix 'R' sampling apparatus stationed in each units respective LPI room:**

	UNITS		
	1 (RM-61)	**2 (RM-63)**	**3 (RM-82)**
Sample cooler	_____	_____	_____
Ice container (30 gal. drum)	_____	_____	_____
Glass thermometer	_____	_____	_____
Plastic liter bottles (3)	_____	_____	_____
Tygon tubing for cooler (! 3/4", 2 1/4")	_____	_____	_____
Adjustable wrench	_____	_____	_____
250 mL disposable beaker	_____	_____	_____
Hose isolation clamp	_____	_____	_____