SALEM GENERATING STATION

PROCEDURE APPROVAL COVER SHEET

Procedure

Number _____

TITLE REACTOR VESSEL HEAD VENT OPERATION

REMARKS:

LAST OTSC INCORPORATED

NEW PROCEDURE

REV.	AUTHOR	SRO REVIEW	QA REVIEW	OPERATING ENGINEER APPROVAL	SORC MEETING NO.	STA. MGR. APPROVAL/DATE
0	F.Kennedy		NA			

1.0 PURPOSE

1.1 This instruction provides the steps required to remove gases from the reactor vessel head by operation of the Reactor Vessel Head Vent during Accident and Transient conditions.

CAUTION: This venting instruction should not be used as the primary means to mitigate an Inadequate Core Cooling event.

CAUTION: This venting instruction assumes that the reactor containment conditions are near normal.

2.0 INITIAL CONDITIONS

2.1 Abnormal reactor coolant system conditions such as reactor vessel level deviation from normal as indicated by the RVLIS or large variations in pressurizer level during normal charging or spraying operations.

2.2 The core exit thermocouples are equal to or greater than the RCS saturation temperature.

2.3 Plant events have occurred (such as accumulator tank discharge rapid RCS cooldown, or core uncovery events) that may result in the presence of a gaseous void in the Reactor Vessel Head.

2.4 Appendix A has been performed if desired.

3.0 IMMEDIATE ACTIONS

3.1 None

4.0 SUBSEQUENT ACTIONS

CAUTION: Do not trip any running or start any non-operating Reactor Coolant Pumps during the performance of the following actions.

NOTE: If the Safety Injection System is in operation, then the actions of steps marked by an asterisk will not be applicable.

4.1 Terminate any changes to the Reactor Coolant System that may be in progress and bring the RCS to as close to a steady-state condition as possible.

CAUTION: Increased charging flow, with condensible gases in the RCS may result in a decreasing pressurizer level, since the increase in pressure will collapse the bubble.

*4.2 Attempt to recombine any condensible gases by increasing RCS pressure through the use of the pressurizer backup heaters and increased charging flow. If this step is successful in condensing the gas volume in the vessel head, then return to the appropriate Emergency Instruction.

4.2.1 If pressurizer level decreases to less than 20% of span, then attempt to restore level by continuing the charging flow or manually starting Safety Injection Pumps. If level cannot be restored, then manually initiate Safety Injection and proceed to EI I-4.0, Safety Injection Initiation.

4.3 In preparation for venting the Reactor Vessel Head, isolate the containment purge and exhaust system and the pressure vacuum relief line and start all available containment air circulation equipment.

4.3.1	Close	1(2) VC 1,2	The Containment Purge Supply
		1(2) VC 4,3	The Containment Purge Exhaust
4.3.2	Close	1(2) VC 5,6	The Containment Pressure Relief System

4.3.3 Start the following fans:

a. 11,12 (21,22) Reactor Shield Vent Fans

b. 11-14 (21-24) Reactor Nozzle Support Fans

c. 11-15 (21-25) Containment Fan Coil Units in FAST

4.4 Ensure 50 degrees subcooling is indicated.

4.4.1 Initiate CRT Test No. 41 to monitor subcooling, or,

4.4.2 Refer to the 50°F-Subcooled line on the Pressure-Temperature Curve.

*4.5 Isolate letdown and initiate RCS makeup from the Chemical and Volume Control System to increase pressurizer level to greater than 50% of span.

*4.6 If pressurizer pressure is <1915 psig, manually block the low pressure SI initiation.

CAUTION: The venting operation may result in pressure decreasing below the SI setpoint. Action should be taken to manually block the automatic SI signal when pressurizer pressure decreases to below 1915 psig.

*4.7 Increase charging flow to maximum to limit the pressurizer pressure and level decrease during the venting period.

CAUTION: If during the venting period, a loss of reactor coolant pump operation occurs, continue the venting and allow natural circulation to establish itself.

4.8 Open the vent isolation valves in one head vent flow path.

4.8.1 Open 1(2)RC40,41.

4.8.2 If 1(2)RC40, or 1(2)RC41 fail to open, then close both valves and open 1(2)RC42,43

4.9 Observe the pressurizer level trend during the venting and, from the following conditions, determine the probable status of the Reactor Coolant System.

4.9.1 Increasing pressurizer level - Gaseous voids exist in the RCS other than the Reactor Vessel Head or pressurizer.

4.9.2 Constant pressurizer level - No significant gaseous voids exist in the Reactor Coolant System.

4.9.3 Decreasing pressurizer level - Gaseous void exists in the Reactor Vessel Head.

4.10 Close both vent isolation valves when any of the following exist:

4.10.1 Reactor vessel level indication stabilizes,

OR

4.10.2 Pressurizer pressure decreases by 200 psi,

OR

4.10.3 Pressurizer level decreases below 20 percent of span

OR

4.10.4 Reactor coolant sub-cooling decreases below the 50^0F-Subcooling line on the Pressure - Temperature curve.

OR

4.10.5 The reactor vessel head is refilled as indicated by a decrease in the rate of depressurization or a change in the rate of the pressurizer level trend.

*4.11 Re-establish normal charging and letdown to maintain the pressurizer water level in the operating range.

*4.12 Evaluate the response of the pressurizer level trend to determine if a gas bubble existed in the vessel head. If a gas bubble existed and the venting was terminated prior to the vessel head being completely refilled, then return to Step 4.4.

NOTE: If multiple venting operations are required and the containment hydrogen concentration is equal to or greater than 3 volume percent, then provisions must be made to remove or reduce the volume of hydrogen from the containment prior to re-opening the reactor vessel head vent.

4.13 Return to the appropriate Emergency instruction following the successful completion of the venting of the reactor vessel head.

APPENDIX "A"

RV HEAD VENT

RCS GASEOUS VOID
DETECTION AND SIZING

1. Achieve a constant pressurizer level and pressure condition. Isolate the RCS letdown flow, turn off all pressurizer heaters, and terminate the pressurizer spray by placing the spray control in manual and zeroing the demand signal.

2. Record the following parameters.

RCS Pressure	=	_____PSI
PZR Level	=	_____%
Charging Rate	=	_____GPM
Seal Injection Flow	=	_____GPM
Seal Leakoff Flow	=	_____GPM
Time	=	_____

3. Allow the charging flow to either increase RCS pressure 100 psi or increase pressurizer level 5% of span.

4. Record the RCS pressure, pressurizer level and time.

RCS Pressure	=	_____PSI
PZR Level	=	_____%
Time	=	_____

5. Reinitiate letdown flow and restore normal pressurizer pressure and level control.

6. Calculate the initial and final pressurizer vapor space volumes.

6.1 Upper Head 180 FT^3
Cylindrical 1440 FT^3
Initial Vapor Volume = (1-PRZ. lvl)(1440 FT^3) + (180 FT^3) = _____FT^3

6.2 Final Vapor Volume =

(_____) - (_____X1440) = _____FT^3
Initial Vapor Volume Step 6.1 — Δ PZR Level

7. Determine the total charged volume into the RCS.

Charged Volume =

{(_____ + _____)-(_____)}X(____)X(.134ft.)=_____FT^3
Chg Flow — Seal Flow — Seal Leak Off — Time Min. — Gal

8. Determine the expected pressurizer level change.

Expected level change =

(_____)X(100% / 1800FT^3) = _____%
Chg Vol Step 7

9. If the actual pressurizer level change is less than the expected level change then a gaseous void exists in the reactor coolant system. Perform the following step to determine the volume of the RCS void.

10. The initial and final RCS gaseous void volumes can be calculated from the following equations.

Initial RCS Void =

(_____)-(_____)-(_____)
Initial Vapor Volume Step 6.1 — Final Vapor Volume Step 6.2 — Charged Volume Step 7

$$\frac{\text{(Initial Vapor Volume)} - \text{(Final Vapor Volume)} - \text{(Charged Volume)}}{1 - \left(\dfrac{\text{Initial Pressure (PSIG) Step 2}}{\text{Final Pressure (PSIG) Step 4}}\right)} = \_\_\_\_\_ FT^3$$

Final RCS Void =

$$\frac{\text{(Initial Void Step 10)} \times \text{(Initial Pressure (PSIG) Step 2)}}{\text{(Final Pressure (PSIG) Step 4)}} = \_\_\_\_\_ FT^3$$

-END-