Distribution:
~~Document~~ Control 50-362
NRC PDR
L PDR
PRC System
TNovak
FMiraglia
HRood
JLee
LB#3 File

SEP 8 1982

MEMORANDUM FOR: Thomas M. Novak, Assistant Director for Licensing, DL

THRU: Frank J. Miraglia, Chief
Licensing Branch No. 3, DL

FROM: Harry Rood, Project Manager
Licensing Branch No. 3, DL

SUBJECT: RESULTS OF FIRST CYCLE OF NATURAL CIRCULATION TESTING AT SAN ONOFRE UNIT 2

Enclosed is a summary of the results of the first cycle of natural circulation testing at San Onofre 2. These tests were completed at about 0500 PDT on September 7, 1982. The enclosed summary was prepared on the basis of discussions with D. Kirsch, W. Long, and T. Marsh of the NRC who witnessed the tests.

After repeating these tests (cycle 2) the plant will have completed the low power testing program and will be ready to go to the 20% power plateau for additional testing. The scheduled date for exceeding 5% power is September 9, 1982.

Original Signed By:

Harry Rood, Project Manager
Licensing Branch No. 3
Division of Licensing

Enclosure:
As stated

cc: D. Eisenhut
E. Case
H. Denton
T. Marsh
C. Liang
W. Long
D. Kirsch
T. Bishop
A. Chaffee
B. Vogler
L. Chandler

OFFICE			DL:LB#3	DL:LB#3			
SURNAME			HRood:ph	FMiraglia			
DATE			9/8/82	9/8/82			

SUMMARY OF RESULTS

FIRST CYCLE OF NATURAL CIRCULATION TESTS

AT LOW POWER - SAN ONOFRE UNIT 2

I. INTRODUCTION

In order to meet the requirements of Item I.G.1 of NUREG-0737, a natural circulation test program has been established for San Onofre Unit 2. The overall objective of the program is to verify plant operating characteristics under natural circulation conditions and to provide operator training under these conditions. The program includes tests at low power (less than 5%), at 20% power, and at 80% power. Three tests, designated A1, A2, and A3, are to be performed at low power. These tests will be performed twice, with half the plant operators participating or observing each cycle of these tests. At approximately 0500 PDT on September 7, 1982, the first cycle of these low power tests was successfully completed at San Onofre Unit 2. The results of these tests are given below.

II. DISCUSSION OF TEST RESULTS

Test A1: Verification of Natural Circulation

Objective - To establish natural circulation flow conditions.

Method - The reactor is critical at approximately 3% power with all four reactor coolant pumps operating. Reactor protective system trips are bypassed, as required, to allow the reactor to be maintained critical with forced circulation secured. At time zero, all four reactor coolant pumps are simultaneously tripped and natural circulation is established.

Results - The natural circulation demonstration was conducted at power levels of about 2 1/2%. Natural circulation was established in about 45 minutes, with a core ΔT of about 27°F. T_{hot} and T_{cold} vs time followed the predicted values. Two operating crews were present, one operating and one assisting, taking data, and observing. All appeared to be well prepared for the test.

Test A2: Verification of Natural Circulation at Reduced Pressures

Objective - To demonstrate the capability to maintain natural circulation and adequate margin to saturation without the use of pressurizer heaters. To determine the reactor coolant system depressurization rate following the loss of all four reactor coolant pumps and pressurizer heaters. To demonstrate the ability to control the subcooled margin through the use of the chemical and volume control system and the steam bypass system.

Method - Natural circulation conditions are established in accordance with Test A1 above. All pressurizer heaters are secured allowing a slow cooling of the pressurizer to begin with a corresponding decrease in the reactor coolant system pressure.

Results - This test demonstrated that natural circulation could be established and maintained at reduced system pressure (about 2050 psig). Again the ΔT was about 27°F. Since the steam bypass system was inoperable, these tests were run using the atmospheric dump valves.

Test A3: Demonstration of Natural Circulation with Reduced Heat Removal Capacity

Objective - To demonstrate the capability to maintain natural circulation with one steam generator isolated. To demonstrate that full natural circulation flow can be reestablished when the isolated steam generator is returned to service.

Method - Natural circulation conditions are established in accordance with test A1 above with indicated reactor power approximately 1%. A controlled cooldown is performed to lower the pressure in both steam generators to approximately 800 psia. Steam Generator 2 is isolated by closing its main isolation valve and securing feedwater flow. When the operator is ready, Steam Generator 2 is returned to service by opening its main steam isolation valve and restoring feedwater. A demonstration is then made that full natural circulation flow can be reestablished.

Results - This test was conducted at about 1% power, with one steam generator isolated. Natural circulation was established with the steam generator isolated, then re-established when the isolated steam generator was returned to service.

III. CONCLUSIONS

The low power tests conducted to date verify that plant operating characteristics under natural circulation conditions are essentially as predicted and are acceptable. Specifically, the ability to establish and maintain natural circulation was demonstrated, as was the length of time required to stabilize natural circulation. The ability to establish natural circulation at reduced RCS pressure was demonstrated, as well as with one steam generator isolated.

Also, the tests conducted to date allowed half of the plant operating staff to experience the initiation and maintenance of the natural circulation mode, using nuclear heat to simulate decay heat. Operators were able to observe and recognize when natural circulation had stablized, and were able to control saturation margin, RCS pressure, and heat removal rate without exceeding specified operating limits. The other operators will conduct the second cycle of A-series tests soon.