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AUTH.NAME AUTHOR AFFILIATION
CRANE,P.A. Pacific Gas & Electric Co.
RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation

SUBJECT: Submits proposed program of low power testing to be conducted prior to power ascension.Detailed test procedures will be developed.

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PACIFIC GAS AND ELECTRIC COMPANY

PG&E

77 BEALE STREET, 31ST FLOOR • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211

MALCOLM H. FURBUSH
VICE PRESIDENT AND GENERAL COUNSEL

ROBERT OHLBACH
ASSOCIATE GENERAL COUNSEL

CHARLES T. VAN DEUSEN
PHILIP A. CRANE, JR.
HENRY J. LaPLANTE
JOHN B. GIBSON
ARTHUR L. HILLMAN, JR.
CHARLES W. THISSELL
DANIEL E. GIBSON
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ATTORNEYS

February 7, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Phillips Building
7920 Norfolk Avenue
Bethesda, Maryland 20014

Re: Docket No. 50-275
Docket No. 50-323
Diablo Canyon Units 1 and 2

Dear Mr. Denton:

We have carefully reviewed the special low power test programs which the Tennessee Valley Authority and Virginia Electric and Power Company have submitted for Sequoyah and North Anna, respectively, and we have concluded that undertaking a similar test program at Diablo Canyon would be of practical benefit.

The low power test programs provide additional experience and information to plant operators, offer the opportunity to verify plant procedures, provide additional plant response information for simulation development, and provide actual plant response data for verification of design conservatism and improvement of NSSS modeling and analysis. Furthermore, the TVA low power test program for Sequoyah has been reviewed by the ACRS, and subject to approval of the detailed test program by the NRC Staff, the Committee recommended approval of an interim low power license to conduct the tests.(1) It is our understanding that procedurally the approval by the Commission would result in issuance of an operating license with a temporary power restriction and would not require any special low power license or exception to the regulations.

Therefore, we submit for your review the outline of a proposed program of low power testing to be conducted at Diablo

(1) Letter from M. W. Carbon (ACRS) to J. F. Ahearne (NRC), dated December 11, 1979 "Interim Low-Power Operation of Sequoyah Nuclear Power Plant, Unit 1."

BOOL SEE 1/7. ROB. M WILLIAMS CE

Canyon Unit 1 prior to power ascension. This program supplements the testing program previously described in the Diablo Canyon FSAR and is in addition to those tests required in Regulatory Guide 1.68. It is our intention that each licensed operator and supervisor at Diablo Canyon participate in at least one of the natural circulation tests and observe at least two in order to maximize the training benefits inherent in conducting such a program.

The special test program we propose for Diablo Canyon Unit 1 consists of ten tests. Tests one through six are the same as submitted by TVA and VEPCO. Test seven has been modified by deleting emergency lighting verification since the adequacy of emergency lighting in critical areas has been verified during preoperational testing, and by having the test performed with the reactor at hot standby rather than critical since the main purpose of the test is to demonstrate the ability to maintain hot standby via the auxiliary feedwater system with loss of all off-site and on-site AC power. We propose to use reactor coolant pump operation as a heat source rather than maintaining the reactor critical.

In addition to the proposed low power tests we have included a brief description of the tests related to natural circulation (tests eight through ten). We plan to conduct these natural circulation tests following our 100-hour acceptance run at 100% power because of the need for actual rather than simulated decay heat. It is our understanding that TVA has submitted an outline of a test which is a modified version of our proposed boron mixing/cooldown test.

Since detailed test procedures have not yet been developed and safety evaluations by PGandE and Westinghouse for these tests have not been completed, some modifications in test scope, intent or detail may be required. We will work with Westinghouse and your staff to develop the detailed test procedures. Once test procedures have been written, they will again be reviewed by Westinghouse and then submitted for Staff review.

We believe that our program addresses, rather completely, the identified needs for such testing and that such a program would have practical value at Diablo Canyon. While our discussions and investigations have covered a broad range of other test possibilities, we have not identified any which would improve our program in any significant way.

Very truly yours,

Philip A. Crane, Jr.

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NATURAL CIRCULATION VERIFICATION

(Test Number 1)

PURPOSE

A. Establish a procedure for getting to the initial conditions of other natural circulation tests.

B. Verify conformance with prototype data.

C. Confirm operating instructions for natural circulation.

INITIAL CONDITIONS

A. All reactor coolant pumps operating.

B. Reactor critical at between 3% and 5% power.

C. Steam generator fed from auxiliary feed system.

D. Steam dump to condenser, dump valves in steam pressure mode of control.

E. Pressurizer pressure and level controllers in automatic, normal reactor coolant system pressure, temperature and pressurizer level parameters.

TEST DESCRIPTION

All reactor coolant pumps will be tripped together. The operator will verify establishment of natural circulation by observing the response of T_h and T_c in each loop. Boundary values will be established for key parameters (T_h, T_c, T_{av}, delta temperature, incore thermocouples and steam level). Core exit thermocouples will be recorded to assess core flow distribution. The reactor operator will be given experience controlling plant parameters in the natural circulation mode. Satisfactory performance of this test is a prerequisite for continuing to the rest of the natural circulation test program.

NATURAL CIRCULATION WITH SIMULATED LOSS OF OFFSITE POWER

(Test Number 2)

PURPOSE

Verify that natural circulation cooling can be established and maintained following loss of offsite power.

INITIAL CONDITIONS

Reactor Power 1%.
Reactor Coolant Pumps operating.
Auxiliary Feed System operating on offsite power.
Pressurizer Heaters controlling pressure.
Normal primary system temperature and pressure.

TEST DESCRIPTION

Test will be initiated by a simulated loss of offsite power. Reactor coolant pumps will be tripped, auxiliary feed pump and pressurizer heater loads will be transferred to diesel power. Operator will verify establishment of natural circulation by observing response of hot leg temperature instrumentation in each loop. Core exit thermocouples will be monitored to assess the core flow distribution.

NATURAL CIRCULATION WITH LOSS OF PRESSURIZER HEATERS

(Test Number 3)

PURPOSE

Verify establishment of natural circulation and determine the rate of decrease of margin to saturation while in this mode and the ability to reestablish margin through cooldown and makeup.

INITIAL CONDITIONS

Reactor Power approximately 3%

Reactor Coolant Pumps operating

Secondary system steam flow adjusted to maintain constant primary coolant temperature.

Steam generators being fed by normal feedwater supply

Pressurizer heaters controlling pressure

TEST DESCRIPTION

Test will be initiated by tripping pressurizer heaters and reactor coolant pumps. Establishment of natural circulation will be verified by observing response of hot leg and cold leg temperature instrumentation in each loop. Core exit thermocouples will be monitored to assess the core flow distribution. The operator will observe the saturation meter to verify margin. Prior to reaching saturation, secondary side steam flow will be increased to affect cooldown and reestablishment of saturation margin will be verified. In conjunction with cooldown, the operator feeds the primary system to compensate for shrinkage.

EFFECT OF STEAM GENERATOR ISOLATION (SECONDARY SIDE) ON NATURAL CIRCULATION

(Test Number 4)

PURPOSE

Verify the effects of steam generator isolation (secondary side) on natural circulation.

INITIAL CONDITIONS

Reactor Power 3%
All steam generators fed by normal feedwater supply
Reactor coolant pumps on
Secondary system steam flow adjusted to maintain constant temperature

TEST DESCRIPTION

Trip reactor coolant pumps and verify establishment of natural circulation. Cooldown using steam dumps to provide sufficient margin to steam generator safeties. Isolate steam generators one at a time until three are isolated or primary system temperature starts to increase. Hot and cold leg temperatures will be monitored to ensure that sufficient heat is being removed by the natural circulation process. The steam generators will be returned to service one at a time and the reestablishment of natural circulation will be verified in each loop. Core exit thermocouples will be monitored to assess core flow distribution.

NATURAL CIRCULATION AT REDUCED PRESSURE

(Test Number 5)

PURPOSE

Verify operation and test accuracy of primary system saturation meter.
Provide operations personnel with online experience in using saturation meter to monitor and control margin to saturation.
Provice operational verification so that changes in saturation margin will not affect natural circulation provided adequate margin to saturation exists.

INITIAL CONDITIONS

Reactor Power approximately 3%
Reactor coolant pumps operating
Steam generators being fed by normal feedwater supply
Pressurizer heaters controlling pressure
Reactor coolant system pressure normal
Secondary system steam flow adjusted to maintain constant temperature

TEST DESCRIPTION

Test is initiated by tripping of reactor coolant pumps and verifying establishment of natural circulation. Primary system pressure will be reduced as primary system temperature is held constant. Accuracy of saturation meter will be verified during pressure reductions. The effect of each pressure reduction on natural circulation will be observed. Core exit thermocouples will be monitored to assess core flow distribution.

DETERMINE THE COOLDOWN CAPABILITY OF THE CHARGING AND LETDOWN SYSTEM

(Test Number 6)

PURPOSE

Determine the cooldown capability of the charging and letdown system with the secondary plant isolated.

INITIAL CONDITIONS

Reactor shutdown

Pressurizer heaters controlling pressure

Reactor coolant pumps running

All steam generators fed by normal feedwater flow

TEST DESCRIPTION

Trip three reactor coolant pumps. Cooldown using steam dumps to provide margin to steam generator safeties. Isolate all steam generators. Establish charging and letdown for maximum cooling capability. Verify the cooldown capability of the charging and letdown system from the hot and cold leg temperatures in the active loop. This will be accomplished by periodically interrupting feed and bleed to permit heatup. Core exit thermocouples will be monitored to assess core flow distribution.

SIMULATED LOSS OF ALL ONSITE AND OFFSITE AC POWER

(Test Number 7)

PURPOSE

To verify:

1. Hot standby conditions can be maintained,
2. Auxiliary feedwater can be controlled by manual means; i.e., with loss of AC power and control air,
3. Ability of 125-volt battery to supply 125-volt vital AC, and
4. Selected equipment areas do not exceed maximum design temperature.

INITIAL CONDITIONS

Reactor at hot standby

Reactor Coolant Pumps operating.

Pressurizer heaters controlling primary system pressure.

TEST DESCRIPTION

Test will be initiated by:

1. Tripping pressurizer heaters,
2. Removing AC power from auxiliary feedwater components and main steam power reliefs,
3. Tripping selected space and equipment coolers,
4. Tripping vital battery chargers and AC power to inverter,
5. Isolating main feedwater and main steam lines,
6. Establishing manual control of auxiliary feedwater,
7. After two hours, terminating the test by restoring AC power and returning equipment to normal service.

NATURAL CIRCULATION BORON MIXING

after 100 hour acceptance run

(Test Number 8)

PURPOSE

A. To demonstrate boron mixing via natural circulation.

INITIAL CONDITIONS

A. Plant at hot standby.

B. Natural circulation established.

C. Significant decay heat.

TEST DESCRIPTION

The test will be initiated by boration of the reactor coolant system. Primary coolant samples will be taken at specified time intervals to evaluate boron mixing in the primary system. The test will be terminated when the reactor coolant system boron concentration has increased by approximately 300 ppm.

NATURAL CIRCULATION COOLDOWN TO RESIDUAL HEAT REMOVAL (RHR) SYSTEM

after 100 hour acceptance run

(Test Number 9)

PURPOSE

A. To demonstrate natural circulation cooldown to RHR using normally available equipment.

INITIAL CONDITIONS

A. Plant at hot standby.

B. Natural circulation established.

TEST DESCRIPTION

The primary system will be cooled down using the chemical and volume control system, auxiliary feedwater and steam dump. The test will be terminated after the RHR system is in service.

MEASUREMENT OF REACTOR VESSEL HEAD TEMPERATURE DURING NATURAL CIRCULATION COOLDOWN (Test Number 10)

PURPOSE

A. To determine reactor vessel head metal surface and upper internal fluid temperatures.

INITIAL CONDITIONS

A. Natural circulation estachlished at approximately 3% power.

TEST DESCRIPTION

After reactor shutdown, natural circulation cooldown will commence. Reactor vessel temperatures (metal and upper internal fluid) will be measured.