

MC-1

SHOREHAM NUCLEAR POWER STATION
PLANT SPECIFIC TECHNICAL GUIDELINES

PSTG #3

PRIMARY CONTAINMENT CONTROL

REVISION NO: 1

PREPARED BY: *W. Hall*
Stephen T. Hanson
OPERATING ENGINEER APPROVAL: *[Signature]*

DATE: *1/88*
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DATE: *4/10/88*

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SHOREHAM NUCLEAR POWER STATION
Plant Specific Technical Guidelines
Primary Containment Control

EPG Step:

PURPOSE

The purpose of this guideline is to:

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

SNPS PSTG Step:

POSE

The purpose of this guideline is to:

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

Justification For Differences/References:

N/A

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EPG Step:

ENTRY CONDITIONS

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

- o Suppression pool temperature above [95°F (most limiting suppression pool temperature LCO)]
- o Drywell temperature above [135°F (drywell temperature LCO or maximum normal operating temperature, whichever is higher)]
- o Containment temperature above [90°F (containment temperature LCO)]
- o Drywell pressure above [2.0 psig (high drywell pressure scram setpoint)]
- o Suppression pool water level above [12 ft. 6 in. (maximum suppression pool water level LCO)]
- o Suppression pool water level below [12 ft. 2 in. (minimum suppression pool water level LCO)]
- o Primary containment hydrogen concentration above [2% (high hydrogen alarm setpoint)]

SNPS PSTG Step:

ENTRY CONDITIONS

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

- o Suppression pool temperature above 90°F
- o Drywell temperature above 145°F
- o Drywell pressure above 1.69 psig
- o Suppression pool water level above + 6 in.
- o Suppression pool water level below - 6 in.
- o Primary containment hydrogen concentration above 4%

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Justification for Differences/References

Most limiting suppression pool temperature LCO: Tech Spec Section 3.6.2.1.

Drywell temperature LCO: Tech Spec Section 3.6.1.7

Deleted reference to "Containment Temperature" which only applies to Mark III containments (SNPS is a Mark II containment)

High drywell pressure scram setpoint - Tech Spec Table: 2.2.1-1

Min/Maximum Suppression Pool water level LCO: Tech Spec Section 3.6.2.1

High hydrogen alarm setpoint: SWEC Drawing 11600.02-7.67-149

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EPG Step:

OPERATOR ACTIONS

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

SNPS EOP Step

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

Notify the Watch Engineer to classify the Event per EPIP 1-0

Justification for Differences/References

Deleted CN/T since it only applies to Mark III containments.

Added SNPS Specific Emergency Plan requirements

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EPG Step:

SP/T Monitor and control suppression pool temperature below [95°F (most limiting suppression pool temperature LCO)] using available suppression pool cooling.

When suppression pool temperature cannot be maintained below [95°F (most limiting suppression pool temperature LCO)]:

SP/T-1 Operate all available suppression pool cooling [using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode].

SP/T-2 Before suppression pool temperature reaches [the Boron Injection Initiation Temperature], (Figure N) enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

SNPS PSTG Step:

SP/T Monitor and control suppression pool temperature below 90°F using available suppression pool cooling. [6]

When suppression pool temperature cannot be maintained below 90°F.

SP/T-1 Operate all available suppression pool cooling using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode.

SP/T-2 Before suppression pool temperature reaches the 110° F, enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

Justification for Differences/References:

Most limiting suppression pool temperature LCO - Tech Spec Section 3.6.2.1

Boron Injection Initiation Temperature - NED Appendix C Calculation No. C-NFD-276

In order to simplify this procedure the most conservative Boron Injection Initiation Temperature from the NED calculation was chosen. This eliminates the use of another graph while still maintaining the most conservative portion of it.

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Primary Containment Control

EPG Step:

SP/T-3 When suppression pool temperature and RPV pressure cannot be maintained below the Heat Capacity Temperature Limit, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SNPS PSTG Step:

SP/T-3 When suppression pool temperature and RPV pressure cannot be maintained below the Heat Capacity Temperature Limit, (Figure G) EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

Justification for Differences/References

Heat Capacity Temperature Limit - NED Appendix C Calculation No. C-NAD-265

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EPG Step:

Monitor and control drywell temperature below [135°F (drywell temperature LCO or maximum normal operating temperature, whichever is higher)] using available drywell cooling.

When drywell temperature cannot be maintained below [135°F (drywell temperature LCO or maximum normal operating temperature, whichever is higher)]:
[#1]

DW/T-1 Operate all available drywell cooling, defeating isolation interlocks if necessary.

PS PSTG Step:

DW/T Monitor and control drywell temperature below 145°F using available drywell cooling.

When drywell temperature cannot be maintained below 145°F:
[#1]

DW/T-1 Operate all available drywell cooling, defeating isolation interlocks if necessary.
[#6]

Justification for Differences/References

Drywell Temperature LCO: Tech Spec Section - 3.6.1.7

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EPG Step:

If while executing the following steps drywell sprays
have been initiated and drywell pressure drops below
[2.0 psig (high drywell pressure scram setpoint)],
terminate drywell sprays.

SNPS PSTG Step:

If while executing the following steps drywell sprays
have been initiated and drywell pressure drops below
1.69 psig, terminate drywell sprays.

Justification for Differences/References

High drywell pressure scram setpoint - Tech Spec Table 2.2.1-1

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EPG Step:

DW/T-2 Before drywell temperature reaches [340°F (maximum temperature at which ADS qualified or drywell design temperature, whichever is lower)] but only if [suppression pool water level is below [17 ft. 2 in. (elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water)] and] drywell temperature and pressure are within the Drywell Spray Initiation Limit, [shutdown recirculation pumps and drywell cooling fans and] initiate drywell sprays [using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode].

SNPS PSTG Step

DW/T-2 Before drywell temperature reaches 340°F but only if suppression pool water level is below Elevation 50 ft. and drywell temperature and pressure are within the Drywell Spray Initiation Limit, (Figure 1) enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure, shut down recirculation pumps and drywell cooling fans and initiate drywell sprays using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode.

Justification for Differences/References

Maximum temperature at which ADS is qualified/drywell design temperature:

- Shoreham Environmental Qualification Report (EQR)
Figure D-1, June 1983 (340°F)
- Shoreham Technical Specification Section 5.2.2. (340°F)

Elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water: SWEC Drawing 11600.02-FK15B and Tech Spec Section 4.6.4.b.3.a.

$$50.75 \text{ Ft.} - 0.25 \text{ psi} (2.31 \text{ ft. H}_2\text{O/psi}) = 50.17 \text{ ft.}$$

Drywell Spray Initiation Limit - NED Appendix C Calculation No. C-NAD-263.

ed statement from DW/T-3 to enter RPV Control prior to initiating Drywell Sprays
e DW/T-3).

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Primary Containment Control

EPG Step:

DW/T-3 When drywell temperature cannot be maintained below [340°F (maximum temperature at which ADS qualified or drywell design temperature, whichever is lower)], EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

SNPS PSTG Step:

DW/T-3 When drywell temperature cannot be maintained below 340°F, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED. <1

Justification for Differences:

Maximum temperature at which ADS is qualified/drywell design temperature:

- Shoreham EQR, Figure D-1, June 1983 (340°F)
- Shoreham Tech Spec Section 5.2.2 (340°F)

Deleted statement directing operator to enter RPV Control. This was moved to DW/T-2 prior to initiating Drywell Sprays. This is justified for the following reasons: continued critical operation with recirculation pumps secured is not permitted by the SNPS Technical Specifications (LCO 3.4.1.1), and initiation of drywell sprays during critical operation is not in accordance with standard operating practices for transients/accidents. The net affect on the intent of this procedure section is not altered, although entry into RPV Control will be permitted earlier than the Guideline intended. <2

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Primary Containment Control

EPG Step:

CN/T Monitor and control containment temperature below [90°F (containment temperature LCO)], using available containment cooling.

When containment temperature cannot be maintained below [90°F (containment temperature LCO)]: [#1]

CN/T-1 Operate all available containment cooling.

If while executing the following steps suppression pool sprays have been initiated and suppression chamber pressure drops below [2.0 psig (high drywell pressure scram setpoint)], terminate suppression pool sprays.

CN/T-2 Before containment temperature reaches [185°F (containment design temperature)], but only if suppression chamber pressure is above [2.0 psig (Mark III Containment Spray Initiation Pressure Limit)], initiate suppression pool sprays using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode.

CN/T-3 When containment temperature cannot be maintained below [185°F (containment design temperature)], EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter [procedure developed from the RPV Control Guideline] at [Step RC-11] and execute it concurrently with this procedure.

SNPS PSTG Step:

N/A

Justification for Differences/References

Steps in the EPG with the prefix CN/ are only applicable to Mark III containments. SNPS is a Mark II containment.

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Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/P Monitor and control primary containment pressure below [2.0 psig (high drywell pressure scram setpoint)] using the following systems:

- o Containment pressure control systems; use [containment pressure control system operating procedures].
- o SBTG [and drywell purge]; use [SBTG and drywell purge operating procedures].

When primary containment pressure cannot be maintained below [2.0 psig (high drywell pressure scram setpoint)]:

SNPS PSTG Step:

PC/P Monitor and control primary containment pressure below 1.69 psig by venting the primary containment in accordance with 23.425.01, Section 8.2.6.

When primary containment pressure cannot be maintained below 1.69 psig:

Justification for Differences/References

The purpose of Step PC/P is to maintain primary containment pressure below 1.69 psig using the normal operating procedures and systems. SP 23.425.01 includes the necessary guidance on venting a pressure rise in the primary containment prior to its reaching 1.69 psig. With this noted in the PSTG, the need for the first bullet item is satisfied, and the second bulleted item is eliminated since SNPS does not have a Standby Gas Treatment System. The SNPS equivalent to SBTG, Reactor Building Standby Ventilation System (RBSVS), is only operated during an emergency condition, and does not include the capability for primary containment venting in its normal mode of operation.

High drywell pressure scram setpoint: Tech Spec Table: 2.2.1-1
RBSVS Design Basis: FSAR Section 6.2

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Primary Containment Control

EPG Step:

If while executing the following steps suppression pool sprays have been initiated and suppression chamber pressure drops below [2.0 psig (high drywell pressure scram setpoint)], terminate suppression pool sprays.

SNPS PSTG Step:

If while executing the following steps suppression pool sprays have been initiated and suppression chamber pressure drops below 1.69 psig, terminate suppression pool sprays.

Justification for Differences/References

High Drywell pressure scram setpoint: Tech Spec Table 2.2.1-1

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Primary Containment Control

EPG Step:

PC/P-1 Before suppression chamber pressure reaches [the Pressure Suppression Pressure] [13.8 psig (Suppression Chamber Spray Initiation Pressure)], but only if [suppression chamber pressure is above 2.0 psig (Mark III Containment Spray Initiation Pressure Limit)] [suppression pool water level is below 24 ft. 6 in. (elevation of suppression pool spray nozzles)], initiate suppression pool sprays [using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode].

SNPS PSTG Step

PC/P-1 Before suppression chamber pressure reaches 9 psig but only if suppression pool water level is below Elevation 50 ft., initiate suppression pool sprays using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode.

Justification for Differences/References

For Step PC/P-1 the applicable parameter for a Mark II containment is the containment is the Suppression Chamber Spray Initiation Pressure. Pressure Suppression pressure applies to Mark III containments in this particular step, and therefore has been deleted.

Deleted reference to Mark III limits which are N/A to SNPS.

Pressure Suppression Pressure: NED Appendix C Calculation No. C-NAD-267

Suppression Chamber Spray Initiation Pressure: NED Appendix C Calculation No. C-NAD-272

Elevation of suppression pool spray nozzles: SWEC Drawing No. 11600.02-FP-200NN

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Primary Containment Control

EPG Step:

If while executing the following steps drywell sprays
have been initiated and drywell pressure drops below
[2.0 psig (high drywell pressure scram setpoint)],
terminate drywell sprays.

SNPS PSTG Step:

If while executing the following steps drywell sprays have
been initiated and drywell pressure drops below 1.69 psig,
terminate drywell sprays.

Justification for Differences/References:

High drywell pressure scram setpoint: Tech Spec Table 2.2.1-1

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Primary Containment Control

EPG Step:

PC/P-2 When suppression chamber pressure exceeds [13.8 psig (Suppression Chamber Spray Initiation Pressure)] but only if [suppression pool water level is below [17 ft. 2 in. (elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water)] and] drywell temperature and pressure are within the Drywell Spray Initiation Limit, [shut down recirculation pumps and drywell cooling fans and] initiate drywell sprays [using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode].

SNPS PSTG Step:

PC/P-2 When suppression chamber pressure exceeds 9 psig but only if suppression pool water level is below Elevation 50 ft. and drywell temperature and pressure are within the Drywell Spray Initiation Limits, (Figure 1) shut down recirculation pumps and drywell cooling fans and initiate drywell sprays using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode.

Justification for Differences/References

Suppression Chamber Spray Initiation Pressure: NED Appendix C Calculation No. C-NAD-272

Elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water: see Step DW/T-2.

Drywell Spray Initiation Limit: NED Appendix C Calculation No. C-NAD-263

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Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/P-3 When suppression chamber pressure cannot be maintained below the Pressure Suppression Pressure, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SNPS PSTG Step:

PC/P-3 When suppression chamber pressure cannot be maintained below the Pressure Suppression Pressure, (Figure J) EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

Justification for Differences/References

Pressure Suppression Pressure - NED Appendix C Calculations No. C-NAD-267.

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Primary Containment Control

PC/P-4 Before suppression chamber pressure reaches [the Primary Containment Pressure Limit], then irrespective of the offsite radioactivity release rate, vent the primary containment, defeating isolation interlocks if necessary, to reduce and maintain pressure below [the Primary Containment Pressure Limit] as follows:

SNPS PSTG Step:

(PC/P-4 Before suppression chamber pressure reaches 60 psig then irrespective of the offsite radioactivity release rate, vent the primary containment, defeating isolation interlocks if necessary, to reduce and maintain pressure below the Primary Containment Pressure Limit as follows: |²

Justification for Differences/References:

Primary Containment Pressure Limit: NED Appendix C Calculation No. C-NAD-303. |¹

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Primary Containment Control

EPG Step:

- (Con't)
- o If suppression pool water level is below [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)], vent the suppression chamber in accordance with [procedure for primary containment venting].
 - o If suppression pool water is at or above [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)], or if the suppression chamber cannot be vented, vent the drywell in accordance with [procedure for containment venting].

SNPS PSTG Step:

- PC/P-4
(Con't)
- o If suppression pool water level is below Elevation 57 ft., vent the suppression chamber in accordance with SP 23.418.01, Section 8.2.1.
 - o If suppression pool water level is at or above Elevation 57 ft. or if the suppression chamber cannot be vented, vent the drywell in accordance with SP 23.418.01, Section 8.2.1.

Justification for Differences/References

Elevation of the bottom of the suppression chamber vent - SP 84.654.03 penetration X-29 and Xs-22.

Shoreham specific venting guidance added.

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Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/P-5 When suppression chamber pressure exceeds [the Primary Containment Pressure Limit], then irrespective of the offsite radioactivity release rate or whether adequate core cooling is assured, vent the primary containment, defeating isolation interlocks if necessary, to reduce and maintain pressure below [the Primary Containment Pressure Limit] as follows:

- o If suppression pool water level is below [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)], vent the suppression chamber in accordance with [procedure for primary containment venting].
- o If suppression pool water level is at or above [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)], or if the suppression chamber cannot be vented, vent the drywell in accordance with [procedure for primary containment venting].

SNPS PSTG Step:

None

Justification for Differences/References

The purpose of this step is to permit venting the containment utilizing systems necessary for maintaining adequate core cooling. This step is not applicable to SNPS since the method of venting the Shoreham containment (through the RBNVS) has no effect on adequate core cooling. Step PC/P-4 will have the operator vent at the appropriate time.

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Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

- PC/P-6 When suppression chamber pressure cannot be maintained below [the Primary Containment Pressure Limit], then irrespective of whether adequate core cooling is assured:
- o [If suppression pool water level is below 2 1/2 ft. 6 in. (elevation of suppression pool spray nozzles),] initiate suppression pool spray.
 - o If [suppression pool water level is below [17 ft. 2 in. (elevation of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water)] and] drywell temperature and pressure are within the Drywell Spray Initiation Limit, [shut down recirculation pumps and drywell cooling fans and] initiate drywell sprays.

SNPS PSTG Step:

- PC/P-5 When suppression chamber pressure cannot be maintained below 60 psig, then irrespective of whether adequate core cooling is assured:
- o If suppression pool water level is below Elevation 50 ft., initiate suppression pool sprays.
 - o If suppression pool water level is below Elevation 50 ft. and drywell temperature and pressure are within the Drywell Spray Initiation Limit, (Figure I) shut down recirculation pumps and drywell cooling fans and initiate drywell sprays.

Justification for Differences/References

Elevation of suppression pool spray nozzles: SWEC Drawing 11600.02-FP-200NN.

Elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water: (see Step DW/~-2).

The Primary Containment Pressure Limit - NED Appendix C Calculation No. C-NAD-303.

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Primary Containment Control

EPG Step:

SP/L Monitor and control suppression pool water level.

If while executing the following steps Primary Containment Flooding is required, enter [procedure developed from Contingency #6].

SP/L-1 Maintain suppression pool water level between [12 ft. 6 in. (maximum suppression pool water level LCO)] and [12 ft. 2 in. (minimum suppression pool water level LCO)]; refer to [sampling procedure] prior to discharging water; [suppression pool makeup may be augmented by SPMS].

If SPMS has been initiated, maintain suppression pool water level between [23 ft. 9 in. (SPMS initiation setpoint plus suppression pool water level increase which results from SPMS operation)] and [19 ft. 11 in. (minimum suppression pool water level LCO)].

If suppression pool water level cannot be maintained above [12 ft. 2 in. (minimum suppression pool water level LCO)], execute [Step SP/L-2].

If suppression pool water level cannot be maintained below [12 ft. 6 in. (maximum suppression pool water level LCO)] ([23 ft. 9 in. (SPMS initiation setpoint plus suppression pool water level increase which results from SPMS operation)] if SPMS has been initiated), execute [Step SP/L-3].

SNPS PSTG Step:

SP/L Monitor and control suppression pool water level.

If while executing the following steps Primary Containment Flooding is required, enter procedure developed from Contingency #6.

SP/L-1 Maintain suppression pool water level between + 6 in. and - 6 in.; refer to SP 23.708.01 prior to discharging water. Refer to SP 23.203.01, Appendix 12.7, prior to adding water.

If suppression pool water level cannot be maintained above - 6 in., execute Step SP/L-2.

If suppression pool water level cannot be maintained below + 6 in., execute Step SP/L-3.

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Primary Containment Control

Justification for Differences/References

Max/Minimum suppression pool water level LCG-Tech Spec Section 3.6.2.1.

Plant specific suppression pool letdown procedure referenced.

All reference to SPMS deleted. SPMS is a Mark III specific system and not applicable to SNPS.

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Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

SP/L-2 SUPPRESSION POOL WATER LEVEL BELOW [12 ft. 2 in. (minimum suppression pool water level LCC);

Execute [Steps SP/L-2.1 and SP/L-2.2] concurrently.

SP/L-2.1 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-2.2 Maintain suppression pool water level above [8 ft. 0 in. (elevation of the top of the HPCI exhaust)].

If suppression pool water level cannot be maintained above [8 ft. 0 in. (elevation of the top of the HPCI exhaust)], secure HPCI irrespective of whether adequate core cooling is assured.

SNPS PS10 Step:

SP/L-2 SUPPRESSION POOL WATER LEVEL BELOW - 6 in. | 23

Execute Steps SP/L-2.1 and SP/L-2.2 concurrently.

SP/L-2.1 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, (Figure L) 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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Primary Containment Control

SNPS PSTG Step:

SP/L-2.2 Maintain suppression pool water level above - 42 in. ↙

If suppression pool water level cannot be maintained above - 42 in., secure HPCI irrespective of whether adequate core cooling is assured.

Justification for Differences/References

Minimum suppression pool water level LCO: Tech Spec Section 3.6.2.1.

Elevation of the top of the HPCI exhaust: SWEC Drawing 11600.02-FP200NN.

Heat Capacity Level Limit: NED Appendix C Calculation No. C-NAD-266.

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EPG Step:

SP/L-3 SUPPRESSION POOL WATER LEVEL ABOVE [12 ft. 6 in. (maximum suppression pool water level LCO)] ([23 ft. 9 in. (SPMS initiation setpoint plus suppression pool water level increase which results from SPMS operation)] if SPMS has been initiated)

Execute [Steps SP/L-3.1, SP/L-3.2, and SP/L-3.3] concurrently.

SNPS PSTG Step:

SP/L-3 SUPPRESSION POOL WATER LEVEL ABOVE + 6 in. | <1

Execute [Steps SP/L-3.1, SP/L-3.2, and SP/L-3.3] concurrently.

Justification for Differences/References

Maximum suppression pool water level LCO: Tech Spec Section 3.6.2-1.
Sections dealing with SPMS deleted (NA to SNPS).

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Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

SP/L-3.1 Maintain suppression pool water level below the SRV Tail Pipe Level Limit.

If suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit, enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

If suppression pool water level and RPV pressure cannot be maintained below the SRV Tail Pipe Level 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 SRV Tail Pipe Level Limit, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SNPS PSTG Step:

SP/L-3.1 Maintain suppression pool water level below the SRV Tail Pipe Level Limit (Figure H).

If suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit, enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure.

If suppression pool water level and RPV pressure cannot be maintained below the SRV Tail Pipe Level 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 SRV Tail Pipe Level Limit, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

Justification for Differences/References

SRV Tail Pipe Level Limit: NED Appendix C Calculation No. C-NAD-271

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EPG Step:

SP/L-3.2 Maintain suppression pool water level below [17 ft. 2 in. (elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water)].

If suppression pool water level cannot be maintained below [17 ft. 2 in. (elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water)]:

- o Terminate drywell sprays.
- o 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.

SNPS PSTG Step:

SP/L-3.2 Maintain suppression pool water level below Elevation 50 ft.

If suppression pool water level cannot be maintained below Elevation 50 ft.:

- o Terminate drywell sprays.
- o 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.

Justification for Differences/References

Elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water. (See Step DW/T-2)

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

SP/L-3.3 Maintain primary containment water level below the Maximum Primary Containment Water Level Limit.

If primary containment water level cannot be maintained below the 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.

SNPS PSTG Step:

SP/L-3.3 Maintain primary containment water level below the Maximum Primary Containment Water Level Limit, (Figure B).

If primary containment water level cannot be maintained below the 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.

Justification for Differences/References

Maximum Primary Containment Water Level Limit - NED Appendix C Calculation No. C-NAD-268.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H Monitor and control hydrogen and oxygen concentrations.

If while executing the following steps:

- o The hydrogen or oxygen monitoring system is or becomes unavailable, sample the drywell and suppression chamber for hydrogen and oxygen in accordance with [sampling procedure].
- o Drywell or suppression chamber hydrogen concentration cannot be determined to be below 6% and drywell or suppression chamber oxygen concentration cannot be determined to be below 5%, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure; secure and prevent operation of hydrogen mixing systems and recombiners and, irrespective of the offsite radioactivity release rate, vent and purge the primary containment in accordance with [Steps PC/H-4.] through 4.4] until drywell and suppression chamber hydrogen concentrations can be determined to be below 6% or drywell and suppression chamber oxygen concentrations can be determined to be below 5%.

SNPS PSTG Step:

PC/H Monitor and control hydrogen and oxygen concentrations, by placing the H₂/O₂ Analyzers in service.

If while executing the following steps:

- o The hydrogen or oxygen monitoring system is or becomes unavailable, request Radiochemistry sample for hydrogen and oxygen.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

SNPS PSTG Step:
(Con't)

- o Drywell or suppression chamber hydrogen concentration cannot be determined to be below 6% and drywell or suppression chamber oxygen concentration cannot be determined to be below 5%, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure; secure and prevent operation of recombiners and, irrespective of the offsite radioactivity release rate, vent and purge the primary containment in accordance with Steps PC/H-4.1 through 4.4 until drywell and suppression chamber hydrogen concentration can be determined to be below 6% or drywell and suppression chamber oxygen concentrations can be determined to be below 5%.

Justification for Differences/References

Added guidance as to how to monitor H₂ and O₂ in containment.

Deleted "hydrogen mixing systems" from statement since at SNPS the hydrogen mixing systems are the drywell and suppression chamber sprays. There is little chance that sprays could possibly cause ignition of the containment atmosphere. Therefore, it is inappropriate to tell the operator to secure Drywell and Suppression pool sprays in this override, as Sections DW/T or PC/P of the Primary Containment Control Guideline may require sprays at this point.

Drywell atmosphere mixing system: FSAR Section 6.2.5.2.1.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-1 When drywell or suppression chamber hydrogen concentration reaches [0.5% (minimum detectable hydrogen concentration)], but only if the offsite radioactivity release rate is expected to remain below the offsite release rate LCO, vent and purge the primary containment, defeating isolation interlocks if necessary, to restore and maintain drywell and suppression chamber hydrogen concentrations below [0.5% (minimum detectable hydrogen concentration)] as follows:

SNPS PSTG Step:

PC/H-1 When drywell or suppression chamber hydrogen concentration reaches 0.5%, but only if the offsite radioactivity release rate is expected to remain below the offsite release rate LCO, vent and purge the primary containment, to restore and maintain drywell and suppression chamber hydrogen concentration below 0.5% as follows:

Justification for Differences/References

Deleted "defeating isolation interlocks if necessary" because this cannot be done in the context of this step. In order to defeat the interlocks mentioned here, it would require bypassing RBSVS initiation logic which is not the intent of this step. Bypassing interlocks will be permitted at a later time, when the guideline allows the bypass of high radiation interlocks.

Minimal detectable hydrogen concentration: SP 44.654.04

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

If while executing the following steps the
offsite radioactivity release rates reaches
the offsite release rate LCO, isolate the primary
containment vent and purge.

SNPS PSTG Step:

If while executing the following steps,
1D11-PNL-19 signals a high alarm condition,
isolate, or confirm, the isolation of the
containment vent valves.

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Justification for Differences/References

Included the necessary guidance for the operating crew to be able to determine
when the offsite release rate LCO is reached. 1D11-PNL-19 is the containment
vent monitor which is set to isolate containment vent valves at 5.4×10^5 CPM.

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SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-1.1 Refer to [sampling procedure].

PC/H-1.2 If suppression pool water level is below [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)], vent the suppression chamber in accordance with [procedure for primary containment venting].

If suppression pool water level is at or above [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)] or if the suppression chamber cannot be vented, vent the drywell in accordance with [procedure for primary containment venting].

PC/H-1.3 If the suppression chamber or drywell can be vented:

- o If drywell oxygen concentration is below 5%, initiate and maximize the drywell nitrogen purge flow.
- o If drywell oxygen concentration is not below 5%, initiate and maximize the drywell air purge flow.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

SNPS PSTG Step:

- PC/H-1.1 Refer to Section 8.2.6 of SP 23.425.01 to assess whether Radiochemistry Authorization is required prior to venting.
- PC/H-1.2 If suppression pool water level is below Elevation 57 ft.; vent the suppression chamber in accordance with SP 23.425.01, Section 8.2.6.
- If suppression pool water level is at or above Elevation 57 ft., or if the suppression chamber cannot be vented, vent the drywell in accordance with SP 23.425.01, Section 8.2.6.
- PC/H-1.3 If the suppression chamber or drywell can be vented, contact Radiochemistry and request authorization to begin nitrogen purge. Maximize nitrogen purge flow to the drywell after authorization is received.

Justification for Differences/References

PC/H-1.1 was expanded to clearly indicate that the following steps are not to be performed outside the normal administrative controls of station procedures.

PC/H-1.2 was altered to match the existing station procedures on venting the primary containment. The second bullet item in PC/H-1.3 was deleted because there is no means at SNPS to add air to the primary containment under normal administrative procedures. Since this particular procedural step is explicitly stated to not require operators to take extraordinary measures, the adjustments made are justified. PC/H-1.3 was altered to delete the conditional action based on Oxygen Concentration. This is unnecessary since an air purge is not permitted.

Elevation of the bottom of the suppression chamber vent: SP 84.654.03, penetration X-29.

SHOREHAM NUCLEAR POWER STATION
Plant Specific Technical Guidelines
Primary Containment Control

EPG Step:

Execute [Steps PC/H-2 and PC/W-3] concurrently.

SNPS PSTG Step:

Execute Steps PC/H-2 and PC/H-3 concurrently.

Justification for Differences/References

N/A

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-2 Monitor and control hydrogen and oxygen concentrations in the drywell.

PC/H-2.1 When drywell hydrogen concentration reaches [1% (minimum hydrogen concentration for recombiner operation or minimum detectable hydrogen concentration, whichever is higher)] but only if drywell hydrogen concentration is below [6% (maximum hydrogen concentration for recombiner operation or 6%, whichever is lower)] or drywell oxygen concentration is below [5% (maximum oxygen concentration for recombiner operation or 5%, whichever is lower)], place hydrogen recombiners in service taking suction directly on the drywell and operate the drywell hydrogen mixing system.

FS PSTG Step:

PC/H-2 Monitor and control hydrogen and oxygen concentrations in the drywell.

PC/H-2.1 When drywell hydrogen concentration reaches 0.5% but only if drywell hydrogen concentration is below 6% or drywell oxygen concentration is below 5% place the hydrogen recombiners in service taking suction directly on the drywell. [#6]

Justification for Differences/References

The Rockwell Hydrogen Recombiner can recombine hydrogen and oxygen even when concentrations of hydrogen are below the minimum detectable level, since the electric heaters will provide the necessary thermal requirements even though the reaction is not necessarily self sustaining (Reference: Rockwell manual T48-1). Minimum detectable hydrogen concentration: SP 44.654.04.

Maximum Hydrogen and Oxygen concentration for recombiner operation: Vendor manual, Rockwell Hydrogen recombination system, T48-1, -2, -3, -4.

Deleted instructions to operate "drywell hydrogen mixing systems" since as described in Appendix B, "The mixing systems referred to in this guideline are motor-driven fans, dampers, and duct work..." SNPS has no such system. reference: FSAR Section 6.2.5.2.1

Added cautionary guidance for EDG 3300 KW concern.

SHOREHAM NUCLEAR POWER STATION
Plant Specific Technical Guidelines
Primary Containment Control

EPG Step:

PC/H-2.2 When drywell hydrogen concentration reaches [6% (maximum hydrogen concentration for recombiner operation or 6%, whichever is lower)] and drywell oxygen concentration reaches [5% (maximum oxygen concentration for recombiner operation or 5%, whichever is lower)], secure any hydrogen recombiner taking suction on the drywell.

PC/H-2.3 Continue in this procedure at [Step PC/H-4].

PS EPG Step:

PC/H-2.2 When drywell hydrogen concentration reaches 6% and drywell oxygen concentration reaches 5%, secure any hydrogen recombiner taking suction on the drywell.

PC/H-2.3 Continue in this procedure at Step PC/H-4.

Justification for Differences/References

Maximum hydrogen concentration for recombiner operation - Vendor manual, Rockwell Hydrogen Recombination System, T48-1, 2, 3, 4.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-3 Monitor and control hydrogen and oxygen concentrations in the suppression chamber.

PC/H-3.1 When suppression chamber hydrogen concentration reaches [1% (minimum hydrogen concentration for recombiner operation or minimum detectable hydrogen concentration, whichever is higher)] but only if suppression chamber hydrogen concentration is below [6% (maximum hydrogen concentration for recombiner operation or 6%, whichever is lower)] or suppression chamber oxygen concentration is below [5% (maximum oxygen concentration for recombiner operating or 5%, whichever is lower)], place hydrogen recombiners in service taking suction directly on the suppression chamber.

SNPS PSTG Step:

PC/H-3 Monitor and control hydrogen and oxygen concentrations in the suppression chamber.

PC/H-3.1 When suppression chamber hydrogen concentration reaches 0.5% but only if suppression chamber hydrogen concentration is below 6% or suppression chamber oxygen concentration is below 5%, place hydrogen recombiners in service taking suction directly on the suppression chamber. [#6]

Justification for Differences/References

See Step PC/H-2.1

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-3.1 If no hydrogen recombiner can be placed in service taking suction directly on the suppression chamber but only if the drywell hydrogen concentration is below [6% (maximum hydrogen concentration for recombiner operation or 6%, whichever is lower)], or drywell oxygen concentration is below [5% (maximum oxygen concentration for recombiner operation or 5%, whichever is lower)], place hydrogen recombiners in service taking suction indirectly on the suppression chamber by way of the drywell.

SNPS PSTG Step:

PC/H-3.1 (Con't) If no hydrogen recombiner can be placed in service taking suction directly on the suppression chamber but only if the drywell hydrogen concentration is below 6% or drywell oxygen concentration is below 5%, place hydrogen recombiners in service taking suction indirectly on the suppression chamber by way of the drywell.

Justification for Differences/References

Maximum hydrogen/oxygen concentration for recombiner operation - Vendor Manual, Rockwell Hydrogen recombination system, T48-1, 2, 3, 4.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-3.2 When suppression chamber hydrogen concentration reaches [6% (maximum hydrogen concentration for recombiner operation or 6%, whichever is lower)] and suppression chamber oxygen concentration reaches [5% (maximum oxygen concentration for recombiner operation or 5%, whichever is lower)], secure all hydrogen recombiners taking suction directly on the suppression chamber.

SNPS PSTG Step:

PC/H-3.2 When suppression chamber hydrogen concentration reaches 6% and suppression chamber oxygen concentration reaches 5%, secure all hydrogen recombiners taking suction directly on the suppression chamber.

Justification for Differences/References

Maximum hydrogen/oxygen concentration for recombiner operation - Vendor manual, Rockwell Hydrogen Recombination System, 1T48-1, 2, 3, 4.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

[When drywell or suppression chamber hydrogen concentration reaches 6% and drywell or suppression chamber oxygen concentration is above 5%,] EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure; secure hydrogen mixing systems and, irrespective of the offsite radioactivity release rate, vent and purge the primary containment, defeating isolation interlocks if necessary, to restore and maintain drywell and suppression chamber hydrogen concentrations below 6% or drywell and suppression chamber oxygen concentrations below 5% as follows:

SNPS PSTG Step:

PC/H-4 When drywell or suppression chamber hydrogen concentration reaches 6% and drywell or suppression chamber oxygen concentration is above 5%, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter procedure developed from the RPV Control Guideline at Step RC-1 and execute it concurrently with this procedure; and, irrespective of the offsite radioactivity release rate, vent and purge the primary containment, defeating isolation interlocks if necessary, to restore and maintain drywell and suppression chamber hydrogen concentrations below 6% or drywell and suppression chamber oxygen concentrations below 5% as follows:

Justification for Differences/References

The requirement for securing the hydrogen mixing systems has been deleted because at SNPS there are the drywell and suppression pool sprays. Since the only reason the EPGs specify securing the mixing systems was to remove possible deflagration ignition sources, there is no reason to secure sprays at SNPS. Further, later H₂ control guidance (Step PC/H-4.1) will specify when to initiate sprays.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

If while executing the following steps
suppression pool or drywell sprays have
been initiated and:

- o Suppression chamber pressure drops
below [2.0 psig (high drywell pressure
scram setpoint)], terminate suppression
pool sprays.
 - o Drywell pressure drops below [2.0 psig
(high drywell pressure scram setpoint)],
terminate drywell sprays.
-

WAPS PSTG Step:

If while executing the following steps
suppression pool or drywell sprays have
been initiated and:

- o Suppression chamber pressure drops
below 1.69 psig terminate suppression
pool sprays.
 - o Drywell pressure drops below 1.69
psig terminate drywell sprays.
-

Justification for Differences/References

N/A

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-4.1 If suppression pool water level is below [24 ft. 6 in. (elevation of suppression pool spray nozzles)], initiate suppression pool sprays [using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode].

SNPS PSTG Step:

PC/H-4.1 If suppression pool water level is below Elevation 50 ft., initiate suppression pool sprays using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode.

Justification for Differences/References

Elevation of suppression pool spray nozzles: SWEC Drawing 11600.02-FP-200NN.

SHOREHAM NUCLEAR POWER STATION
Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-4.2 If suppression pool water level is below [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)], vent the suppression chamber in accordance with [procedure for primary containment venting].

If suppression pool water level is at or above [26 ft. 9 in. (elevation of the bottom of the suppression chamber vent)] or if the suppression chamber cannot be vented, vent the drywell in accordance with [procedure for primary containment venting].

SNPS PSTG Step:

PC/H-4.2 If suppression pool water level is below Elevation 57 ft., vent the suppression chamber in accordance with SP 23.418.01, Section 8.2.1.

If suppression pool water level is at or above Elevation 57 ft., or if the suppression chamber cannot be vented, vent the drywell in accordance with SP 23.418.01, Section 8.2.1.

Justification for Differences/References

Elevation of the bottom of the suppression chamber vent - SP 84.654.03, penetration X-29 and XS-22.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-4.3 If the suppression chamber or drywell can be vented, initiate and maximize the drywell purge flow.

SNPS PSTG Step:

PC/H-4.3 If the suppression chamber or drywell can be vented, initiate and maximize the drywell purge flow through all available purge valves defeating isolation interlocks if necessary.

Justification for Differences/References

The step has been altered to include the necessary guidance to get air into the containment during conditions which would otherwise preclude opening the purge valves.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-4.4 If [suppression pool water level is below [17 ft. 2 in. (elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water)] and] drywell temperature and pressure are within the Drywell Spray Initiation Limit, [shut down recirculation pumps and drywell cooling fans and] initiate drywell sprays [using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode].

SNPS PSTG Step:

PC/H-4.4 If suppression pool water level is below Elevation 50 ft. and drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure I), shut down recirculation pumps and drywell cooling fans and initiate drywell sprays using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCI mode.

Justification for Differences/References

Elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water - see DW/T-2.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

H-5 When drywell or suppression chamber hydrogen concentration cannot be restored and maintained below 6% and drywell or suppression chamber oxygen concentration cannot be restored and maintained below 5%, then irrespective of whether adequate core cooling is assured:

SNPS PSTG Step:

PC/H-5 When drywell or suppression chamber hydrogen concentration cannot be restored and maintained below 6% and drywell or suppression chamber oxygen concentration cannot be restored and maintained below 5%, then irrespective of whether adequate core cooling is assured:

Justification for Differences/References

N/A

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

If while executing the following steps
suppression pool or drywell sprays have been
initiated and:

- o Suppression chamber pressure drops below
[2.0 psig (high drywell pressure scram
setpoint)], terminate suppression pool
sprays.
 - o Drywell pressure drops below [2.0 psig
(high drywell pressure scram setpoint)],
terminate drywell sprays.
-

CCPS PSTG Step:

If while executing the following steps
suppression pool or drywell sprays have
been initiated and:

- o Suppression chamber pressure drops below
1.69 psig, terminate suppression pool sprays.
 - o Drywell pressure drops below 1.69 psig,
terminate drywell sprays.
-

Justification for Differences/References

High drywell pressure scram setpoint - Tech Spec table: 2.2.1-1

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

PC/H-5.1 If suppression pool water level is below [24 ft. 6 in. (elevation of suppression pool spray nozzles)], initiate suppression pool sprays.

SNPS PSTG Step:

PC/H-5.1 If suppression pool water level is below Elevation 50 ft., initiate suppression pool sprays.

Justification for Differences/References

Elevation of suppression pool spray nozzles: SWEC drawing 11600.02-FP-200NN.

SHOREHAM NUCLEAR POWER STATION

Plant Specific Technical Guidelines

Primary Containment Control

EPG Step:

DW/T-5.2 If [suppression pool water level is below [17 ft. 2 in. (elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water)] and] drywell temperature and pressure are within the Drywell Spray Initiation Limits, [shut down recirculation pumps and drywell cooling fans and] initiate drywell sprays.

SNPS PSTG Step:

PC/H-5.2 If suppression pool water level is below Elevation 50 ft., and drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure I) shut-down recirculation pumps and drywell cooling fans and initiate drywell sprays.

Justification for Differences/References

Elevation of bottom of internal suppression chamber to drywell vacuum breakers less vacuum breaker opening pressure in feet of water. (See DW/T-2)