UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
SOUTHERN CALIFORNIA EDISON COMPANY, ET. AL.	)	Docket Nos. 50-361 OL 50-362 OL
	)	
(San Onofre Nuclear Generating	)	
	)	
Station, Units 2 and 3)	)	

DIRECT TESTIMONY AND EXHIBIT OF

MR. RICHARD M. ROSENBLUM

TESTIMONY OF RICHARD M. ROSENBLUM

Q. Would you please state your name?

A. Richard M. Rosenblum.

Q. By whom are you employed?

A. I am employed by Southern California Edison Company ("SCE").

Q. What is your current position with SCE?

A. I am the Startup Supervisor for Unit 2, San Onofre Nuclear Generating Station.

Q. Would you please describe your formal education and other training you have received?

A. I graduated in 1973 with a Master of Science Degree in Nuclear Engineering from Rensselaer Polytechnic Institute and a Bachelor of Science Degree in Nuclear Engineering from that same school in 1972. While at Rensselaer Polytechnic Institute, I qualified as a Senior Reactor Operator on the Rensselaer Polytechnic Institute test reactor.

Q. Are you a registered professional engineer?

A. Yes. I am a registered professional engineer (Control Systems), in the State of California.

Q. Would you please describe your employment background?

A. From 1973 to 1976, I was employed by Combustion Engineering Inc., ("CE") in their Startup Engineering group. During that time, I was technical advisor on initial startup of two units and technical advisor during refueling and startup of two additional units. On the last of those units, I was manager

of the CE st rtup team. I joined SCE in 1976 as a Startup Engineer. In 1979, I became Supervisor of Startup for Unit 2.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to discuss staffing of the startup effort at Unit No. 2 and the startup tests that are proposed for that unit.

Q. What personnel are involved in the fuel loading and low power testing?

A. The testing after the fuel loading and low power license issuance will be supported by personnel from four primary organizations; licensed operators perform the hands-on activities, they are supported by a group of about twenty SCE startup personnel, approximately ten CE startup personnel, and technical experts from SCE and other vendors of major components as required. In addition, SCE Shift Technical Advisors routinely provide technical support to the operators on a 24 hour per day basis.

Q. Would you please describe the tests that will be accomplished during fuel loading and low power testing of SONGS Unit No. 2?

A. The activities subsequent to issuance of a fuel load and low power license can be divided into four general categories:

(1) <u>Fuel Loading</u>

During this activity each of two hundred and seventeen fuel assemblies is transferred from the Fuel

Handling Building to the Containment Building, where it is inserted into a specified location in the reactor vessel. After all fuel assemblies have been loaded into the reactor, each assembly is video taped to confirm its location. This location is then verified to be correct by plant personnel.

Next, several reactor structural members are placed above the fuel and the reactor vessel head is installed and bolted in place. The total duration of the fuel loading activity from movement of the first fuel assembly to completion of the reactor vessel installation is expected to be four weeks.

(2) <u>Post Core-Loading Hot Functional Testing</u>

Following fuel loading an integrated plant test program, called Post-Core Loading Hot Functional Testing, is performed. The primary purpose of this testing is to perform a verification of those parameters which can only be definitively measured with the fuel in place. During Hot Functional Testing, the reactor is taken from ambient conditions to normal operating temperature and pressure (approximately 545°/2,250 psia) utilizing heat generated by pumps, heaters and other equipment, but not by nuclear heat and then returned again to ambient. Typical tests which would be performed at this time include: Reactor Coolent System (RCS) Flow Measurements, Flow Coastdown Measurements,

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Pressurizer Control Systems Tests, Control Rod Exercise Tests, Control Rod Drop Time Tests, RCS Heat Loss Measurements, and RCS Inventory Measurements.

Testing is performed continuously during this period which is expected to take seven weeks.

(3) Initial Criticality and Low Power Physics Testing

Upon completion of Hot Functional Testing, the reactor is returned to approximately 320°F and 600 psia at which time the reactor is initially brought critical. Shortly thereafter, power is raised to less than 0.01 percent of full power. At this time reactor physics tests are performed for three to four weeks. This activity is termed Low Power Physics Testing, and testing is performed at both reduced temperature (320°F) and at normal operating conditions (545°F/2250 psia). Typical tests which would be performed at this time include: Differential Boron Worth Measurements, Control Rod Worth Measurements, Control Rod Symmetry Tests, Moderator Temperature Coefficient Measurements, Pseudo Dropped Rod Worth Measurements, Pseudo Ejected Rod Worth Measurements, and RCS Chemistry and Radio-Chemistry Tests.

(4) Power Escalations to 5% of Full Power

Following completion of Low Power Physics Testing, reactor power is gradually raised to 3 1/2 percent of full power. At this point, natural circulation demonstrations are performed. To familiarize operating personnel with the

characteristics and control of natural circulation, each operating crew will participate in one of these tests prior to further power increase. This is expected to take about one week.

Further testing at 4 1/2 percent of full power may be performed. Such testing would be on the non-nuclear steam plant and would include placing the main feedwater systems in service and rolling the turbine to full speed for testing. This is expected to take about one week.

Q. Have the tests that will be performed pursuant to the requested fuel load and low power testing license been defined?

A. Yes. Such tests are outlined in Exhibit RMR-1, "Low Power Testing Program."

Witness: Richard M. Rosenblum

Exhibit No. , (RMR-1)

Date:

LOW POWER TESTING PROGRAM

I. Fuel Loading (approximately 28 days)

A. Initially all reactor internals are not installed.

B. Install core barrel.

C. Using refueling machine and dummy fuel element verify coordinates of all fuel locations.

D. Establish refueling conditions.

1. Boron concentration.
2. Water Level and Cooling.
3. Containment Integrity.
4. Tech. Spec. compliance.
5. Install Temporary Neutron Detectors.

E. Load Fuel.

1. Move fuel element from storage location to transfer machine.
2. Transfer to containment.
3. Move from transfer machine to core.
4. Lower into core.
5. Verify acceptable sub-criticality analysis.
6. Unlatch and move to pickup new fuel element.
7. Fuel loading rate 2-3 fuel assemblies/hour.

F. Verify Fuel Load.

1. Traverse center lines of fuel to verify proper positioning.
2. Verify serial number, orientation, and location of each Fuel Assembly and CEA. Videotape for record.

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G. Reassembly of Reactor Internals.

1. Install Upper Guide Structure.

2. Install/couple CEA extension shafts.

3. Install Incore Detectors.

4. Install Reactor Vessel Head.

5. Bolt down Reactor Vessel Head.

6. Install cable support structure and connect cables.

H. Ready for start of Post-Core-Hot-Functional Testing.

II. <u>Post Core-Hot Functional Testing</u>

Reactor Shutdown (approximately 45 days).

A. Fill and vent Reactor Coolant System.

120°F and 150 psia; record baseline thermal expansion data.

B. Pressurize and heatup to 350 psia and 200°F. Perform:

1. Component Cooling Water Heat Rejection Test.

2. Secure Shutdown Cooling and start Reactor Coolant Pumps.

3. Record thermal expansion data.

C. Heatup to 260°F, 350 psia. Perform:

1. CEDM exercise and rod drops.

2. Record thermal expansion data.

3. Instrumentation comparisons.

4. Incore instrumentation data.

D. Heatup and pressurize to 350°F, 600 psia, (470°/1550 psia, 530°F/1990) psia. Perform:

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1. Record thermal expansion data.
2. Instrumentation comparisons.
3. Incore instrumentation data.

E. Heatup and pressurize to full operating temperature and pressure (545°F/2250 psia). Perform:

1. RCS Leakage Measurement.
2. RCS Heat Loss Measurement.
3. RCS Flow Measurement.
4. RCS Flow Coastdown Measurement.
5. CEDM Exercises and Drop Time Measurements.
6. Pressure Control Tests.
7. Steam Plant Testing.
8. Thermal Expansion Measurements.
9. Instrumentation comparisons.

F. Cooldown and depressurize to initial criticality conditions (320°F, 600 psia).

III. <u>Initial Criticality and Low Power Physics Testing</u>

A. Initial criticality (7 days).

1. Achieved at 320°F, 600 psia.
2. Performed in steps.
   a. With the reactor at refueling boron concentration, slowly remove control rods while monitoring core sub-criticality, until CEA's are fully withdrawn.
   b. Slowly reduce the boron concentration until criticality is achieved.

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c. Raise power to 0.01% to 0.1% of full power and stabilize the plant.

B. Low Power Physics Testing (14 days).

Power level at all times less than one tenth of one percent of full power. Usually in the range of one hundredth of one percent of full power.

C. Testing during low power physics consists primarily of three types of measurements.

1. Shutdown Worth Measurements.
    a. CEA Group Worth.
    b. Individual CEA Worth Measurements.
    c. CEA Symmetry Measurements.
    d. Boron Worth Measurements.
2. Temperature and Pressure Coefficient Measurements.
3. Chemistry and Radio-chemistry Monitoring (performed continually).

D. Test Sequence.

1. Low Temperature 320°F (3 days).
    a. Temperature coefficient Measurement.
    b. Group 6,5,4, Worth Measurement, Individual and Sequential.
2. Temperature and Pressure increase to 545°/2250 psia (2 days).
    a. Temperature Coefficient Measurement.
    b. Pressure Coefficient Measurement.

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3. Operating conditions (545°/2250 psia) (9 days).

a. Individual CEA symmetry check.

b. Pseudo Dropped Individual PLCEA Worth Measurement.

c. Pseudo Dropped Group PLCEA Worth Measurement.

d. Pseudo Worst Dropped Full Length CEA Worth Measurement.

e. Group 6,5,4,3 Worth Measurement.

f. Temperature Coefficient Measurement.

g. Pseudo Ejected CEA (ZPDIL) Worth Measurement.

h. Group 2,1 Worth Measurement.

i. Temperature Coefficient Measurement.

j. PLCEA Group Worth Measurement.

k. CEA Group B Worth Measurement.

l. CEA Group A Worth Measurement.

m. Pseudo Stuck CEA Worth Measurement.

n. Sequential Withdrawal Worth Measurement.

o. Individual CEA 2-1 Worth Measurement.

p. CEA Group P Worth Measurement.

q. Pseudo Ejected CEA Worth (FPDIL) Measurement.

IV. Power Escalation to 5% of Full Power

A. After completion of all low power physics tests, management permission to proceed to a higher power level is granted.

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B. Natural circulation testing at 3 1/2% power (7 days) required primarily for operator training. Three demonstrations are performed.

1. Natural Circulaton Verification.
   a. Trip all 4-RCP's.
   b. Verify natural circulation.
   c. Stabilize and hold for specified time.
   d. Reduce power and terminate test.
2. Natural circulation with reduced pressure.
   a. Secure pressurizer heaters.
   b. Trip all 4-RCP's.
   c. Verify natural circulation.
   d. Monitor depressurization rate and take appropriate action.
   e. Decrease power and terminate test.
3. Natural circulation with reduced heat removal capacity.
   a. Trip all 4-RCP's.
   b. Verify natural circulation.
   c. Isolate one steam generator.
   d. Stabilize conditions.
   e. Restore isolated steam generator.
   f. Verify natural circulation stabilized.
   g. Reduce power and terminate test.

C. If not licensed to a higher power level, perform steam plant testing (7 days).

1. Increase power to 4-1/2%.

2. Place main feedwater system in service.

3. Roll turbine to 1800 RPM.

   a. Overspeed trip test.

   b. Synchronization check.

   c. Checkout generator at full speed.

   d. Lightly load turbine/generator for test purposes (1% electrical load).