QUAD CITIES NUCLEAR POWER STATION
EMERGENCY OPERATING PROCEDURES
GENERATION PACKAGE

TECHNICAL GUIDELINE
WRITERS GUIDELINE
VERIFICATION & VALIDATION PROGRAM
PROCEDURE TRAINING DESCRIPTION

QUAD CITIES NUCLEAR POWER STATION

EMERGENCY OPERATING PROCEDURE

PLANT SPECIFIC TECHNICAL GUIDELINE

TABLE I

ABBREVIATIONS

ADS	-	Automatic Depressurization System
APRM	-	Average Power Range Monitor
CRD	-	Control Rod Drive
CS	-	Core Spray
ECCS	-	Emergency Core Cooling System
HCU	-	Hydraulic Control Unit
HPCI	-	High Pressure Coolant Injection
HVAC	-	Heating, Ventilating and Air Conditioning
LCO	-	Limiting Condition for Operation
LOCA	-	Loss of Coolant Accident
LPCI	-	Low Pressure Coolant Injection
MSIV	-	Main Steamline Isolation Valve
NDTT	-	Nil-Ductility Transition Temperature
NPSH	-	Net Positive Suction Head
RCIC	-	Reactor Core Isolation Cooling
RHR	-	Residual Heat Removal
RPS	-	Reactor Protection System
RPV	-	Reactor Pressure Vessel
RWCU	-	Reactor Water Cleanup
RWM	-	Rod Worth Minimizer
SBGT	-	Standy Gas Treatment
SBLC	-	Standby Liquid Control
SORV	-	Stuck Open Relief Valve
SRV	-	Safety Relief Valve (Electromatic Relief Valve or Target Rock Safety - Relief Combination Valve)

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OPERATOR PRECAUTIONS

General

This section lists "Cautions" which are generally applicable at all times.

CATUION #1

Monitor the general state of the plant. If an entry condition for a procedure developed from the Emergency Procedure Guidelines occurs, enter that procedure. When it is determined that an emergency no longer exists, enter normal operating procedure.

CAUTION #2

Monitor RPV water level and pressure and primary containment temperatures and pressure from multiple indications.

CAUTION #3

If a safety function initiates automatically, assume a true initiating event has occurred unless otherwise confirmed by at least two independent indications.

CAUTION #4

Whenever RHR is in the LPCI mode, inject through the heat exchangers as soon as possible.

CAUTION #5

Suppression pool temperature is determined by QOS 1600-8. Drywell temperature is determined by QOS 1600-20.

CAUTION #6

Whenever [temperature near the instrument reference leg vertical runs] exceeds the temperature in the table and the instrument reads below the indicated level in the table, the actual RPV water level may be anywhere below the elevation of the lower instrument tap.

Temperature	Indicated Level	Instrument
169°F	-37 in.	Yarway Narrow Range (-60 to +60 in.)
170°F	63 in.	GEMAC Upper 400 Range (-42 to 358 in.)
210°F	-233	GHEMAC Lower 400 Range (-334 to 66 in.)
548°F	-242	Yarway Lower Range (-234 to 66 in.)
548°F	44	GEMAC Narrow Range (0 to 60 in.)

CAUTION #7

Yarway Level indicated levels are not reliable during rapid RPV depressurization below 500 psig. For these conditions, utilize the GEMAC to monitor RPV water level.

CAUTION #8

This caution intentionally left blank.

CAUTION #9

If signals of high suppression pool water level +5" (high level suction interlock) or low condensate storage tank water level 10,000 gal. (low level suction interlock) occur, confirm automatic transfer of, or manually transfer HPCI and RCIC suction from the condensate storage tank to the suppression pool.

CAUTION #10

Do not secure or place an ECCS in MANUAL mode unless, by at least two independent indications, (1) misoperation in AUTOMATIC mode is confirmed, or (2) adequate core cooling is assured. If an ECCS is placed in MANUAL mode, it will not initiate automatically. Make frequent checks of the initiating or controlling parameter. When manual operation is no longer required, restore the system to AUTOMATIC/STANDBY mode if possible.

CAUTION #11

If a high drywell pressure ECCS initiation signal 2.0 psig (drywell pressure which initiates ECCS) occurs or exists while depressurizing, prevent injection from those CS and RHR-LPCI pumps not required to assure adequate core cooling prior to reaching their maximum injection pressures. When the high drywell pressure ECCS initiation signal clears, restore CS and LPCI to AUTOMATIC/STANDBY mode.

CAUTION #12

Do not throttle HPCI or RCIC systems below 2200 rpm.

CAUTION #13

Cooldown rates above 100°F/hr may be required to accomplish this step.

CAUTION #14

Do not depressurize the RPV below 100 psig unless motor driven pumps sufficient to maintain RPV water level are running and available for injection.

CAUTION #15

Open SRVs in the following sequence if possible:

1. 203-3B
2. 203-3C
3. 203-3E
4. 203-3D
5. 203-3A

CAUTION #16

Bypassing low RPV water level ventilation system isolation and MSIV isolation interlocks may be required to accomplish this step.

CAUTION #17

Cooldown rates above 100°F/hr may be required to conserve RPV water inventory, protect primary containment integrity, or limit radioactive release to the environment.

CAUTION #18

If continuous LPCI operation is required to assure adequate core cooling, do not divert all RHR pumps from LPCI mode.

CAUTION #19

This caution intentionally left blank.

CAUTION #20

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CAUTION #21

Elevated suppression chamber pressure may trip the RCIC turbine on high exhaust pressure.

CAUTION #22

Defeating isolation interlocks may be required to accomplish this step.

CAUTION #23

Do not initiate drywell sprays if suppression pool water level is above +48".

CAUTION #24

Bypassing high drywell pressure and low RPV water level secondary containment HVAC isolation interlocks may be required to accomplish this step.

CAUTION #25

A rapid increase in injection into the RPV may induce a large power excursion and result in substantial core damage.

CAUTION #26

Large reactor power oscillations may be observed while executing this step.

RPV CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to:

- Maintain adequate core cooling
- Shutdown the reactor, and
- Cool down the RPV to cold shutdown conditions temperature (100°F < RPV water temperature < 212°F)

ENTRY CONDITIONS

The entry conditions for this guideline are any of the following:

- RVP water level below +8 in. (low level scram setpoint)
- RPV pressure above 1060 psig (high RPV pressure scram setpoint)
- Drywell pressure above 2.0 psig (high drywell pressure scram setpoint
- A condition which requires MSIV isolation
- A condition which requires reactor scram, and reactor power above 3% (APRM downscale trip) or cannot be determined.

OPERATOR ACTIONS

RC-1 If reactor scram has not been inititated, initiate reactor scram.

Irrespective of the entry condition, execute Steps RC/L, RC/P, and RC/Q concurrently.

RC/L Monitor and control RPV water level.

RC/L-1 Confirm initiation of any of the following:

- Primary Containment Isolation
- ECCS
- Emergency diesel generator initiation

Initiate any of these which should have initiated but did not.

If while executing the following step:

- Boron Injection is required, enter [procedure developed from CONTINGENCY #7].
- RPV water level cannot be determined, RPV FLOODING IS REQUIRED; enter [procedure developed from CONTINGENCY #6].
- RPV Flooding is required, enter [procedure developed from CONTINGENCY #6].

RC/L-2 Restore and maintain RPV water level between +8 in (low level scram setpoint) and +48 in (high level trip setpoint) with one or more of the following systems: #9 #10 #11

- Condensate/feedwater system 1100 - 0 psig (RPV pressure range for system operation)
- CRD system 1100 - 0 psig (RPV pressure range for system operation)
- RCIC system 1150 - 50 psig (RPV pressure range for system operation) #12

- HPCI system 1150 - 100 psig (RPV pressure range for system operation)

- CS system 325 - 0 psig (RPV pressure range for system operation)

- LPCI system 325 - 0 psig (RPV pressure range for system operation)

If RPV water level cannot be restored and maintained above +8 in. (low level scram setpoint), maintain RPV water level above -143 in. (top of active fuel).

If RPV water level can be maintained above -143 in. (top of active fuel) and the ADS timer has initiated, prevent automatic RPV depressurization by resetting the ADS timer or by utilizing the ADS INHIBIT switch.

If RPV water level cannot be maintained above -143 in. (top of active fuel), enter [procedure developed from CONTINGENCY #1].

If Alternate Shutdown Cooling is required enter [procedure developed from CONTINGENCY #5].

RC/L-3 Proceed to cold shutdown in accordance with QGP 2-3.

RC/P Monitor and control RPV pressure.

If while executing the following steps:

- Emergency RPV Depressurization is anticipated, rapidly depressurize the RPV with the main turbine bypass valves. #13

- Emergency RPV Depressurization or RPV Flooding is required and less than 5 (number of SRVs dedicated to ADS) SRVs are open, enter [procedure developed from CONTINGENCY #2].

- RPV Flooding is required and 5 (number of SRVs dedicated to ADS) SRVs are open, enter [procedure developed from CONTINGENCY #6].

RC/P-1 If any SRV is cycling, manually open SRVs until RPV pressure drops to 935 psig (RPV pressure at which all turbine bypass valves are fully open).

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If while executing the following steps:

- Boron Injection is required, and
- The main condenser is available, and
- There has been no indication of gross fuel failure or steam line break,

open MSIVs to re-establish the main condenser as a heat sink. #16

RC/P-2 Control RPV pressure below 115 psig (lowest SRV lifting pressure) with the main turbine bypass valves. #14

RPV pressure control may be augmented by one or more of the following systems:

- SRVs only when suppression pool water level is above -25 in. #15
- HPCI #12
- RCIC

- RWCU (recirculation mode) if no boron has been injected into the RPV.

- Main steam line drains.

- RWCU (blowdown mode) if no boron has been injected into the RPV.

If while executing the following steps the reactor is not shutdown, return to [Step RC/P-2].

RC/P-3 When either:

- All control rods are inserted beyond position 04 (maximum subcritical banked withdrawal position), or

- 537 pounds (Cold Shutdown Boron Weight) of boron have been injected into the RPV, or

- The reactor is shutdown and no boron has been injected into the RPV,

depressurize the RPV and maintain cooldown rate below 100°F/hr (RPV cooldown rate LCO) ____ #14, #17

RC/P-4 When the RHR shutdown cooling interlocks clear, initiate the shudtdown cooling mode of RHR. ____ #18

If the RHR shutdown cooling mode cannot be established and further cooldown is required, continue to cool down using one or more of the systems used for depressurization.

If RPV cooldown is required but cannot be accompl.shed and all control rods are inserted beyond position 04 (maximum subcritical banked withdrawal position), ALTERNATE SHUTDOWN COOLING IS REQUIRED; enter procedure developed from CONTINGFNCY #5.

RC/P-5 Proceed to cold shutdown in accordance with QGP 2-1.

RC/Q Monitor and control reactor power.

If while executing the following steps:

- All control rods are inserted beyond position 04 (maximum subcritical banked withdrawal position), terminate boron injection and enter QGP 2-3.

- The reactor is shutdown and no boron has been injected into the RPV, enter QGP 2-3.

RC/Q-1 Verify the reactor mode switch in SHUTDOWN.

RC/Q-2 If the main turbine-generator is on-line and the MSIVs are open, confirm or initiate recirculation flow runback to minimum.

RC/Q-3 If reactor power is above 3% (APRM downscale trip) or cannot be determined, trip the recirculation pumps.

Execute [Steps RC/Q-4 and RC/Q-5] concurrently.

RC/Q-4 If the reactor cannot be shutdown before suppression pool temperature reaches 130°F (Boron Injection Initiation Temperature), BORON INJECTION IS REQUIRED; inject boron into the RPV with SBLC and prevent automatic initiation of ADS. #19

If boron cannot be injected with SLC, inject boron into the RPV by one or more of the following alternate methods:

- CRD
- RWCU
- Feedwater
- HPCI
- RCIC
- Safe Shutdown Pump

RC/Q-4.1 If boron is not being injected into the RPV by RWCU, confirm automatic isolation of or manually isolate RWCU.

RC/Q-4.2 Continue to inject boron until 537 pounds (Cold Shutdown Boron Weight) of boron have been injected into the RPV.

RC/Q-4.3 Enter QGP 2-3.

RC/Q-5 Insert control rods as follows:

RC/Q-5.1 If any scram valve is not open:

- Remove:

  590-175 A, C, E and G at Panel 901-15(902-15)
  590-175 B, D, F and H at Panel 901-17 (902-17)

  (fuses which de-energize RPS scram solenoids)

- Close valve 0302-109 scram air header supply valve and open valves 0302-21A, 302-21B, 0302-21C, 302-21D

When control rods are not moving inward:

- Replace:

  590-175 A, C, E and G
  590-175 B, D, F and H

  (fuses which de-energize RPS scram solenoids)

- Close Valves:

  0302-21A, 0302-21B, 0302-21C, 0302-21D
  and open valve 0302-109

RC/Q-5.2 Reset the reactor scram.

If the reactor scram cannot be reset:

1. Start both CRD pumps.

   If no CRD pump can be started, continue in this procedure at [Step RC/Q-5.6.1].

2. Close valve 0301-25. HCU accumulator charging water header valve.

3. Rapidly insert control rods manually until the reactor scram can be reset. #20

4. Reset the reactor scram.

5. Open valve 0301-25 HCU accumulator charging water header valve.

RC/Q-5.3 If the scram discharge volume vent and drain valves are open, initiate a manual reactor scram.

1. If control rods moved inward, return to [Step RC/Q-5.2].

2. Reset the reactor scram.

   If the reactor scram cannot be reset, continue in this procedure at [Step RC/Q-5.5.1].

3. Open the scram discharge volume vent and drain valves.

RC/Q-5.4 Individually open the scram test switches for control rods not inserted beyond position 04 (maximum subcritical banked withdrawal position).

When a control rod is not moving inward, close its scram test switch.

RC/Q-5.5 Reset the reactor scram.

If the reactor scram cannot be reset:

1. Start both CRD pumps.

   If no CRD pump can be started, continue in this procedure at [Step RC/Q-5.6.1].

2. Close valve 0301-25 (HCU accumulator charging water header valve).

RC/Q-5.6 Rapidly insert control rods manually until all control rods are inserted beyond position 04 (maximum subcritical banked withdrawal position). #20

If any control rod cannot be inserted beyond position 04 (maximum subcritical banked withdrawal position):

1. Individually direct the effluent from valve 301-102 CRD withdraw line vent to a contained radwaste drain and open valve 301-102 CRD withdraw line vent for each control rod not inserted beyond position 04 (maximum subcritical banked withdrawal position).

2. When a control rod is not moving inward, close valve 301-102 CRD withdraw line vent.

PRIMARY CONTAINMENT CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to:

- Maintain primary containment integrity, and
- Protect equipment in the primary containment.

ENTRY CONDITIONS

The entry conditions for this guideline are any of the following:

- Suppression pool temperature above 95°F (most limiting suppression pool temperature LCO)
- Drywell temperature above 180°F (maximum normal operating temperature)
- Drywell pressure above 2.0 psig (high drywell pressure scram setpoint)
- Suppression pool water level above +2 in. (maximum suppression pool water level LCO)
- Suppression pool water level below -2 in. (minimum suppression pool water level LCO)

OPERATOR ACTIONS

Irrespective of the entry condition, execute [Steps SP/T, DW/T, CN/T, PC/P and SP/L] concurrently.

SP/T Monitor and control suppression pool temperature.

SP/T-1 Close all SORVs.

If any SORV cannot be closed scram the reactor.

SP/T-2 When suppression pool temperature exceeds 95°F (most limiting suppression pool temperature LCO), operate available suppression pool cooling. #18

SP/T-3 Before suppression pool temperature reaches 130°F (Boron Injection Initiation Temperature), scram the reactor.

SP/T-4 If suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit, maintain RPV pressure below the Limit. #8 #13 #14

If suppression pool temperature and RPV pressure cannot be restored and maintained below the Heat Capacity Temperature Limit, EMERGENCY RPV DEPRESSURIATION IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

DW/T Monitor and control drywell temperature.

DW/T-1 When average drywell temperature exceeds 180°F (drywell maximum normal operating temperature, whichever is higher), operate available drywell cooling. #6

Execute [Steps DW/T-2 and DW/T-3] concurrently.

DW/T-2 If drywell temperature near the cold reference leg instrument vertical runs reaches the RPV Saturation Temperature, RPV FLOODING IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

DW/T-3 Before drywell temperature reaches 300°F (drywell design temperature) but only if suppression chamber temperature and drywell pressure are below the Drywell Spray Initiation Pressure Limit shut down recirculation pumps and drywell cooling fans and initiate drywell sprays. ____ #18

If drywell temperature cannot be maintained below 300°F (drywell design temperature) EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

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PC/P Monitor and control primary containment pressure.

PC/P-1 Operate systems, as required:

- Refer to QOP 1600-3 Post Accident Venting of Primary Containment

PC/P-2 Before suppression chamoer pressure reaches 12.8 psig (Suppression Chamber Spray Initiation Pressure) and if suppression pool water level is below 27 ft. 6 in. (elevation of suppression pool spray nozzles) initiate suppression pool sprays. ______ #8, #18

PC/P-3 If suppression chamber pressure exceeds 12.8 psig (Suppression Chamber Spray Initiation Pressure) but only if suppression chamber temperature and drywell pressure are below the Drywell Spray Initiation Pressure Limit, shut down recirculation pumps and drywell cooling fans and initiate drywell sprays. ______ #18

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- If suppression pool water level is below 27 ft. 6 in. (elevation of suppression pool spray nozzles), initiate suppression pool sprays.

- If suppression chamber temperature and drywell pressure are below the Drywell Spray Initiation Pressure Limit shut down recirculation pumps and drywell cooling fans and initiate drywell sprays.

PC/P-7 If suppression chamber pressure exceeds the Primary Containment Pressure Limit, vent the primary containment in accordance with procedure for containment venting to reduce and maintain pressure below the Primary Containment Pressure Limit. #22

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SP/L-2 SUPPRESSION POOL WATER LEVEL BELOW -2 in. (minimum suppression pool water level LCO)

Maintain suppression pool water level above the Heat Capacity Level Limit.

If suppression pool water level cannot be maintained above the Heat Capacity Level Limit, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

SP/L-3 SUPPRESSION POOL WATER LEVEL ABOVE + 2 in. (maximum suppression pool water level LCO).

Execute Steps SP/L-3.1 and SP/L-3.2 concurretly.

SP/L-3.1 Maintain suppression pool water level below the Suppression Pool Load Limit.

If suppression pool water level cannot be maintained below the Suppression Pool Load Limit, maintain RPV pressure below the Limit. #13 #14

If suppression pool water level and RPV pressure cannot be maintained below the Suppression Pool Load Limit but only if adequate core cooling is assured, terminate injection into the RPV from sources external to the primary containment except from boron injection systems and CRD.

If suppression pool water level and RPV pressure cannot be restored and maintained below the Suppression Pool Load Limit, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

SP/L-3.2 Before suppression pool water level reaches 18 ft. (Elevation of bottom of Mark I internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water) but only if adequate core cooling is assured, terminate injection into the RPV from sources external to the primary containment except from boron injection systems and CRD.

1. When suppression pool water level reaches 18 ft. (elevation of bottom of Mark I internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water) but only if suppression chamber temperature and drywell pressure are below the Drywell Spray Initiation Pressure Limit shut down recirculation pumps and drywell cooling fans and initiate drywell sprays. #18

2. If suppression pool water level exceeds 18 ft. (elevation of bottom of Mark I internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water), contiue to operate drywell sprays. #23

3. When primary containment water level reaches 92.5 ft. (Maximum Primary Containment Water Level Limit), terminate injection into the RPV from sources external to the primary containment irrespective of whether adequate core cooling is assured.

SECONDARY CONTAINMENT CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to:

- Protect equipment in the secondary containment,
- Limit radioactivity release to the secondary containment, and either:
- Maintain secondary containment integrity, or
- Limit radioactivity release from the secondary containment.

ENTRY CONDITIONS

The entry conditions for this guideline are any of the following secondary containment conditions:

- Differential pressure at or above 0 in. of water
- An area temperature above the maximum normal operating temperature
- HVAC exhaust radiation level above the maximum normal operating radiation level
- An area radiation level above the maximum normal operating radiation level
- A floor drain sump water level above the maximum normal operating water level
- An area water level above the maximum normal operating water level

OPERATOR ACTIONS

If while executing the following steps secondary containment HVAC exhaust radiation level exceeds 3 MR above background (secondary containment HVAC isolation setpoint):

- Confirm or manually initiate isolation of secondary containment HVAC, and

- Confirm initiation of or manually initiate SBGT only when the space being evacuated is below 212°F.

If while executing the following steps:

- Secondary containment HVAC isolates, and

- Secondary containment HVAC exhaust radiation level is below 3 MR above background (secondary containment HVAC isolation setpoint),

restart secondary containment HVAC.

#24

Irrespective of the entry condition, execute Steps SC/T, SC/R, and SC/L concurrently.

SC/T Monitor and control secondary containment temperatures.

SC/T-1 Operate available area coolers.

SC/T-2 If secondary containment HVAC exhaust radiation level is below 3 MR above background (secondary containment HVAC isolation setpoint) operate available secondary containment HVAC.

SC/T-3 If any area temperature exceeds its maximum normal operating temperature, isolate all systems that are discharging into the area except systems required to shut down the reactor, assure adequate core cooling, or suppress a working fire.

SC/T-4 If a primary system is discharging into an area, then before any area temperature reaches its maximum safe operating temperature, enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

SC/T-5 If a primary system is discharging into an area and an area temperature exceeds its maximum safe operating temperature in more than one area, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SC/R Monitor and control secondary containment radiation levels.

SC/R-1 If any area radiation level exceeds its maximum normal operating radiation level, isolate all systems that are discharging into the area except systems required to shut down the reactor, assure adequate core cooling, or suppress a working fire.

SC/R-2 If a primary system is discharging into an area, then before any area radiation level reaches its maximum safe operating radiation level, enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

SC/R-3 If a primary system is discharging into an area and an area radiation level exceeds its maximum safe operating radiation level in more than one area, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SC/L Monitor and control secondary containment water levels.

SC/L-1 If any floor drain sump or area water level is above its maximum normal operating water level, operate available sump pumps to restore and maintain it below its maximum normal operating water level.

If any floor drain sump or area water level cannot be restored and maintained below its maximum normal operating water level, isolate all systems that are discharging water into the sump or area except systems required to shut down the reactor, assure adequate core cooling, or suppress a working fire.

SC/L-2 If a primary system is discharging into an area, then before any floor drain sump or area water level reaches its maximum safe operating water level, enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

SC/L-3 If a primary system is discharging into an area and a floor drain sump or area water level exceeds its maximum safe operating water level in more than one area, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

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RADIOACTIVITY RELEASE CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to limit radioactivity release into areas outside the primary and secondary containments.

ENTRY CONDITIONS

The entry condition for this guideline is:

- Offsite radioactivity release rate above 10 times the Technical Specification limit (release rate which requires an ALERT).

OPERATOR ACTIONS

RR-1 Isolate all primary systems that are discharging into areas outside the primary and secondary containments except systems required to assure adequate core cooling or shut down the reactor.

RR-2 If offsite radioactivity release rate approaches or exceed 1 R/HR (release rate which requires a GENERAL EMERGENCY) and a primary system is discharging into an area outside the primary and secondary containments, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

CONTINGENCY #1

LEVEL RESTORATION

If while executing the following steps:

- Boron Injection is required, enter procedure developed from CONTINGENCY #7.
- RPV water level cannot be determined, RPV FLOODING IS REQUIRED; enter procedure developed from CONTINGENCY #6.
- RPV Flooding is required, enter procedure developed from CONTINGENCY #6.

C1-1 Inititate HPCI

C1-2 Line up for injection and start pumps in 2 or more of the following injection subsystems:

- Safe Shutdown Pump
- RCIC
- LPCI
- CS-A
- CS-B

If less than 2 of the injection subsystems can be lined up, commence lining up as many of the following alternate injection subsystems as possible:

- Service water crosstie
- Fire system to Safe Shutdown Pump
- Interconnections with other units
- ECCS Jocky Fill
- SBLC (test tank)
- SBLC (boron tank)

C1-3 Monitor RPV pressure and water level. Continue in this procedure at the step indicated in the following table.

RPV PRESSURE REGION

425 psig[1] 100 psig[2]

	HIGH	INTERMEDIATE	LOW
INCREASING	C1-4	C1-5	C1-6
DECREASING	C1-7		C1-8

1 (RPV pressure at which CS shutoff head is reached)
2 (HPCI low pressure isolation setpoint, whichever is higher)

If while executing the following steps:

- The RPV water level trend reverses or RPV pressure changes region, return to Step C1-3.

- RPV water level drops below -59 in. (ADS initiation setpoint), prevent automatic initiation of ADS.

C1-4 RPV WATER LEVEL INCREASING, RPV PRESSURE HIGH

Enter procedure developed from the RPV Control Guideline at [Step RC/L].

C1-5 RPV WATER LEVEL INCREASING, RPV PRESSURE INTERMEDIATE

If HPCI and RCIC are not available and RPV pressure is increasing, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED. When RPV pressure is decreasing, enter procedure developed from the RPV Control Guideline at Step RC/L.

If HPCI and RCIC are not available and RPV pressure is not increasing, enter procedure developed from the RPV Control Guideline at Step RC/L.

Otherwise, when RPV water level reaches +8 in. (low level scram setpoint) enter procedure developed from the RPV Control Guideline at Step RC/L.

C1-6 RPV WATER LEVEL INCREASING, RPV PRESSURE LOW

If RPV pressure is increasing, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED. When RPV pressure is decreasing, enter procedure developed from the RPV Control Guideline at Step RC/L.

Otherwise, enter procedure developed from the RPV Control Guideline at Step RC/L.

C1-7 RPV WATER LEVEL DECREASING, RPV PRESSURE HIGH OR INTERMEDIATE

If HPCI or RCIC is not operating, restart whichever is not operating.

If no injection subsystem is lined up for injection with at least one pump running, start pumps in alternate injection subsystems which are lined up for injection.

When RPV water level drops to -143 in. (top of active fuel):

- If no system, injection subsystem or alternate injection subsystem is lined up with at least one pump running, STEAM COOLING IS REQUIRED. When any system, injection subsystem or alternate injection subsystem is lined up with at least one pump running, return to Step C1-3.
- Otherwise, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED. When RPV water level is increasing or RPV pressure drops below 100 psig (HPCI low pressure isolation setpoint) return to Step C1-3.

C1-8 RPV WATER LEVEL DECREASING, RPV PRESSURE LOW

If no LPCI or CS subsystem is operating, start pumps in alternate injection subsystems which are lined up for injection.

If RPV pressure is increasing, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

When RPV water level drops to -143 in. (top of active fuel), enter procedure developed from CONTINGENCY #4.

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CONTINGENCY #2

EMERGENCY RPV DEPRESSURIZATION

C2-1 When either:

#13, #14

- Boron Injection is required and all injection into the RPV except from boron injection systems and CRD has been terminated and prevented, or

- Boron Injection is not required,

C2-1.1 This step left blank

C2-1.2 If suppression pool water level is above 4 ft. 9 in. (elevation of top of SRV discharge device):

- Open all SRV's.

C2-1.3 If less than 3 (Minimum Number of SRVs Required for Emergency Depressurization) SRVs are open and RPV pressure is at least 50 psig (Minimum SRV Re-opening Pressure) above suppression chamber pressure, rapidly depressurize the RPV using one or more of the following systems (use in order which will minimize radioactive release to the environment): #22

- Main condenser
- Main steam line drains
- HPCI steam line
- RCIC steam line
- Head vent
- RWCU

If RPV Flooding is required, enter procedure developed from CONTINGENCY #6.

C2-2 Enter procedure developed from the RPV Control Guideline at Step RC/P-4.

CONTINGENCY #3

STEAM COOLING

C3-1

If while executing the following steps Emergency RPV Depressurization is required or any system, injection subsystem, or alternate injection subsystem is lined up for injection with at least one pump running, enter procedure developed from CONTINGENCY #2.

When RPV water level drops to -240 in. (Minimum Zero-Injection RPV Water Level) or if RPV water level cannot be determined, open one SRV.

When RPV pressure drops below 700 psig (Minimum Single SRV Steam Cooling Pressure), enter procedure developed from CONTINGENCY #2.

CONTINGENCY #4

CORE COOLING WITHOUT LEVEL RESTORATION

C4-1 Open all SRV's.

#13

C4-2 Operate Core Spray subsystems with suction from the suppression pool.

When at least one core spray subsystem is operating with suction from the suppression pool and RPV pressure is below 190 psig (RPV pressure for rated CS) terminate injection into the RPV from sources external to the primary containment.

C4-3 When RPV water level is restored to -143 in. (top of active fuel) enter procedure developed from the RPV Control Guideline at Step RC/L.

CONTINGENCY #5

ALTERNATE SHUTDOWN COOLING

C5-1 Initiate suppression pool cooling.

C5-2 Close the RPV head vents, MSIVs, main steam line drain valves, and HPCI and RCIC isolation valves.

C5-3 Place the control switch for one (Minimum Number of SRVs Required for Alternate Shutdown Cooling) SRV in the OPEN position.

C5-4 Slowly raise RPV water level to establish a flow path through the open SRV back to the suppression pool.

C5-5 Start one RHR pump with suction from the suppression pool.

C5-6 Slowly increase LPCI injection into the RPV to the maximum.

C5-6.1 If RPV pressure does not stabilize at least 54.4 psig (Minimum Alternate Shutdown Cooling RPV Pressure) above suppression chamber pressure, start another RHR pump.

C5-6.2 If RPV pressure does not stabilize below 166 psig (Maximum Alternate Shutdown Cooling RPV Pressure, open another SRV.

C5.6-3 If the cooldown rate exceeds 100°F/hr (maximum RPV cooldown rate LCO) LPCI injection into the RPV until the cooldown rate decreases below 100°F/hr (maximum RPV cooldown rate LCO) or RPV pressure decreases to within 50 psig (Minimum SRV Re-opening Pressure) of suppression chamber pressure, whichever occurs first.

C5-7 Control suppression pool temperature to maintain RPV water temperature above 140°F (RPV NDTT).

C5-8 Proceed to cold shutdown in accordance with procedure QGP 2-3 for cooldown to cold shutdown conditions.

CONTINGENCY # 6

RPV FLOODING

C6-1 If at least 3 (Minimum number of SRVs Required for Emergency Depressurization) SRVs can be opened, close the MSIVs, main steam line drain valves, HPCI and RCIC isolation valves.

C6-2 If any control rod is not inserted beyond position 04 (maximum subcritical banked withdrawal position):

C6-2.1 Terminate and prevent all injection into the RPV except from boron injection systems and CRD until RPV pressure is below the Minimum Alternate RPV Flooding Pressure.

Number of open SRVs	Minimum Alternate RPV Flooding Pressure (psig)
5	125
4	155
3	210
2	320

If less than 2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure) SRVs can be opened, continue in this procedure.

If while executing the following step, RPV water level can be determined and RPV Flooding is not required, enter procedure developed from CONTINGENCY #7 and procedure developed from the RPV Control Guideline at Step RC/P-4 and execute these procedures concurrently.

C6-2.2 Commence and slowly increase injection into the RPV with the following systems until at least 2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure) SRVs are open and RPV pressure is above the Minimum Alternate RPV Flooding Pressure: #25

- Motor driven feedwater pumps
- Condensate pumps
- CRD
- LPCI
- Safe Shutdown Pump

If at least 2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure) SRVs are not open or RPV pressure cannot be increased to above the Minimum Alternate RPV Flooding Pressure, commence and slowly increase injection into the RPV with the following systems until at least 2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure) SRVs are open and RPV pressure is above the Minimum Alternate RPV Flooding Pressure:

- CS
- LPCI
- Safe Shutdown Pump
- ECCS Fill Jockey Pump

C6-2.3 Maintain at least 2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure) SRVs open and RPV pressure above the Minimum Alternate RPV Flooding Pressure by throttling injection.

C6-2.4 When:

- All control rods are inserted beyond position 04 (maximum subcritical banked withdrawal position), or

- The reactor is shutdown and no boron has been injected into the RPV,

continue in this procedure.

C6-3 If RPV water level cannot be determined:

C6-3.1 Commence and increase injection into the RPV with the following systems until at leat 3 (Minimum Number of SRVs Required for Emergency Depressurization) SRVs are open and RPV pressure is not decreasing and is at least 77 psig (Minimum RPV Flooding Pressure above suppression chamber pressure.

- Safe Shutdown Pump
- Motor driven feedwater pumps
- CS
- LPCI
- Condensate pumps
- CRD
- ECCS Jockey Pump
- SBLC (test tank)
- SBLC (boron tank)

C6-3.2 Maintain at least 3 (Minimum Number of SRVs Required for Emergency Depressurization) SRVs open and RPV pressure at least 77 psig (Minimum RPV Flooding Pressure) above suppression chamber pressure by throttling injection.

C6-4 If RPV water level can be determined, commence and increase injection into the RPV with the following systems until RPV water level is increasing:

- Safe Shutdown Pump
- Motor driven feedwater pumps
- CS
- LPCI
- Condensate pumps
- CRD
- ECCS Jockey Pump
- SBLC (test tank)
- SBLC (boron tank)

C6-5 If RPV water level cannot be determined:

C6-5.1 Fill all RPV water level instrumentation reference columns.

C6-5.2 Continue injecting water into the RPV until temperature near the cold reference leg instrument vertical runs is below 212°F and RPV water level instrumentation is available.

If while executing the following steps, RPV water level can be determined, continue in this procedure at Step C6-6.

C6-5.3 If it can be determined that the RPV is filled or if RPV pressure is at least 77 psig (Minimum RPV Flooding Pressure) above suppression chamber pressure, terminate all injection into the RPV and reduce RPV water level.

C6-5.4 If RPV water level indication is not restored withing the Maximum Core Uncovery Time Limit after commencing termination of injection into the RPV, return to Step C6-3.

This page intentionally left blank.

CONTINGENCY #7

LEVEL/POWER CONTROL

If while executing the following steps RPV Flooding is required or RPV water level cannot be determined, control injection into the RPV to maintain reactor power above 8% (Reactor Flow Stagnation Power) but as low as practicable. However, if reactor power cannot be determined or maintained above 8% (Reactor Flow Stagnation Power), RPV FLOODING IS REQUIRED; enter procedure developed from CONTINGENCY #6.

C7-1 If:

- Reactor power is above 3% (APRM downscale trip) or cannot be determined, and
- Suppression pool temperature is above 130°F (Boron Injection Initiation Temperature), and
- Either an SRV is open or opens or drywell pressure is above 2.0 psig (high drywell pressure scram setpoint)

lower RPV water level by terminating and prevent all injection into the RPV except from boron injection systems and CRD until either: #26

- Reactor power drops bewlow 3% (APRM downscale trip) or
- RPV water level reaches -143 in. (top of active fuel), or
- All SRVs remain closed and drywell pressure remains below 2.0 psig (high drywell pressure scram setpoint).

If while executing the following steps Emergency RPV Depressurization is required, continue in this procedure at Step C7-2.1.

If while executing the following step:

- Reactor power is above 3% (APRM downscale trip) or cannot be determined, and
- RPV water level is above -143 in. (top of active fuel), and
- Suppression pool temperature is above 130°F (Boron Injection Initiation Temperature), and
- Either an SRV is open or opens or drywell pressure is above 2.0 psig (high drywell pressure scram setpoint),

return to Step C7-1.

C7-2 Maintain RPV water level either:

#9, #10, #11, #25

- If RPV water level was deliberately lowered in Step C7-1, at the level to which it was lowered, or
- If RPV water level was not deliberately lowered in Step C7-1, between +8 in. (low level scram setpoint) and +48 in. (high level trip setpoint)

with the following systems:

- Condensate/feedwater system 1100 - 0 psig (RPV pressure range for system operation)
- CRD system 1100 - 0 psig (RPV pressure range for system operation)

- RCIC system 1150 - 50 psig (RPV pressure range for system operation) #12

- HPCI system 1150 - 100 psig (RPV pressure range for system operation)

- LPCI system 325 - 0 psig (RPV pressure range for system operation)

If RPV water level cannot be so maintained, maintain RPV water level above -143 in. (top of active fuel).

If RPV water level cannot be maintained above -143 in. (top of active fuel), EMERGENCY RPV DEPRESSURIATION IS REQUIRED:

C7-2.1 Terminate and prevent all injection into the RPV except from boron injection systems and CRD until RPV pressure is below the Minimum Alternate RPV Flooding Pressure.

Number of open SRVs	Minimum Alternate RPV Flooding Pressure (psig)
5	125
4	155
3	210
2	320

If less than 2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting presure) SRVs can be opened, continue in this procedure.

C7-2.2 Commence and slowly increase injection into the RPV with the following systems to restore and maintain RPV water level above 143 in. (top of active fuel): ___ #25

- Condensate/feedwater system
- CRD
- RCIC
- HPCI
- LPCI
- Safe Shutdown Pump

If RPV water level cannot be restored and maintained above -143 in. (top of active fuel), commence and slowly increase injection into the RPV with the following systems to restore and maintain RPV water level above -143 in. (top of active fuel):

- CS
- LPCI
- Safe Shutdown Pump
- Jockey Pump

If while executing the following step reactor power commences and continues to increase, return to Step C7-1.

C7-3 When 266 pounds (Hot Shutdown Boron Weight) of boron have been injected or all control rods are inserted beyond position 04 (maximum subcritical banked withdrawal position), restore and maintain RPV water level between +8 in. (low level scram setpoint) and +48 in. (high level trip setpoint).

If RPV water level cannot be restored and maintained above +8 in. (low level scram setpoint), maintain RPV water level above -143 in. (top of active fuel).

If RPV water level cannot be maintained above -143 in. (top of active fuel) EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; return to Step C7-2.1.

If Alternate Shutdown Cooling is required, enter procedure developed from CONTINGENCY #5.

C7-4 Proceed to cold shutdown in accordance with procedure QGP 2-3 for cooldown to cold shutdown conditions.

QUAD-CITIES STATION

EMERGENCY PROCEDURE WRITER'S GUIDELINE

ID/TEMP-H

ATTACHMENT 2

LIST OF ABBREVIATIONS

ADS - Automatic Depressurization

CRD - Control Rod Drive

EHC - Electro-Hydraulic Control

ERV - Electromatic Relief Valve

HPCI - High Pressure Coolant Injection

HVAC - Heating, Ventilation, and Air Conditioning

LPCI - Low Pressure Coolant Injection

MSIV - Main Steam Isolation Valve

RBCCW - Reactor Building Closed Cooling Water

RCIC - Reactor Core Isolation Cooling

RPV - Reactor Pressure Vessel

RWM - Rod Worth Minimizer

RHR - Residual Heat Removal

RPS - Reactor Protection System

SBLC - Stand-by Liquid Control

SGTS - Stand-by Gas Treatment System

SRV - Safety/Relief Valve

SSP - Safe Shutdown Pump

TBCCW - Turbine Building Closed Cooling Water

TIP - Transversing Incore Probe

UPS - Uninterruptible Power Supply

TABLE OF CONTENTS

TABLE OF CONTENTS (CON'T)

1.0 INTRODUCTION

1.1 PURPOSE

This writer's guide provides guidance that is applicable to the Emergency Operating Procedures at Quad-Cities Station. Its purpose is to provide administrative and technical guidance on the preparation of function oriented Emergency Operating Procedures.

1.2 SCOPE

This writer's guide only applies to those procedures contained in Quad-Cities Station General Abnormal Procedures Manual (QGA)

2.0 PROCEDURE NETWORK

2.1 PROCEDURE CATEGORY

Within the procedure network, the major categorization of procedures is by the type of function addressed by the procedure.

Emergency procedures are procedures which govern the plant operation during conditions of uncertainty and will return the plant to a safe and stable condition.

2.2 EMERGENCY PROCEDURE DESIGNATION AND NUMBERING

Each procedure will be uniquely identified. The identification permits easy administration of the process of procedure preparation, review, revision, distribution, and operator use.

2.2.1 PROCEDURE DESIGNATION

Designation of the emergency procedures will be QGA, Quad-Cities General Abnormal Procedures.

2.2.2 PROCEDURE NUMBERING

The emergency procedure numbering system is divided into three main components: book, block, and the procedure. The book is designated by QGA. The block numbers start with 100 and are numbered consecutively for as many blocks as necessary. Example: 100, 200, 300, etc. The procedure number follows the block number and is also numbered consecutively for as many procedures as necessary.

Example: QGA 100-1

- 1 — Procedure Number
- 100 — Block Number
- QGA — Book

2.2.3 REVISION NUMBERING

The revision number will appear on each page of the procedure. It will appear in the upper right hand corner of the page below the procedure number.

3.0 FORMAT

3.1 PROCEDURE HEADING

Every emergency procedure will have an identification heading on page 1. The purpose of this heading is: (1) to identify the procedure; (2) to identify the revision number; and (3) to give the month and year of the initiation of the revision.

3.2 PAGE IDENTIFICATION AND NUMBERING

Each page of the procedure will be identified by (1) the procedure number and revision number located in the upper right-hand corner of the page and (2) the pages will be numbered sequentially at the bottom of each page with the word (final) on the last page.

3.3 INSTRUCTION STEP NUMBERING

Instruction steps will be numbered and identified as follows:

A.
    1.
        a.
            (1)
                (a)

3.4 FIGURE NUMBERING

Figures or tables that are not part of the main procedure but may be needed as reference material will be contained at the end of the block of procedures. The numbering will be the same as for the main procedures except that the figure or table number will be proceded by a "T".

Example: QGA 300-T4

Figures or tables which are necessary to be part of the main procedure will be incorporated wherever needed in the procedure for convenient use.

3.5 PAGE FORMAT

An example of page format is presented in ATTACHMENT 1.

4.0 MECHANICS OF STYLE

4.1 SPELLING

Spelling should be consistant with modern usage. When a choice of spelling is offered by a dictionary, the first spelling should be used.

4.2 VOCABULARY

Words used in procedures should convey precise understanding to the trained person.

a. Use simple words. Simple words are usually short words of few syllables. Simple words are generally common words.

b. Use common usage if it makes the procedure easier to understand.

c. Use words which are concrete rather than vague, specific rather than general, familiar rather than formal, precise rather than blanket.

d. Define words that may be understood in more than one sense.

e. Avoid using verbs that are unfamiliar, vague, or that can be misinterpreted.

f. Eliminate superfluous words.

g. The use of shall, will, should, and may are as follows:

   1. Shall - mandatory requirement.

   2. Will - mandatory requirement.

   3. Should - preferred or desired method. Nonmandatory

   4. May - acceptable or suggested method.

h. System readiness or status will be denoted as follows.

   1. Operable/operability. These words mean that a system, subsystem, train, component, or device is capable of performing its specified function. Implicit in this definition should be the assumption that all necessary attendant instrumentation, controls, electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function are also capable of performing their related function.

2. Operating. This word means that a system, subsystem, train component, or device is in operation and is performing its specified function, and that "out of service cards" or other conditions do not prevent it from maintaining that service.

3. Available. This word means that a system, subsystem, train, component, or device is operable and can be used as desired. However, it need not be operating.

NOTE

If a system does not fit one of the above formal definitions, its use should not be ruled out if it can function in a degraded mode of operation.

i. Use logic terms as follows:

1. When attention does need to be called to combinations of conditions, the word AND shall be placed between the description of each condition. The word AND shall not be used to join more than three conditions.

   If more than four conditions need to be joined, a list format shall be used.

2. The word OR shall be used when calling attention to alternative combinations of conditions. The use of the word OR shall always be in the inclusive sense. To specify the exclusive "or" the following may be used: either A OR B but not both.

3. When action steps are contingent upon certain conditions or combinations of conditions, the step shall begin with the words IF, IF NOT, or WHEN followed by a description of the condition or conditions (the antecedent), a comma, the word THEN followed by the action to be taken (the consequent).

4. Use of IF NOT should be limited to those cases where the operator must respond to the second of two possible conditions. IF should be used to specify the first condition.

j. Avoid all-inclusive words unless the absolute meaning is real. All inclusive words include never, all, always, every and none.

4.3 NUMERICAL VALUES

The use of numerical values should be consistent with the following rules:

a. Arabic numerals should be used.

b. For numbers less than unity, the decimal point will oe preceded by a zero.

c. The number of significant digits should be equal to the number of significant digits contained in the acceptable tolerance for the measurement, except for common usage.

d. Acceptable values should be specified such that addition and subtraction by the user is avoided if possible. This can generally be done by stating acceptance values as limits.

Examples: 510°F maximum, 300 psig minimum, 580°F to 600°F

4.4 UNITS OF MEASURE

Units of measure are fixed by definition by the National Bureau of Standards (NBS). Units of measure will be consistent with NBS definitions.

4.5 ABBREVIATIONS, LETTER SYMBOLS, AND ACRONYMS

The use of abbreviations should be limited to those which are common to a well trained licensed reactor operator. Abbreviations may be used where necessary to save time and space and where their meaning is unquestionably clear to the reader. A list of abbreviations is included in ATTACHMENT 2.

Capitalization of abbreviations should be uniform. If the abbreviation is comprised of lower case letters, it should appear in lower case in a title or heading. The period should be omitted in abbreviations except in cases where the omission would result in confusion. Acronyms are words formed by the initial letters of a name.

Example: CECo for Commonwealth Edison Company

Letter symbols may be used to represent operations, quantities, elements, and relations. The meaning of a symbol should be spelled out at the point of its first use or defined within the procedure or other standard source.

Abbreviations, symbols, and acronyms should not be over-used. Their use should be for the benefit of the reader. They should be beneficial by:

a. Saving reading time.

b. Ensuring clarity when space is limited.

c. Communicating mathematical ideas.

4.6 CAPITALIZATION

It should be recognized that no one set of rules for capitalization can be universally applicable or all encompassing. The following guidelines will be applied in principle to areas not strictly defined.

4.6.1 TITLES OF AN ORGANIZATIONAL STRUCTURE

Staff positions and titles, when they refer to an individual with specific authority, duties, and responsibilities are capitalized. General categories or groups of people identified within the organizational structure are not capitalized.

Examples: Station Superintendent
Operating Engineer
Shift Engineer
Reactor Operator
electrician
mechanic

4.6.2 SYSTEMS AND COMPONENTS

The name of plant system titles are capitalized. When the word "system" is deleted from the title because of brevity and is understood because of context, the title is capitalized. When words from the title of a system are used and reference to that system is not intended, the words are not capitalized.

Examples: Residual Heat Removal System
The recirculating pump supplies...

4.6.3 HEADINGS AND SUBHEADINGS

First-level sentence headings will be placed in full capitals with an underscore, second-level sentence headings will be placed in full capitals without an underscore, and third-level sentence headings will be placed in initial capitals without an underscore.

4.6.4 MODES OF OPERATION

Modes of operation should be capitalized as they apply to a specific configuration of the plant or of a system.

Examples: Hot Standby
Cold Shutdown
Hot Shutdown
Refueling Outage

4.6.5 FIGURES

Capitalization should be used for references to figures and titles of figures within text material.

Example: Refer to FIGURE 2 for...

4.6.6 USE OF LOGIC TERMS

The logic term AND, OR, NOT IF, WHEN, and THEN are often necessary to preciselv describe a set of conditions of sequence of actions.

When logic statements are used, logic terms will be highlighted so that all the contingencies are clear to the operator. Highlighting and emphasis will be achieved by using capitalization and underlining. All leters of the logic terms will be capitalized. The use of AND and OR within the same logic statement will be avoided. When AND and OR are used together, the logic statement can be very ambigious.

4.7 USE OF UNDERLINING

Underlining will be used for emphasis.

4.8 LISTING OF REFERENCES

Listing of references within the text of procedures should be minimzed. The concept of "each procedure stands alone infers that references are not necessary within procedural text. But, it is impractical to blindly follow this concept. Listing of references within text of procedures are as follows:

a. When the task required by a procedure is wholly governed by another procedure, such other procedure should be referenced rather than repeating the instruction.

b. When the entire referenced procedure must be used to accomplish the task, only the procedure number need be referenced at the end of the step. Example: 1. Initiate shutdown cooling (QOP 1000-5).

c. When only several steps apply from the procedure to be referenced, such steps should be reiterated and the procedure should not be referenced.

5.0 TERMINOLOGY

5.1 COMPONENT IDENTIFICATION

With respect to identification of components, the following rules are established:

a. Equipment, controls, and displays will be identified in operator language (common usage) terms. These terms may not always match engraved names on panels but will be complete.

b. When engraved names and numbers on panels and alarm windows are specifically the item of concern in the procedure, the engraving should be quoted verbatim and emphasized by using all capitals.

5.2 DEFINITION OF TERMS

Terms may be understood in more than one sense. It is important that the same term be used consistently in all procedures which use the term. A listing of terms and their definitions are provided in ATTACHMENT 3.

5.3 LEVEL OF DETAIL

Too much detail should be avoided in the interest of being able to effectively execute the instructions in a timely manner. The level of detail required is the detail that a newly trained and licensed operator would desire during an emergency condition.

5.4 USE OF CAUTIONARY NOTES

Cautionary notes can be considered in two fundamental categories: those that apply to the entire procedure and those that apply to a portion of the procedural content. Those that apply to the entire procedure are named PRECAUTIONS and are covered in operator training. Those that apply to a portion of a procedure are named CAUTIONS and are placed immediately BEFORE that procedural content to which they apply. This helps ensure that the procedure user observes the caution before performing the step. It should be used instead of an instructional step. It should be used to denote a potential hazard to equipment or personnel associated with or consequent to the subsequent instructional steps.

5.5 DESCRIPTION OF COMPONENT STATUS

Specific terminology should be defined and adopted to indicate component status. All procedures which refer to such status should use the adopted terminology. The following terms and definitions are recommended.

a. In Service/Out of Service. This means that the component is or not functioning within the plant mode of operation.

b. Running/Shutdown. This refers to the conditions of rotating equipment.

c. On/Off. This should be used for simple equipment.

   Example: recorders, lights, and it means that equipment is or is not being powered.

d. Racked In/Racked Out. This should be used for physical status of switchgear and it means that the switchgear is available or not available to supply equipment.

e. Energized/De-energized. This should be used to indicate status of electrical circuits, such as logic circuits and electrical buses, and it means that the circuit is or is not powered.

ATTACHMENT 1

QGA 100-1
Revision 1
January 1984

Margin 1"

I. ENTRY CONDITIONS (heading all caps and underlined)

A. THIS HEADING IS ALL CAPS NO UNDERLINE

B.

C.

II. OPERATOR ACTIONS

A.

1. IF X (start here with typing)

THEN X

a.

(1)

(a)

ATTACHMENT 3

PROCEDURE TERMS AND THEIR DEFINITIONS

VERB/TERM	APPLICATION
Allow	To permit a stated condition to be achieved prior to proceeding, for example, "allow discharge pressure to stabilize".
Check	To perform a physical action which achieves a result such as "check lube oil level".
CLOSE	Opposite of open, for example: CLOSE VALVE 2001-833.
Complete	To accomplish specified procedural requirements.
Establish	To make arrangements for a stated condition, for example: "establish communication with control room".
INITIATE	To cause an evolution to happen, for example: INITIATE shutdown cooling.
Inspect	To measure, observe, or evaluate a feature or characteristic for comparison with specified limits; method of inspection should be included, for example: "visually inspect for leaks".
OPEN	To change the physical position of a mechanical device, such as valve or door to the fully open position.
RECORD	To document specified condition or characteristic, for example: "RECORD discharge pressure".
SET	To physically adjust to a specified value an adjustable feature, for example: "SET diesel speed to . . . rpm".
Shift Supervisor	This term is to include the Shift Engineer, the Shift Foreman, and the Station Control Room Engineer.
START	To energize an electro-mechanical device by manipulation of a start switch or button, for example: "START . . . pump".
STOP	Opposite of start, for example: "STOP pump".
THROTTLE	To position a mechanical device to achieve the results required by the procedural step.
TRIP	To manually activate a semi-automatic feature, for example: "TRIP breaker . . ."

ATTACHMENT 3

PROCEDURE TERMS AND THEIR DEFINITIONS

(CONTINUED)

VERB/TERM	APPLICATION
VENT	To perform a venting activity whose complexity is within the skills of the operator, for example: "VENT . . . pumps".
VERIFY	To ensure that a particular parameter or equipment position is in the desired condition. If it is not, it shall be placed to the desired condition.

ATTACHMENT 4

QGA PROCEDURE BREAKDOWN

100 REACTOR CONTROL

100-1 Reactor Level

100-2 Reactor Pressure

100-3 Reactor Power

200 PRIMARY CONTAINMENT CONTROL

200-1 Suppression Pool Temperature

200-2 Drywell Temperature

200-3 Containment Pressure

200-4 Suppression Pool Level

300 SECONDARY CONTAINMENT CONTROL

300-1 Containment Radiation Level and Temperature

300-2 Containment Water Levels

400 RADIOACTIVITY RELEASE CONTROL

400-1 Radioactivity Release

QUAD-CITIES STATION

PROGRAM

FOR

VERIFICATION AND VALIDATION

OF

EMERGENCY PROCEDURES

I. VERIFICATION OBJECTIVES

Quad-Cities General Abnormal Procedure (QGA) verification objectives are to confirm the QGAs.

A. Accurately incorporate provisions of the Quad-Cities Technical Guidelines.

B. All written in compliance with the Quad-Cities Writers Guide.

C. Present a level of detail enabling effective operator comprehension and response.

D. Utilize a language compatible to operator training and experience.

E. Are compatible to plant equipment, controls, and indications regarding:

1. Equipment operation

2. Control/indication locations (with respect to procedure need)

3. Nomenclature

4. Instrument unit of measure and readability

II. VALIDATION OBJECTIVE

The objective of QGA validation is to determine that specified operations can be performed to manage the emergency condition.

III. VERIFICATION METHODS

A. Desk-Top Reviews

The following desk-top reviews will be conducted for QGA verification.

1. Review of QGAs for compliance to the Technical Guidelines and compatibility to plant equipment, controls, and indications.

2. Review of QGAs for accuracy of plant-specific calculated parameters.

3. Review of QGAs for compliance to the Writers Guide for level of detail and language use.

B. Control Room Walk-Through

A walk through the Control Room will be used to verify level of detail and compatibility to equipment nomenclature, control/indication and instrument applicability.

IV. VALIDATION METHODS

A. Control Room walk-throughs by each rotating shift will demonstrate actions required by the QGAs can be related to equipment, controls, and indication.

B. Training exercises at the Simulator will be used to demonstrate and measure generic effectiveness for managing emergency conditions.

V. DOCUMENTATION

A. Desk-Top Reviews

Implementation of desk-top reviews will be documented by memorandum or letter (accompanied by marked-up copies of procedures if desireable).

B. Walk-Throughs

1. Control Room walk-throughs will be documented by checklist (Attachment 1).

2. Simulator exercises will be documented by checklist (Attachment 2).

EMERGENCY PROCEDURE

PLANT OPERATIONS WALK-THROUGH CHECKLIST

PROCEDURE NO. ____________

DATE ____________________

List any step for which:

1. Level of detail is inadequate or should be revised to improve "how to" instruction. ____________________

2. Equipment (pump, valve, instrument, switch, etc.) identification is incorrect or omitted when identification is required. ____________________

3. Travel from one location to another while complying with the procedures is impractical. ____________________

4. An action is required but no apparent instrument, alarm indicating light, etc. monitors the effect of the action. ____________________

5. Installed instrumentation reads out in units different than specified in the procedure. ____________________

Comments ____

Signed: ____________________
Instructor

EMERGENCY PROCEDURE

GENERIC SIMULATOR CHECKLIST

Simulator ______________________

Transient ______________________

Procedure(s) Used ______________________

Date ______________________

1. List any step(s) resulting in immediate unexpected simulator response. ______________________

Describe the unexpected response. ______________________

2. List any step(s) that were difficult to perform in the necessary time interval. ______________________

Why? ______________________

3. List any step(s) that were being performed when management of the emergency was judged a failure. ______________________

What was the nature of the failure? ______________________

Recommendations: ______________________

Signed: ______________________
Instructor

QUAD CITIES STATION EMERGENCY OPERATING PROCEDURE TRAINING DESCRIPTION

Introduction

The general training format for each licensed operator will involve three distinct phases. Phase one will involve formal classroom lectures, phase two will involve control room and plant tours/walkdowns and phase three will require each licensed operator to demonstrate proficiency in the use of the EOP's at General Electric BWR Simulator in Morris, IL.

Training Objectives

1. State, from memory, the entry conditions for Level Control, Containment Control and Reactivity Control.
2. Determine what conditions will allow departure from EOP's and subsequent use of normal operating procedures.
3. Identify control room instrumentation that monitor parameters for which EOP entry conditions are required.
4. Discuss alternate methods for shutting down the reactor.
5. Discuss flowpaths for initiation of alternate modes of shutdown Cooling.
6. Given applicable graphs and parameters, determine whether limits defined by graphs in EOP's are being approached or exceeded.
7. Given particular graphs, analyze the actions to be taken when parameters defined by the EOP graphs are exceeded.
8. Using the EOP's, simulate the operator's actions required to shutdown the reactor given a failure to scram.
9. Discuss selected cautions using EOP's.
10. Using the EOP's, simulate the operators actions required to maintain adequate core cooling given a postulated transient with coincident equipment failure.
11. Using the EOP's simulate the operator's actions required to maintain primary or secondary containment parameters within limits.

12. Demonstrate familiarity with SPDS/EOP displays, as applicable.

13. Demonstrate ability to use EOP's under accident conditions while operating at the Simulator facility.

EOP Training

1. Classroom - Qualified subject matter experts/instructors will use approved lesson plans to present the EOP material to all licensed operators. Students will be given procedures, handouts and flow charts for their use in analyzing the EOP's.

   Generally, the EOP classroom training will address Logic terms, use of general precautions, Procedure Specific precautions, Step Specific precautions, action verbs and special definitions.

   Specifically, procedures will be broken down step by step. Each series of steps will be explained in the text. The explanation will include reasons for taking the prescribed actions and how those actions are accomplished.

   A formative oral evaluation will be conducted by the instructor at major steps in the procedures to ensure that the trainees are mastering the material. Feedback on the procedures shall be collected from the students. This feedback will be considered for changes to the lesson plan and appropriate comments will be forwarded to Operating Department procedure writers.

   Classroom instruction will take approximately three days. A written examination will follow the classroom instruction. Additional training will be required for satisfactory class completion if the trainee scores below 70% on the written exam.

2. Control Room/Plant Walkdowns - approximately 8 hours will be devoted by each licensed operator for the purpose of identifying all control room instrumentation and plant equipment necessary for the effective implementation of the EOP's. Plant and Control room tours will be conducted under the direct supervision of a qualified subject matter expert/instructor.

3. Simulator - each licensed operator will spend three full days at the General Electric B.W.R. Simulator in Morris, IL to gain practice in the safe and effective implementation of the EOP's. These operators will be supervised by a qualified member of General Electric's or Quad Cities Station's Training Staff. Any problems encountered during simulation will be forwarded back to procedure writers for resolution. Qualified training Staff members will perform evaluations of each licensed operators ability to implement the steps identified in the EOP's.

Instructional Techniques

Instructor's guides with appropriate lesson plan material will be utilized during the classroom lecture format series. Student handouts/texts will be used as necessary. The number of students enrolled in individual classroom sessions will be limited so as to provide an optimum instructor to trainee ratio and thereby provide maximum interaction.

Checklists will be used during control room/plant tours to aid in identifying all important instrumentation, controls and equipment. Summative evaluations will be used at the end of the classroom lecture and simulator training sessions.