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RECIP.NAME RECIPIENT AFFILIATION
KNIGHTON,G. Licensing Branch 3

SUBJECT: Forwards update to 830127 description of natural circulation test program & "Evaluation of Natural Circulation Cooldown Test Performed at San Onofre Nuclear Generating Station." Confirmatory Item 7 in NUREG-0857,SSER 5 closed.

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Original Affidavit Attached to this Copy.

Arizona Public Service Company

ANPP-30141-EEVBJr/KEJ
August 7, 1984

Director of Nuclear Reactor Regulation
Attention: Mr. George Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
PVNGS Test Program
Docket Nos. STN 50-528/529/530
File: 84-056-026; G.1.01.10

References: (1) Letter from E. E. Van Brunt, Jr., APS, to G. W. Knighton, NRC, dated January 27, 1983, (ANPP-22841-WFQ/TFQ). Subject: Natural Circulation Cooldown Testing.
(2) NUREG-0857, Supplement No. 5 "Safety Evaluation Report related to the Operation of Palo Verde Nuclear Generating Station, Units 1, 2, and 3", dated November 1983.

Dear Mr. Knighton:

Please find attached a report providing a description of the PVNGS test program which satisfies the requirements of Branch Technical Position (BTP) RSB 5-1. The information included in this report is intended to update the information provided in Reference (1) regarding compliance with BTP RSB 5-1.

Also included, as an attachment to this report, is an evaluation prepared by Combustion Engineering Owners Group (CEOG) entitled "An Evaluation of the Natural Circulation Cooldown Test performed at the San Onofre Nuclear Generating Station." This evaluation is referenced in the attached PVNGS report due to its comparisons to the System 80 Nuclear Steam Supply System.

With this submittal, we believe this addresses the Staff's concerns of PVNGS Compliance with BTP RSB 5-1 and should also close confirmatory item No. 7 in Section 1.10 of Reference (2).

If you have any questions concerning this matter, please contact me.

Very truly yours,

E E Van Brunt / DSK

E. E. Van Brunt, Jr.
APS Vice President
Nuclear Production
ANPP Project Director

EEVBJr/KEJ/mb

B001
1/1

cc: A. C. Gehr
E. A. Licitra
R. Zimmerman

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, Donald Karner, represent that I am Assistant Vice President, Nuclear Production of Arizona Public Service Company, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority to do so, that I have read such document and know its contents, and that to the best of my knowledge and belief, the statements made therein are true.

Donald Karner

Donald Karner

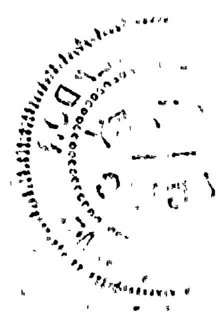
Sworn to before me this 8th day of August, 1984.

Nora E. Meador

Notary Public

My Commission Expires:

My Commission Expires April 6, 1987



NATURAL CIRCULATION TESTING

This report provides a description and summary of the Palo Verde Nuclear Generating Station (PVNGS) test program to satisfy the requirements of Branch Technical Position RSB 5-1. This test program includes demonstrating the ability to bring a System 80 Plant to cold shutdown with essentially safety-grade components and systems operating from only onsite power available or only offsite power with a concurrent single failure. This program also includes demonstrations of boron mixing during natural circulation, available nitrogen capacity to the atmospheric dump valves, and available condensate storage capacity.

Several previous reports form the pre-test analysis showing that PVNGS' design meets the requirements of BTP RSB 5-1. These analyses are given references 1 and 2, (Appendix E). Reference 1 was a detailed full scope computer simulation of a BTP RSB 5-1 evolution for a System 80 Plant and was submitted to the NRC on the CESSAR docket. Reference 2 was a CE Owners Group effort to evaluate the results from the SONGS Natural Circulation test and compare the results with similar CE Plants and is included as an attachment with this submittal. Reference 2 includes discussions of the similarities and differences between SONGS and PVNGS. Appendix D lists the applicable sections of CEN 259 to the PVNGS design.

Natural circulation testing during the PVNGS power ascension test program wil encompass two tests; Loss of Offsite Power at 50% power and Natural Circulation Test from 80% power. Appendix A describes the BTP RSB 5-1 testing requirements, how PVNGS will meet the requirements and a brief discussion. Appendix B gives the systems and components relied upon during the Natural Circulation Test Program, whether or not they are safety-grade and a discussion of their functions or impacts on the test. Appendix C is a test outline of the Natural Circulation Test from 80% power. These two tests are planned to be performed during the power ascension test program though they may not be run on the initial ascension to 100% power. If this is the case, they will be performed shortly after the NSSS Warranty test but before the conclusion of the power ascension test program. The Natural Circulation Test from 80% power shall include the following demonstrations:

1. Natural Circulation following the plant trip from 80% power.

2. Adequate boron mixing can be achieved under natural circulation conditions (Boron mixing demonstration may be performed during the Loss of Offsite Power Test from 50% power).

3. By performance or in combination with analysis, the ability to perform a natural circulation cooldown followed by a plant de-pressurization to shutdown cooling initiation conditions.

The test will attempt to form a void in the upper reactor head region, then demonstrate a void collapse technique via the reactor head vent system and charging into the Reactor Coolant System (RCS). Once this method has been demonstrated, all pressurizer heaters will be used to further collapse the void. Appendices A and C discuss the actual test objectives and steps. Presently, these two test procedures are available for the NRC review, if required, and are based on Appendices A, B, and C.

REFERENCES

1. Letter from A. E. Scherer to D. G. Eisenhut dated 12 August, 1983, LD-83-074. Subject: Natural Circulation Cooldown Reanalysis for CESSAR-F.

2. CEN-259, An evaluation of the Natural Circulation Cooldown Test performed at the San Onofre Nuclear Generating Station, January, 1984.

3. Letter from E. E. Van Brunt, Jr. to T. Novak dated November 10, 1982 (ANPP-22261-WFQ/TFQ), Subject: Natural Circulation Cooldown Testing.

4. PVNGS FSAR Appendix 5A, Question 5A.17, Amendment 7 & 8.

5. Letter from E. E. Van Brunt, Jr. to G. W. Knighton dated January 27, 1983 (ANPP-22841-WFQ/TFQ), Subject: NRC Staff comments addressed concerning Natural Circulation Cooldown Testing.

COMPARISON OF PVNGS NATURAL CIRCULATION TEST PROGRAM
WITH BTP-RSB-5-1

REQUIREMENT	PVNGS TESTING	DISCUSSION
1. All systems, procedures and equipment used to demonstrate compliance with RSB BTP 5-1 must meet the four functional requirements stated therein. These functional requirements are as follows: 1) All systems must be safety graded; 2) All system shall have suitable redundancy in components, features, etc., to permit system function to be accomplished assuming only onsite or only offsite power and a single failure; 3) System(s) shall be operable from the control room with only onsite or only offsite power. Limited action outside the control room is acceptable if suitably justified. 4) System(s) shall be capable of bringing the reactor to cold shutdown, with only offsite or only onsite power, within a reasonable time assuming the most limiting single failure.	Natural circulation will be induced at the 50% Power level during the Loss of Offsite Power Test (LOPT). This test is designed to demonstrate the systems operability under conditions which involve a loss of offsite power. The purpose of this test is to: 1. Verify ability to shutdown and maintain the reactor in a HOT STANDBY condition and demonstrate the operation of the emergency diesels and load shedding features of the Plant's Class IE busses. The plant will be maintained in a hot standby condition with safety grade equipment, with the exception of the system(s) listed in Appendix B. 2. During the restoration from loss of offsite power, the boron mixing requirements of this branch statement may be performed. This will be accomplished while maintaining the plant in Mode 3 by dumping steam via the steam bypass control system (SBCS), allowing for possible water reclamation, or the atmospheric dump values (ADVs). The boron mixing test shall be performed with the use of emergency powered backup heaters, though all heaters will be available if necessary for pressure control.	The 50% Loss of Offsite Power Test has been designed to address the first three functional requirements of BTP RSB-5-1. During the Natural Circulation Test from 80% power letdown will not be isolated. Operation of letdown, which will allow for continuous use of the Boronmeter, will not impact boron mixing or heat loss due to CVCS operation since letdown flow is small in comparison to total RCS natural circulation flow (less than 1%). Further, calculations showing the volume of borated water required to be charged to the RCS to obtain proper shutdown margins prior to cooldown are straight forward and clearly demonstrate that this process can be accomplished. Emergency pressurizer heaters will also be available to the operators throughout the Natural Circulation Test from 80% power. This is desirable since it will allow for plant cooldown retaining the ability to maintain proper subcooling. The 50% Loss of Offsite Power Test will require pressure control with only those heaters supplied from the diesel generators.

REQUIREMENT	PVNGS TESTING	DISCUSSION
	2. (Cont.) The steam generator water level shall be maintained via essential auxiliary feedwater system. While the plant is in hot standby the condensate storage inventory shall be monitored. The Natural Circulation Test from 80% power shall demonstrate the ability to cooldown the plant while in Natural Circulation. Approximately 1000ft3 void in reactor vessel head will be allowed to form, then collapsed per CE guidelines. At least one full cycle of void formation in the Reactor Vessel Head and eventual recollapse of the void will be performed. The void and collapse technique is described in the 80% test outline, Appendix C. It is expected that enough information to verify models can be obtained with the generation of one bubble. This cooldown shall be performed on safety grade systems with the exceptions noted in Appendix B.. Following the reactor trip, the decay heat shall be removed via the SBCS. The letdown control valves shall remain open to allow use of the letdown boronmeter during the boron mixing if	

REQUIREMENT	PVNGS TESTING	DISCUSSION
	performed at this point. During the cooldown process decay heat removal will be transfered to the Safety grade Atmospheric Dump Values (ADV).	

COMPARISON OF PVNGS NATURAL CIRCULATION TEST PROGRAM WITH BPT-RSB-5-1

REQUIREMENT	PVNGS TESTING	DISCUSSION
II. Tests should confirm adequate mixing of borated water prior to and during cooldown under natural circulation and should permit estimates of time to achieve such mixing. Effects which should be considered are as follows: stratification leading to delay in mixing times, availability of letdown and auxiliary spray, boration rate adequate to maintain shutdown margin during a cooldown.	A boron mixing test shall be performed during either the loss of offsite power test or the 80% Natural Circulation test. This test will require sampling at the following locations; hot leg every 30 minutes, pressurizer every 60 minutes, VCT every 60 minutes, and the boronometer every 10 minutes. Backup (class IE) pressurizer heaters and auxiliary sprays will be available during boron mixing. It will be unlikely that the pressurizer boron concentration will become equalized with the RCS with the use of 300 kw of heaters. Therefore, the RV Boron Conc. will be maintained such that when the PZR Outsurge is added to the RV the Shutdown Margin will not be reduced below the Tech. Spec. Limits. The Boron Concentration calculation will take into account the total RCS & Pressurizer volume. The amount of boron required to reach shutdown cooling condition will then be added to the RCS via the changing system.	Sample locations and frequencies are adequate to supply data sufficient for proper analysis of the concerns in BPT-RSB-5-1 regarding stratification leading to delay in mixing times and regional non uniformities in boron concentration. The availability of letdown was discussed in Part 1 above; since auxillary spray is safety related failure is considered unlikely. Note during PVNGS tests use of the auxiliary sprays will be minimized due to the use of only 300 kw heaters and the way the boron concentration required to reach shutdown cooling conditions is calculated and maintained.

COMPARISON OF PVNGS NATURAL CIRCULATION TEST PROGRAM WITH BTP-RSB-5-1

REQUIREMENT	PVNGS TESTING	DISCUSSION
III. Tests to satisfy the requirements of RSB BTP 5-1 should provide information which can be used to prepare emergency operating procedures and determine the adequacy of sizing of the seismic Category I condensate storage tank. The seismic Category I water supply shall have sufficient inventory to permit operation at hot shutdown for at least four hours followed by cooldown to SDCS entry conditions. The inventory needed shall be based upon the longest cooldown time required with either only onsite or only offsite power available and an assumed single failure.	Both the loss of offsite power test and the Natural Circulation Cooldown test shall extensively used the operations recovery and abnormal procedures. 41AO-1ZZ13 Natural Circulation Cooldown 91EP-1ZZ01 Emergency Operations 41AO-1ZZ09 Degraded Electrical Four hours of Hot Standby Operation will be demonstrated during a combination of time in Mode 3 during the 80% Natural Circulation Test and Loss of Offsite Power Test.	PVNGS design provides a 550,000 gallon seismic Category I condensate storage tank as the primary source of water for the auxilliary feedwater system. Actual verification of condensate capacity will be made via careful analysis of feedwater inventory data taken during the Natural Circulator test from 80% power and LOPT.

COMPARISON OF PVNGS NATURAL CIRCULATION TEST PROGRAM
WITH BTP-RSB-5-1

REQUIREMENT	PVNGS TESTING	DISCUSSION
IV. Additional effects which should be considered in setting up tests and supporting analyses in compliance with the requirements of BTP-RSB-5-1 are as follows: A. Steam bubble formation in upper head region which could limit depressurization rate.	During the depressurization portion of the Natural Circulation test from 80% power careful monitoring of the RCS for head voiding will be performed. The procedure will attempt early depressurization to induce an upper head void. The void collapse technique is described in Appendix B.	Existing calculations and test procedures are adequate to meet the concerns regarding steam bubble formation in the upper head region.
B. Adequate nitrogen supply to safety grade ADV's	During the Natural Circulation Test from 80% power the ADV will be operated from the Nitrogen backup supply during the Cooldown portion of the test. During the cooldown nitrogen usage will be monitored.	Use of the ADV's during the Natural Circulation Cooldown and previously performed pre-operational test shall have demonstrated the ability to cooldown on the ADV's via the nitrogen backup supply or manual operation.
Test Outline	See Appendix C	

SYSTEMS AND COMPONENTS RELIED UPON DURING
THE NATURAL CIRCULATION TEST PROGRAM

SYSTEM/COMPONENT	SAFETY GRADE (yes/no)	DISCUSSION
on IE Pressurizer Heaters	No	All pressurizer heaters will be used for the initial transient in NC and LOPT tests to allow for full automatic plant response. Also all heaters will be used to collapse the void in the upper vessel after the use of the head vent system is demonstrated.
E Pressurizer Heaters	No	The IE pressurizer heaters only will be used for the boration, cooldown, and depressurization portions of this test, except as noted above, to ensure proper subcooling is maintained.
in Feedwater System (FW)	No	The FW must be used to supply both steam generators pre-trip. Following reactor trip, the feedwater control system will ramp down main feedwater flow to 5% of full flow at which time flow will be manually secured. To enhance plant safety, main feedwater should not be secured until proper operation of the auxiliary feed-water system is verified.
Pressurizer Level	No	Non class level instrument LI-103 which is cold calibrated, during final part of cooldwon and depressurization. The initial level indication shall be by LI-110.
Reactor Head Vent System	Class power supplied Q1B piping (yes)	Reactor Head Vent System will be used during final depressurization

SYSTEM/COMPONENT	SAFETY GRADE (yes/no)	DISCUSSION
ɛeam bypass control system (SBCS)	No	The steam bypass control system will be used post-trip to dump steam during the boron mixing portion of the test. The use of the SBCS during this portion of the test will allow for water recovery and therefore help minimize costs and restoration time. Operation of the atmospheric dump valves will be demonstrated during the cooldown and depressurization portions of these tests.
Auxiliary Feedwater System (AF)	Yes	After reactor trips the emergency auxilary feed-water system supplied from the CST will be used to feed the steam generators.
Letdown portion of the chemical and volume control system (CVCS)	No	Letdown will be operable during hot standby and boron mixing portions of these tests to prevent the high thermal stress that would be placed upon the loop charging nozzles if it were secured. The presence or absence of letdown will have a negligible effect on the boron mixing process. This will also allow use of the boronometer during the boron mixing sections.

SYSTEM/COMPONENT	SAFETY GRADE (yes/no)	DISCUSSION
:ample system and boronometer	No	Primary fluid samples must be taken at the locations and with frequencies stated in the procedure guidelines.
.tmospheric dump valves (ADVs)	Yes	Operation of the ADVs will be demonstrated during the safety related natural circulation cooldown.
:itrogen backup to ADVs	Yes	
oration portion of the chemical nd volume control system (CVCS)	Yes	
uxiliary spray system	Yes	
EDM Cooler	No	Energized from class power supplies. Use of the cooler will preclude CEDM failure with the RCS temperature greater than 300°F.
:ontainment Normal Air Handling Unit.	No	Energized from class power supplies. This system will maintain containment environment for personnel access if required.

SYSTEM/COMPONENT	SAFETY GRADE (yes/no)	DISCUSSION
:actor Cavity Fan	No	Note above discussion
:actor Drain Tank drain pumps/ valves	No	Maintaining RDT pump down capabilities is required due to RCS venting via head vent. Under an accident condition the eventual filling and overpressurization would be handled by the blowout diaphragm which would cause an airborne radiation hazard in the containment.
emineralized water	No	Condensate storage (CST) inventory will be monitored and recorded during cooldown and four hours of hot standby. Demineralized water will be used to make up to the CST, if required. Total water usage will be recorded. The Reactor Makeup Water Tank will be used as a backup water supply if required.
.uclear Cooling Water	No	Will be supplied to the CEDM coolers and RCPs seals. Essential cooling water can be lined up to containment heat loads, this feature will be used during the loss of power test. This will preclude equipment damage. Nuclear Cooling Water will also be used to cool letdown and nuclear sampling.
.ux. Steam	No	Aux. steam supply will be transfered to aux. boiler prior to test. The aux. steam will maintain seal injection temperature to the RCPs, thus minimizing possibliity of seal damage.

NATURAL CIRCULATION TEST

Objectives and Acceptance Criteria

I. Objectives

A. To measure plant response to a total loss of reactor coolant flow from 80% power.

B. To verify natural circulation following the plant trip from 80% power.

C. To demonstrate that adequate boron mixing can be achieved under natural circulation conditions. (Boron mixing demonstration to be performed during this test only if not previously performed.)

D. To demonstrate, by performance or in combination with analysis, the ability to perform a natural circulation cooldown followed by a plant depressurization to shutdown cooling initiation conditions.

E. To evaluate natural circulation flow conditions and provide data to verify training simulator models.

II. Acceptance Criteria

A. Natural circulation power-to-flow ratio is less than 1.0.

B. The reactor coolant system can be properly borated while in natural circulation. (Boron mixing demonstration to be performed during this test only if not previously performed).

C. The reactor coolant system can be cooled down and depressurized during natural circulation. (Performance or in combination with analysis)

Proposed Procedure Outline for the Natural Circulation Test

Procedure Outline	Discussion
I. Initial Conditions	
A. Plant stable at 80 ± 2% of rated thermal power.	A. Adequate decay heat is available for natural circulation, i.e., the natural circulation loop ΔT is not expected to drop below 10°F for the duration of the test.
B. All four plant protective system channels are in operation.	
C. Steam bypass control system and both feedwater control systems are in automatic.	
D. Pressurizer pressure and level control systems are in automatic.	
E. Plant auxiliary loads are transfered to the start-up transformers. Plant safety-related loads are powered from normal sources, i.e., startup transformers.	E. All plant auxiliary and safety related loads will be energized throughout the test. The loss of offsite power test, Test 14.2.12.5.9 of CESSAR, is designed to test the various transfer functions and demonstrate plant behavior under an actual loss of offsite power as required by Regulatory Guide 1.68.
F. HJTC system in operation.	F. Monitor and periodically record RVUH temperature at each HJTC junction throughout entire test.

Procedure Outline	Discussion
II. Procedure	
A. Reactor Coolant pump trip/ natural circulation.	A. During the initial transient and the subsequent boration, steaming will be accomplished via the steam bypass control system or the atmospheric dump valve. The main feedwater system will be used to supply steam generators pre-trip; the auxiliary feedwater system will be used to supply steam generators post trip. Record feedwater usage post trip for entire test.
1. Trip plant	
2. Establish natural circulation	
3. Stabilize plant and take data	
4. Verification of natural circulation.	
5. Measure power to flow ratio.	
B. Boron mixing demonstration	B. Perform boron mixing demonstration only if not previously performed.
1. Determine required boron increase.	1. Amount added will be the greater of 100 ppm or that required to meet shutdown margin at approximately 350°F. The possible difference between pressurizer and RCS boron concentration will be accounted for and excess shutdown margin will be added to the reactor vessel.

Procedure Outline	Discussion
2. Initiate Boron Sampling.	2. Sample locations and frequencies are designed to demonstrate adequate mixing and permit estimation of times required to achieve such mixing.
a. Hot leg #1 - 30 min.	
b. Pressurizer - 60 min.	
c. Volume Control Tank - 60 min.	
d. Boronometer - 10 min.	
3. Initiate boration.	
a. Charge to RCS using a minimum of two charging pumps.	a. Maximize mixing in the chemical and volume control system and enhance boronometer readings.
b. Periodically operate emergency heaters and auxiliary spray. simultaneously.	
c. Maintain normal pressurizer level.	
d. Acceptance criteria for adequate boron mixing three successive hot leg samples within ± 20 ppm.	

Procedure Outline	Discussion
C. Cooldown	
1. Ensure adequate feedwater available for cooldown and depressurization.	
2. Initiate hot leg #1 boron samples.	
3. Verify transfer steam loads to atmospheric dump valves: Air to be supplied to these valves via the safety grade nitrogen supply bottles.	3. Nitrogen usage to be evaluated via careful monitoring of the nitrogen supply bottles.
4. Secure all (non emergency powered) pressurize heaters.	4. Non-emergency powered heaters to remain secured except following RVUH steam bubble formation as noted below and if necessary to maintain a minimum of 28 °F loop subcooling.
5. Using atmospheric dump valves, initiate cooldown.	5. Charge as necessary due to coolant contraction to maintain pressurizer level. The boron concentration of the charging fluid to be at least as great as the RCS boron concentration of the RCS. Monitor and periodically record RVUH temperatures at each HJTC junction.
a. Manual Control of Letdown	
b. $\leq$ 75°F hour cooldown	
c. Feed steam generators via the auxiliary feedwater system.	
d. Stabilize plant after cooldown complete for approximately 30 min.	d. Cooldown to a hot leg temperature of about 350°F or until an approximately 1000 void in Reactor vessel head is present, or actual pressurizer water level reaches 80%.

Procedure Outline	Discussion
D. Depressurization	D. This procedure will perform an early depressurization in an attempt to form an RVUH steam bubble if not already present.
1. Initiate auxiliary spray	
a. Monitor loop subcooling. Maintain 20°F of subcooling using pressurizer heaters if necessary. Continue to record readings from the HJTC system.	a. Data from HJTC system to be used to verify system response to RVUH steam bubble formation.
b. If steam bubble formation is indicated, continue auxiliary spray and increase actual pressurizer level approximately to 80%, monitor RV level system	
c. When actual pressurizer level reaches 80%, secure auxiliary spray and initiate loop charging.	
d. Open reactor vessel head vent and vent system to the reactor drain tank. Demonstrate ability to collapse bubble using the vent and preferentially directing charging to the RVUH.	d. Monitor reactor drain tank level and pressure. Shut head vent valves if pressure between containment and tank exceeds 50 psid.

Procedure Outline	Discussion
e. Shut head vent valves. Energize pressurizer heaters and raise system pressure by 100 psi in order to continue to collapse the bubble.	e. Minimize operation of head vent system in this mode. Once ability to collapse bubble using the vent has been demonstrated, pressurizer heaters will be used to continue the process.
f. Allow the plant to stabilize then continuing depressurization.	Steps F through K to be performed only if entry into into shutdown cooling is to be performed. Otherwise the data to this point will be used to show by analysis initiation of shutdown cooling was possible.
g. If steam bubble formation is indicated, continue auxiliary spray and increase actual pressurizer level to 80%, monitor RV level system to ensure steam bubble above hot leg.	
h. When pressurizer level reached 80%, secure auxiliary spray and initiate loop charging.	
i. Energize all pressurizer heaters and raise system pressure by 100 psi.	
j. Allow the plant to stabilize then continue depressurization.	
k. Repeat steps 2.g through 2.j as required to attain shutdown cooling system entry conditions.	

Procedure Outline	Discussion
E. System Restoration.	E. If boron mixing test was performed as part of this test, restart one reactor coolant pump and continue to take boron concentration data in order to check for possible boron stratification. Do not start RCPs if void is known to exist in the upper head.

APPENDIX D

APPLICABLE SECTION OF CEN 259 TO PVNGS

1.0 Introduction

3.0 Boron Mixing Analysis - This section compares the CE Pretest Predictions for the San Onofre Nuclear Generating Station (SONGS) with actual test data obtained during the SONGS test program and states conclusions. From the results of the SONGS tests and from computer analysis this section discusses System 80 Pretest Predictions and the System 80 boron mixing process.

4.0 Reactivity Analysis - This section shows by analysis the required amount of boron required to be added to ensure no return to criticality provided; all control rods are fully inserted following a reactor scram or the most reactive control rod remains stuck out following a scram.

5.0 Reactor Vessel Upper Head Cooldown Analysis

6.0 Compliance with Testing Required of BTP RSB 5-1 (sections 6.1 and 6.5).