UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SOUTHERN CALIFORNIA EDISON COMPANY AND

SAN DIEGO GAS AND ELECTRIC COMPANY

DOCKET NO. 50-206

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT NO. 1

AMENDMENT TO PROVISIONAL OPERATING LICENSE

Amendment No. 77
License No. DPR-13

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Southern California Edison Company and San Diego Gas and Electric Company (the licensees) dated December 5, 1983, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public; and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and Paragraph 3.B of Provisional Operating License No. DPR-13 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 77, are hereby incorporated in the license. Southern California Edison Company shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective 90 days from the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

J. E. Lyons

for Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: July 6, 1984

ATTACHMENT TO LICENSE AMENDMENT NO. 77

PROVISIONAL OPERATING LICENSE NO. DPR-13

DOCKET NO. 50-206

Revise Appendix A Technical Specifications and Bases by removing the following pages and by inserting the enclosed pages. The revised pages contain the captioned amendment number and marginal lines indicating the area of change.

Remove Pages	Insert Pages
1a	1a
10	10
--	10a
--	10b
--	10c
--	10d
11	11
38	38
38a	38a
38b	38b
--	38c
--	38d
--	43c
--	43d

Residual Heat Removal (RHR) Train

A train of components that includes: one RHR pump aligned with one RHR heat exchanger; one component cooling water pump aligned with the same RHR heat exchanger and with one component cooling water heat exchanger; and one salt water pump aligned with the same component cooling water heat exchanger.

Operational Mode - Mode

An Operational Mode (i.e., Mode) shall correspond to any one inclusive combination of core reactivity condition, power level, and average reactor coolant temperature specified in Table 1.2.

TABLE 1.2

OPERATIONAL MODES

MODE	REACTIVITY CONDITION, K_{eff}	% RATED THERMAL POWER*	AVERAGE COOLANT TEMPERATURE
1. POWER OPERATION	≥ 0.99	$>$ 5%	$\geq 350°F$
2. STARTUP	≥ 0.99	$\leq$ 5%	$\geq 350°F$
3. HOT STANDBY	< 0.99	0	$\geq 350°F$
4. HOT SHUTDOWN	≤ 0.95	0	$350°F > T_{avg} > 200°F$
5. COLD SHUTDOWN	≤ 0.95	0	$\leq 200°F$
6. REFUELING**	≤ 0.95	0	$\leq 140°F$

* Excluding decay heat.

** Reactor vessel head unbolted or removed and fuel in the vessel.

3.1.2 OPERATIONAL COMPONENTS

Applicability: Applies to the operating status of the reactor coolant system equipment and related equipment. For the applicable surveillance requirements, see Table 4.1.2.

Objective: To identify those conditions of the reactor coolant system necessary to ensure safe reactor operation.

Specification:

A. At least one pressurizer safety valve shall be operable or open when the reactor head is on the vessel, except for hydrostatic tests.

B. The reactor shall not be made critical or maintained critical unless both pressurizer safety valves are operable.

C. During Modes 1 and 2, all three reactor coolant loops and their associated steam generators and reactor coolant pumps shall be in operation. With less than the above required coolant loops in operation, be in at least Hot Standby within 1 hour, except as modified by Specification D below.

D. The limitations of Specification C may be suspended during Modes 1 and 2 as follows:

1. Operation may be conducted with 0, 1, 2, or 3 reactor coolant pumps operating during low power physics testing at less than 5% of full power.

2. Whenever reactor power is less than 10% of full power, operation with one or two reactor coolant pumps operating shall be limited to less than 24 consecutive hours.

E. During Mode 3, the following specifications shall apply:

1. At least two of the reactor coolant loops listed below shall be operable:

a. Reactor coolant loop A and its associated steam generator and reactor coolant pump.

b. Reactor coolant loop B and its associated steam generator and reactor coolant pump.

c. Reactor coolant loop C and its associated steam generator and reactor coolant pump.

2. At least one of the above reactor coolant loops shall be in operation.*

3. With less than the above required reactor coolant loops operable, restore the required loops to operable status within 72 hours or be in Hot Shutdown within the next 12 hours.

4. With no reactor coolant loop in operation, suspend all operations involving a reduction in boron concentration of the reactor coolant system and immediately initiate corrective action to return the required reactor coolant loop to operation.

F. During Mode 4, the following specifications shall apply:

1. At least two of the reactor coolant loops/residual heat removal (RHR) trains listed below shall be Operable:

   a. Reactor coolant loop A and its associated steam generator and reactor coolant pump.

   b. Reactor coolant loop B and its associated steam generator and reactor coolant pump.

   c. Reactor coolant loop C and its associated steam generator and reactor coolant pump.

   d. Residual heat removal (RHR) pump G-14A and one associated RHR train.

   e. Residual heat removal (RHR) pump G-14B and one associated RHR train.

2. At least one of the above loops/trains shall be in operation.**

* All reactor coolant pumps may be de-energized for up to one hour provided (a) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (b) core outlet temperature is maintained at least 40°F below saturation temperature.

** All reactor coolant pumps and residual heat removal pumps may be de-energized for up to one hour provided (a) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (b) core outlet temperature is maintained at least 40°F below saturation temperature.

3. With less than the above required loops/trains operable immediately initiate corrective action to return the required loops/trains to operable status as soon as possible; if the remaining operable loop/train is an RHR train, be in Cold Shutdown within 24 hours.

4. With no loop or train in operation, suspend all operations involving a reduction in boron concentration of the reactor coolant system and immediately initiate corrective action to return one required loop or train to operation.

G. During Mode 5 with reactor coolant loops filled, the following specifications shall apply:

1. At least one residual heat removal (RHR) train shall be operable and in operation*, and either

   a. One additional RHR train shall be operable,** or

   b. The secondary side water level of at least two steam generators shall be greater than or equal to 256 inches of narrow range on cold calibrated scale.

2. With less than the above required loops/trains operable, or with less than the required steam generator level, immediately initiate corrective action to return the required loops/trains to operable status or to restore the required level as soon as possible.

3. With no RHR train in operation, suspend all operations involving a reduction in boron concentration of the reactor coolant system and immediately initiate corrective action to return the required RHR train to operation.

H. During Mode 5 with reactor coolant loops not filled, the following specifications shall apply:

* The RHR pump may be de-energized for up to one hour provided (a) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (b) core outlet temperature is maintained at least 40°F below saturation temperature.

** One RHR train may be inoperable for up to 2 hours for surveillance testing, provided the other RHR train is operable and in operation.

1. Two residual heat removal (RHR) trains shall be operable* and at least one RHR train shall be in operation**

2. With less than the above required RHR trains operable, immediately initiate corrective action to return the required RHR trains to Operable status as soon as possible.

3. With no RHR train in operation, suspend all operations involving a reduction in boron concentration of the reactor coolant system and immediately initiate corrective action to return the required RHR train to operation.

Basis: One pressurizer safety valve is sufficient to prevent over-pressurizing when the reactor is subcritical, since its relieving capacity is greater than that required by the sum of the available heat sources, i.e., residual heat, pump energy and pressurizer heaters.

Prior to reducing boron concentration by dilution with make up water either a reactor coolant pump or a residual heat removal pump is specified to be in operation in order to provide effective mixing. During boron injection, the operation of a pump, although desirable, is not essential. The boron is injected into an inlet leg of the reactor coolant loop. Thermal circulation which exists whenever there is residual heat in the core and the reactor coolant system is filled and vented, will cause the boron to flow to the core.

Lack of further mixing cannot result in areas of reduced boron concentration within the core. Prior to criticality the two pressurizer safety relief valves are specified in service in order to conform to the system relief capabilities.(1)

* One RHR train may be inoperable for up to 2 hours for surveillance testing provided the other RHR train is operable and in operation.

** The RHR pump may be de-energized for up to one hour provided (a) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (b) core outlet temperature is maintained at least 40°F below saturation temperature.

The plant is designed to have all three reactor coolant loops operational during normal power operation (Modes 1 and 2). Under these conditions, the DNB ratio will not drop below 1.30 after a loss of flow with a reactor trip.(2)(3) With one reactor coolant loop not in operation, this specification requires that the plant be in at least Hot Standby within one hour. However, exception is taken whenever reactor power is less than 10% of full power. Heat transfer analyses show that reactor heat equivalent to 8% of full power can be removed with natural circulation only; hence, for up to 24 hours the specified upper limit of 10% of full power with 1 or 2 reactor coolant pumps operating provides a substantial safety factor.

In modes other than Modes 1 and 2, functional redundancy in the core heat removal methods (not necessarily system redundancy) is specified to satisfy single failure considerations. Functional redundancy, as applied to the San Onofre Unit 1 power plant, includes use of diverse heat removal methods. Furthermore, single failure considerations apply only to active components.

In Mode 3, a single reactor coolant loop provides sufficient capability for removing decay heat; however, single failure considerations require that two loops be OPERABLE.

In Mode 4 and Mode 5 (reactor coolant loops filled), a single reactor coolant loop or RHR train provides sufficient capability for removing decay heat; but single failure considerations require that at least two methods (either RCS loop or RHR train) be OPERABLE.

In Mode 5 (reactor coolant loops not filled), a single RHR train provides sufficient heat removal capability for removing decay heat; but single failure considerations, and the unavailability of any of the steam generators as a heat removing component, require that at least two RHR trains be OPERABLE.

The operation of one reactor coolant pump or one residual heat removal pump provides adequate flow to ensure mixing, prevent stratification and produce gradual reactivity changes during boron concentration reductions in the Reactor Coolant System. The reactivity change rate associated with boron reduction will, therefore, be within the capability of operator recognition and control (4).

References: (1) Final Engineering Report and Safety Analysis, Sections 9 and 10

(2) Final Engineering Report and Safety Analysis, Paragraph 10.2

(3) Supplement No. 1 to Final Engineering Report and Safety Analysis, Section 3, Question 9

(4) NRC letter dated June 11, 1980 from D. G. Eisenhut to all operating pressurized water reactors.

3.8 Fuel Loading and Refueling

Applicability: Applies to fuel handling and refueling operations. For the applicable surveillance requirements, see Table 4.1.2.

Objective: To prevent incidents during fuel handling operations that could affect public health and safety.

Specification: A. During refueling operations (Mode 6):

1. Radiation levels in the containment and spent fuel building shall be monitored.

2. Core subcritical neutron flux shall be continuously monitored during the entire refueling period by not less than two neutron monitors, each with continuous visual indication and one with continuous audible indication.

3. For water levels in the refueling pool, greater than elevation 40 feet, 3 inches (See 7. below for reference elevation), the following specifications shall apply:

a. At least one of the following methods of decay heat removal shall be in operation and circulating reactor coolant at a flow rate of ≥ 400 gpm:

(1) One RHR train.

(2) One refueling water pump taking suction from the refueling pool through the recirculation heat exchanger (with supporting heat removal systems operating), and discharging via the safety injection system piping to one reactor coolant loop cold leg.

b. With less than one method of decay heat removal in operation, except as provided in c. below, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the reactor coolant system. Immediately initiate corrective action to return the required decay heat removal method to operating status as soon as possible. In addition, within four hours, close all containment penetrations that provide direct access from the containment atmosphere to the outside atmosphere.

c. The decay heat removal capability may be removed from operation for up to one hour per eight hour period.

4. Whenever the water level in the refueling pool is less than elevation 40 feet 3 inches [see (7) below for reference elevation], the following specifications shall apply:

   a. Two of the following methods of decay heat removal shall be operable, and at least one shall be in operation circulating reactor coolant:

      (1) Residual heat removal (RHR) pump G-14A with one RHR train.

      (2) Residual heat removal (RHR) pump G-14B with a second RHR train.

      (3) One refueling water pump taking suction from the refueling pool through the recirculation heat exchanger (with supporting heat removal systems operating), and discharging via the safety injection system piping to one reactor coolant loop cold leg.

   b. With less than the required methods of decay heat removal operable, immediately initiate corrective action to return the required methods of decay heat removal to operable status as soon as possible or to establish water level in the refueling pool of at least 40 feet 3 inches [see (7) below for reference elevation].

   c. With none of the required methods of decay heat removal in operation, suspend all operations involving a reduction in boron concentration of the reactor coolant system. Immediately initiate corrective action to return the required decay heat removal method to operation. In addition, within four hours, close all containment penetrations that provide direct access from the containment atmosphere to the outside atmosphere.

5. During reactor vessel head removal and while loading and unloading fuel from the reactor, the more restrictive of the following reactivity conditions shall be met:

   a. A shutdown margin greater than 5% $\Delta k/k$,

   b. A boron concentration greater than or equal to 2,000 ppm.

6. The reactor shall be subcritical for at least 148 hours prior to movement of irradiated fuel in the reactor pressure vessel.

7. Borated water to insure the shutdown margin as specified in Item A.(5) above shall be maintained to an elevation not less than 40 feet 3 inches in the refueling pool during movement of fuel assemblies and RCC's. Reference elevation is sea level, mean lower low water.

8. If any of the specified limiting conditions for refueling is not met, refueling of the reactor shall cease, work shall be initiated to correct the violated conditions so that the specified limits are met, and no operations which may increase the reactivity of the core shall be carried out.

B. With fuel assemblies in the spent fuel storage pool:

1. Loads in excess of 1,500 pounds shall be prohibited from travel over fuel assemblies in the storage pool.

2. Borated water to insure the shutdown margin as specified in Item A(5) above shall be maintained to an elevation not less than 40 feet 3 inches in the spent fuel storage pool. Reference elevation is sea level, mean lower low water.

3. With the requirement of B(2) above not satisfied suspend all movement of fuel assemblies and crane operations with loads in the fuel storage areas and restore the water level to within its limits within four hours.

<u>Basis</u>:

During refueling the reactor refueling cavity is filled with approximately 240,000 gallons of borated water whose concentration is sufficient to maintain the reactor subcritical by greater than 5% $\Delta k/k$ or to a boron concentration greater than or equal to 2,000 ppm, whichever is more restrictive. Operation of one method of decay heat removal is provided to assure continuous mixing flow of refueling water through the reactor vessel during the refueling period.(1) Borated water injection capability is provided as per Specification 3.2 Part A in the unlikely event there is any need during the refueling period.

The requirement that at least one method of decay heat removal be in operation ensures that (i) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during refueling, and (ii) sufficient cooling circulation is maintained through the reactor core to minimize the effect of a boron dilution incident and prevent boron stratification.

The requirement to have two methods of decay heat removal operable when the refueling pool water level is less than elevation 40 feet 3 inches ensures that a single failure of an operating component will not result in a complete loss of decay heat removal capability. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling; thus, in the event of a failure of an operating component, adequate time is available to initiate alternate means to cool the core.(2)

In addition to the above safeguards, interlocks are utilized during refueling to ensure safe handling.(3) These include:

(1) An interlock on the lifting hoist to prevent lifting of more than one fuel assembly at any one time.

(2) The spent fuel transfer mechanism can accommodate only one fuel assembly at a time.

The restriction on movement of loads in excess of 1,500 pounds (i.e., the nominal weight of a fuel assembly, RCC, and associated handling tool) over fuel assemblies in the storage pool ensures that in the event this load is dropped (i) the activity release will be limited to that contained in a single fuel assembly, and (ii) any possible distortion of fuel in the storage racks will not result in a critical array. This assumption is consistent with activity release assumed in the accident analysis.

Requiring a minimum water elevation of 40 feet 3 inches in the refueling pool, and similarly in the spent fuel storage pool, ensures that (i) at least 23 feet of water would be available to remove 99% of the iodine gap activity assumed to be released in the event of a dropped and damaged fuel assembly, and (ii) there will be at least twelve feet of water above the top of the fuel rods of a withdrawn fuel assembly so as to limit dose rates at the top of the water in accordance with Section 4.2.6 of the facility FSA. Reference elevation is sea level, mean lower low water.

Finally, detailed written procedures are provided, and are carried out under close supervision by licensed personnel.

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel assures that sufficient time has elapsed to allow the radioactive decay of short-lived fission products.

References:

(1) Supplement No. 1 to Final Engineering Report and Safety Analysis, Section 5, Questions 8 and 9

(2) NRC letter dated June 11, 1980 from D. G. Eisenhut to all operating pressurized water reactors.

(3) Final Safety Analysis, Paragraph 2.9

		Check	Frequency
15.	Reactor Coolant Loops/Residual Heat Removal Loops	a. Per Technical Specifications 3.1.2.C and 3.1.2.D, in Mode 1 and Mode 2 verify that all required reactor coolant loops are in operation and circulating reactor coolant.	a. Once per 12 hours
		b. Per Technical Specification 3.1.2.E, in Mode 3 verify	
		1. At least two required reactor coolant pumps are operable with correct breaker alignments and indicated power availability.	1. Once per 7 days
		2. The steam generators associated with the two required reactor coolant pumps are operable with secondary side water level $\geq$ 256 inches of narrow range on cold calibrated scale.	2. Once per 12 hours
		3. At least one reactor coolant loop is in operation and circulating reactor coolant.	3. Once per 12 hours
		c. Per Technical Specification 3.1.2.F, in Mode 4 verify	
		1. At least two required (RC or RHR) pumps are operable with correct breaker alignments and indicated power availability.	1. Once per 7 days
		2. The required steam generators are operable with secondary side water level $\geq$ 256 inches of narrow range on cold calibrated scale.	2. Once per 12 hours
		3. At least one reactor coolant loop/RHR train is in operation and circulating reactor coolant.	3. Once per 12 hours
		d. Per Technical Specifications 3.1.2.G and 3.1.2.H, in Mode 5 verify, as applicable:	

Check	Frequency
1. At least one RHR train is in operation and circulating reactor coolant.	1. Once per 12 hours
2. When required, one additional RHR train is operable with correct pump breaker alignments and indicated power availability.	2. Once per 7 days
3. When required, the secondary side water level of at least two steam generators is $\geq$ 256 inches of narrow range on cold calibrated scale.	3. Once per 12 hours
e. Per Technical Specification 3.8.A.3, in Mode 6, with water level in refueling pool greater than elevation 40 feet 3 inches, verify that at least one method of decay heat removal is in operation and circulating reactor coolant at a flow rate of at least 400 gpm.	e. Once per 12 hours
f. Per Technical Specification 3.8.A.4, in Mode 6, with water level in refueling pool less than elevation 40 feet 3 inches, verify	
1. At least one decay heat removal method is in operation and circulating reactor coolant.	1. Once per 12 hours
2. One additional decay heat removal method is operable with correct pump breaker alignments and indicated power availability.	2. Once per 7 days