U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-206/86-24

Docket No. 50-206

License No. DPR-13

Licensee: Southern California Edison Company
P. O. Box 800
2244 Walnut Grove Avenue
Rosemead, California 91770

Facility Name: San Onofre Nuclear Generating Station Unit 1

Inspection at: San Clemente, California

Inspection conducted: May 19-23, 1986

Inspectors: C. Ramsey for — 6/6/86
P. Qualls, Reactor Inspector — Date Signed

C. Ramsey — 6/6/86
C. Ramsey, Reactor Inspector — Date Signed

Approved by: D.F. Kirsch for — 6/6/86
T. Young Jr., Chief — Date Signed
Engineering Section

Inspection During the Period May 19-23, 1986 (Report No. 50-206/86-24)

Areas Inspected: An announced team inspection of the Unit 1 10 CFR 50 Appendix R Fire Protection Program. The inspection involved IE Manual Chapter TI 2515/62 Revision 2.

Results: In the areas inspected, no violations of NRC requirements were identified.

DETAILS

1. Persons Contacted

Southern California Edison Company

*M. D. Wharton, Deputy Station Manager
*R. W. Krieger, Operations Manager
*D. E. Nunn, Manager of NGS
*D. H. Peacor, Station Emergency Preparedness Manager
*C. A. Couser, Compliance Engineer
*R. T. Benson, Station Technical Staff
*A. J. Schrman, Coordination Supervisor
*J. Kittler, Engineer
*J. W. McGraw, Licensing Engineer
*M. E. Freedman, Compliance Engineer
*D. Ziebell, Coordination Supervisor
*G. Engman, Electrical Engineer
*G. T. Gipson, Compliance
*D. Barreres, Supervising Engineer
*R. Ornelas, Licensing Engineer
*W. M. Lazear, Q.A. Supervisor
*D. Allston, Licensing Engineer
*D. A. Dack, Quality Assurance Engineer
*R. K. Rickter, E.P. Engineer
*K. Milas, Mechanical Engineer
*J. Reedish, Superintendent Unit I
*D. Pastuna, Electrical Engineer
*T. L. Roell, Project Engineer
*M. S. Shutt, Electrical Controls
*J. Mackey, Mechanical Engineer
*R. Tye, EP Engineer
*D. A. Duck, Quality Assurance
D. L. Johnson, Station Engineering
M. P. Short, Project Manager
G. T. Gipson, Compliance
R. T. Benson, Station Tech Staff
A. J. Schramm, Operations
W. McGhee, Operations
M. J. Kirby, Training
M. S. Zenker, Compliance
A. S. Mattong, Station Engineering
J. Huey, Construction Superintendent
J. Rainsberry, Nuclear Licensing

Impell Corporation

*K. Scown, Manager Fire Protection
*B. Waggener, Supervising Engineer
*P. Hypner, Supervising Engineer
*T. Donat, Supervising Engineer

*R. Cupp, Technical Manager
*J. A. Lee, Supervising Engineer

*Denotes those attending the exit meeting of 5/23/86.

2. Assessment of Compliance With Section III G of Appendix R to 10CFR50 - Systems and Performance Goals

On a sample basis, the inspectors evaluated certain measures that the licensee took to achieve compliance with Appendix R to 10 CFR 50. The focus of the inspectors review and evaluation was primarily aimed at those measures established by the licensee to mitigate the consequences of disabling plant fires and achieve safe shutdown of the reactor. The results of the inspector's assessment are as follows:

A. Fire Hazard Analysis Methodology

To enable predictions of fire hazard potential and resulting fire damage to systems and components that are required for safe shutdown of the plant, in most instances, the licensee followed the NRC guidance contained in NRC Generic Letter No. 86-10 to arrive at assumptions and conclusions about the affects of an exposure fire involving in-situ or transient combustible materials within a particular plant configuration. Certain aspects of fire related damage thresholds originating from localized high humidity conditions; high temperatures below auto-ignition temperatures; highly corrosive spieces and the affects of these combustion products on sensitive safety related equipment such as relays, contacts, hand switches, controllers and logic equipment were not specifically addressed in the licensee's fire hazard analysis methodology. However, where the licensee did postulate adverse affects as result of fire damage to systems or components in areas adjacent to plant configurations that were being considered; or, where the potential existed to damage redundant safe shutdown trains that were located within the same configuration (area or compartment); alternative or dedicated shutdown capability was provided. Alternative shutdown capability was provided for five areas and dedicated shutdown capability was provided for five additional areas.

In the remaining fourteen areas of the plant, the licensee elected to achieve compliance with section III G.1 of Appendix R by performing analyses ("compliance evaluations") to demonstrate that features are provided which are capable of limiting fire damage so that one complete train of required system and components will remain free of fire damage in order to achieve and maintain safe shutdown conditions. These evaluations largely entail assessment of non-rated fire barriers separating redundant safe shutdown trains (this is further discussed in paragraph 3 of the report).

The design basis fire utilized by the licensee considered the complete combustion of all combustible materials (in-site and transient) in the area under consideration. The severity of a given postulated fire was expressed based on combustible loading, fire

duration and peak temperatures reached during the combustion process. In general, radiant, conductive and convective heat transfer assumptions as a function of the fire environment were included in the licensee's predictions about fire occurrences and fire spread to other areas. As a result, new fire barriers, fire detection and suppression systems were installed in some areas.

No violations or deviations were identified.

B. Systems Required to Achieve Safe Shutdown

Upon detection of a fire in identified plant areas that contain required safe shutdown systems and components, the licensee demonstrated the capability to achieve a controlled safe shutdown condition as required by Appendix R and in accordance with plant operating technical specifications. It appears that the required performance goals for the shutdown functions can be met by utilizing systems and components that will be (based on licensee assumptions) free of fire damage. For most of the areas of concern, the plant can be safely shutdown from the control room using the normal charging pumps for reactor coolant make-up and normal auxiliary feedwater pumps for steam generator makeup. Normal instrumentation will be available to monitor process variables and normal support systems will be available to provide supporting functions.

(1) Alternative Shutdown Capability (Section III.G.3 and III.L. Compliance

For the five areas that alternative shutdown capability is provided for, alternatives to the normal systems are provided as follows:

(a) Area 1-AB-(-3)-2A. The safety injection system which includes the safety injection pumps and secondary side feed pumps in series, will be used to provide reactor coolant make-up in lieu of the normal charging system in the event of a fire in this area. This method of achieving reactor coolant make-up involves a blowdown into the suppression pool via the pressurizer power operated relief valves (PORV's) to allow for reactor coolant make-up at a lower system pressure.

(b) Area 1-YD(-14)-4D. A disabling fire in this area could preclude RHR and component cooling water system operation. Therefore, in this event the solid steam generator option will be used as the alternative in order to achieve cold shutdown.

(c) Area 1-YD-(-7)-4E. A fire in this area could disable the salt water cooling pumps (circulating water pump pit area). For this event, an alternative salt water cooling pump is provided.

(d) Area 1-TB-35-9B (Turbine Deck) and Area 1-PB-56-33 (Power Block Roof). A single fire in these areas could disable required instrumentation to monitor process variables (i.e. hot leg temperature). For this event, instrumentation provided at dedicated shutdown panel no. (C-38) will be utilized.

(2) Dedicated Shutdown Capability (Section III.G.3)

For the 5 areas that dedicated shutdown capability is provided for, the control room will be evacuated and shutdown will be accomplished from the dedicated shutdown panel. A fire in containment (area 1-CO-(-10)-1; containment penetration (areas 1-CO-(-10)-4A and 1-CO-(-10)-4B; control room (Zone 16); 4160V switchgear room (zone 8) or turbine building ground floor (area 1-TB-8-9A) would require use of the dedicated shutdown system.

The dedicated shutdown system includes a 2000 KW diesel generator and supporting equipment which provide an independent onsite power source for the dedicated shutdown system. When using the dedicated shutdown system, reactor coolant makeup is accomplished through the use of the normal charging pumps, but power is supplied from the dedicated diesel generator through dedicated circuitry which is completely independent of the normal circuitry. Steam generator makeup is supplied by a dedicated auxiliary feedwater pump (No. G10W) located at the dedicated shutdown facility. All rquired instrumentation is installed at the dedicated shutdown panel except for steam generator pressure and instrumentation for monitoring reactivity.

Steam generator pressure is acquired from local readings of a gauge on the steam generator header. Monitoring of reactivity (required boron concentration) is provided by a PASS system (sampling).

No violations or deviations were identified.

C. Functional Testing of the Dedicated Shutdown System

The inspectors did not review the results of the licensee's pre-operational test package for the dedicated shutdown system because functional testing of the system was incomplete at the time of the inspection. Functional testing of the system to determine that each component will satisfactorily perform its intended function is required prior to start-up from the current Unit 1 outage. Test procedure nos. SO1-PE-3009.03-1; 3009.05-1; 30009.05-2; 3009.05-3; 3009.05-4; 3009.05-6-1; 3009.06-2; 3009.09-1; 3009.10-1; 3050.01-1; 3068.00-2; 3068.00-4; 3068.02-1; 3341.01-1; 3341.08-1; 3341.09-1 and 3341.15-1 have been written to perform this testing.

This is considered an Open Item (50-206/86-24-01) pending verification of satisfactory test results by Region V.

D. Incomplete Modifications

Several minor modifications (i.e., installation of gauges, switches, ladders, etc.) that are intended to enhance Appendix R compliance were not complete at the time of the inspection. These modifications are being implemented by Design Change Package (DCP) Nos. 3009.05; 3009.06; 3009.09; 3009.10; 3009.11; 3341.0; 3341.1; 3341.04; 3341.09; 3341.15; 3341.18; 3341.19 and 3050.01 which are scheduled to be completed prior to start-up from the current outage.

This is considered an Open Item (50-206/86-24-02) pending verification by Region V.

E. Supplemental Procedures

At the time of the inspection, the licensee did not have station approved procedures implementing the postfire shutdown capability. Only draft procedures were available for the inspector's review. Based on the inspector's review of draft Annunciator Operating Instruction No. SO1-13-8; Abnormal Operating Instruction Nos. SO1-2.7-1 and SO1-2.7-2; and, General Operating Instruction No. SO1-3-9, it was determined that the licensee's method of implementing the procedures is difficult for persons outside the licensee's organization to fully comprehend. However, when the licensee's implementing method was clearly understood by the inspectors, it was determined by the inspectors that the licensee's approach was feasible.

Procedures for alternative shutdown and "recipe" procedures which provide directions that augment existing normal shutdown procedure nos. SO1-3-4 and SO1-3-5 by specifying actions to mitigate component and circuit malfunctions resulting from a fire in any one fire area/zone were not written (except for 2 examples). According to the licensee, the alternative shutdown procedure will be separate from existing shutdown procedures and its final draft is scheduled for completion by May 30, 1986. There will be 21 "recipe" procedures which are scheduled for final draft completion by June 6, 1986.

Draft Abnormal Operating Instruction No. SO1-2.7-2 was complete and contained instructions for achieving dedicated shutdown using the dedicated shutdown system. This procedure was reviewed in draft form by the inspectors in order to ascertain that dedicated shutdown outside the control room could be achieved in a safe and orderly manner. Based on this review, the inspectors determined that the procedure adequately directed operators to perform the required actions. Furthermore, this procedure was walked through by the inspectors and the licensee's staff. The walkthrough indicatd that there was no serious level of difficulty involved in the required operator actions. No repairs were specified to achieve hot shutdown and warning or caution steps necessary were clearly stated. Based on the walkthrough, it appears that due to fire effects in the control room or in 4 other area of the plant, stable hot shutdown could be achieve within required time contraints by utilizing the

dedicated shutdown system. For achieving cold shutdown, the required repair materials were on site and designated for this purpose. Portions of the cold shutdown repair procedures were satisfactorily demonstrated during the walkthrough.

According to the licensee, all of the postfire safe shutdown procedures will be written and station approved by June 9, 1986, prior to startup from the current outage.

This is considered an Open Item (50-206/86-24-03) pending Region V's review and acceptance of the station approved procedures.

F. Operator Training

All operators had not been trained in the required actions to take in order to mitigate the adverse consequences of disabling fires in the plant. This training was ongoing at the time of the inspection. According to the licensee, this training is scheduled to be completed after all post-fire safe shutdown procedures have been station approved, prior to startup from the current outage.

This is considered an Open Item (50-206/86-24-04) pending verification by Region V.

3. Assessment of Compliance with Section III G. of Appendix R to 10CFR50 - Separation of Redundant Trains

In 14 areas of the plant where alternative or dedicated shutdown capability was not provided, the licensee perform analyses ("compliance evaluations") in order to demonstrate that equivalent features existed to protect system and components important to safe shutdown so that one train of systems necessary to achieve and maintain hot shutdown would remain free of fire damage (section III G.1 compliance). These analyses were not submitted to the NRC for prior review and approval. Instead, the licensee retained them onsite for the inspectors to review. This is consistent with the new NRC guidance for Appendix R compliance that is contained in Generic Letter 86-10. The results of the inspectors review is as follows.

A. Section III.G.1. Compliance

The inspection team toured and visually assessed each of the areas identified in the licensee's analyses. No exceptions were taken technical assumptions made by the licensee. However the inspectors disagreed with the administrative content of the analyses for areas identified as 1-AB-14-35; 1-AB-11-34; 1-FH-14-7; 1-PB-14-8; 1-PB-20-11A; 1-PB-20-12; 1-PB-20-13 and 1-PB-14-26.

In response to the inspector's concerns, the licensee agreed to revise the analyses for these areas to include enhancement information about the actual plant configuration. These revised analyses are to be submitted to Region V for review and acceptance prior to Unit 1 startup from the current outage.

This is considered an Open Item (50-206/86-24-05) pending Region V review and acceptance.

B. Required Exemption from Sections III.G.2 and III.G.3

The analyses for areas identified as 1-AB-20-2N; 1-YD-14-4F; 1-YD-20-4C; 1-TB-14-9E and 1-TB-20-9D were also determined to be unacceptable by the inspection team. These analyses attempted to provide justification for equivalent features that would satisfy the requirements of Section III.G.I of Appendix R. The inspection team determined that the physical configuration of these plant areas combined with the analyses given, did meet the requirements of section III.G.1 of Appendix R. Because only spatial separation exist between these redundant trains which are located within the same fire areas, the level of assurance provided to maintain one redundant train free of fire damage is not equivalent to that required by section III.G.1 of Appendix R. Therefore, sections III.G.2 and III.G.3 of Appendix R are applicable to these areas. The licensee had requested an exemption from section III.G.2 of Appendix R for area no. 1-PB-14-25 prior to the insepction.

In response to the inspector's concern, the licensee agreed to submit exemption requests for areas of concern to NRR for review and approval prior to Unit 1 restart from the current outage.

This is considered an Open Item (50-206/86-24-06) pending verification by Region V.

4. Associated Circuits

The provision for electrical isolation of safe shutdown control systems was found to be adequate. From the list of equipment and component provided by the licensee, the inspectors selected a random sample of electrical cables, schematics, raceways and other technical information in order to evaluate and verify that each circuit selected would not be damaged by fire and adversely impact safe shutdown in view of hot shorts, opens and grounds. The following concerns were evaluated:

A. Common Bus Concern

The common bus associated circuit concern is found in circuits, either safety related or non-safety related, where there is a common power source with safe shutdown equipment and the power source is not electrically protected from the circuit of concern.

No violations or deviations were identified.

B. Spurious Signal Concern

The spurious signal associated circuit concern is made up of the following:

(1) False waterflow, control and instrumentation readings such as those that occurred in the 1975 Brown's Ferry Nuclear Plant

Fire. These circuit faults could be induced by fire initiated grounds, hot shorts or open circuits.

(2) Spurious operation of safety related or non-safety related components that adversely affect the shutdown capability (i.e. RHR/RCS isolation valves).

(a) Current Transformer Secondaries

The licensee demonstrated that transfer/disconnect switches were installed in circuits for the secondaries of current transformers. These switches provide the capability of shorting the undesired circuitry before completing the desired connections for ammeters which are located in the control room and at the dedicated shutdown panel. However, circuit breaker modifications in progress will require a breaker coordination and high impedance fault analysis for breaker nos. 12C03 (4KV); 1118 (480V MCC1 feeder); 1129 (480V MCC1B feeder); 1218 (480V MCC2 feeder); 1229 (480V MCC2B feeder) and 1314 (480V MCC3 feeder).

This is considered an Open Item (50-206/86-24-07) pending verification by Region V.

(b) High-Low Pressure Interfaces

The licensee identified 7 high-low pressure interfaces and by analysis indicated that adequate precautions have been taken to mitigate the adverse consequences sudden interfaces of systems under different pressures.

No violations or deviations were identified.

(c) Isolation of Other Fire Initiated Spurious Signals

The licensee determined that some components could spuriously actuate as a result of fire induced damage. Resolution to these cases included manual operation of equipment, rerouting cables and re-establishment of control at the dedicated shutdown panel through independent circuits.

No violations or deviations were identified.

C. Common Enclosure Concern

The associated circuits common enclosure concern is found when redundant circuits are routed together in a raceway or enclosure and they are not electrically isolated or, a fire can damage both circuits due to inadequate fire protection features.

According to the licensee, the following mitigates the existance of common enclosure concerns:

(1) All circuits, both safety related and non-safety related are electrically protected. This circuit protection is provided by fuses or circuit breakers which are size to prevent excessive conductor temperatures in the event of a fault or short circuit. If a fault or short circuit occurs in the non safety circuit the fuses or circuit breakers will open to de-energize the affected circuit.

(2) In cases where both safe shutdown trains are routed in a common enclosure, alternate or dedicated shutdown capability has been provided.

During a random cable selection the inspectors questioned the labeling of raceway no. 39L4 in switchgear room #1 (fire area/zone 13A) and raceway no. 39L4 in the yard (fire area/zone 1-YD-20-4B). This discrepancy was inconsistent with raceway drawings of the licensee's safe shutdown cable routings; therefore, potentially compromising the licensee's entire associated circuit analyses (in particular, alternative shutdown capability).

In response to this concern, the licensee agreed to conduct a 20 percent random sample of all raceways in order to verify the significance of this discrepancy. On June 2, 1986, the licensee contacted the Region V office by telephone to inform the NRC of the results of the 20 percent sampling. According to the licensee, approximately 462 race were sampled. Eight (or approximately 2 percent) of these were of concern. Therefore, the licensee initiated a further review to determine the significance of the concerns before continuing the sampling.

On June 3, 1986, the licensee again contacted the Region V office by telephone to inform the NRC of the results of the review of the 8 additional identifed concerns. According to the licensee, only 2 raceways were actually mislabeled, resulting in a total of 3 mislabeled raceway from the approximately 464 raceways sampled during and subsequent to the inspection. The licensee took the position that this small percentage of mislabeled raceways was indicative of isolated cases and although corrective actions is warranted, no impact on the associated circuits analyses was perceived and no further sampling was necessary.

Based on the licensee statements and positions taken during the June 3, 1986 telephone conversation, the inspectors requested that the licensee provide documentation to Region V which validates the basis for the positions taken and assumptions made regarding the mislabeled raceways and their impact on the associated circuits analyses. The licensee agreed to provide this submittal for Region V review and acceptance prior to re-start of Unit 1 from the current outage.

This is considered an Unresolved Item (50-206/86-24-08) pending Region V review.

In addition, during the inspection, the inspectors informed the licensee that Engineering Procedure No. SO-123-V-5.10 and Quality Assurance Procedure No. E&C 24-10-15 should be revised to include Appendix R evaluations when performing future modifications that include installation of cables.

This is considered an Open Item (50-206/86-24-09) pending verification by Region V.

5. Emergency Lighting (Section III.J. Compliance)

The required 8-hour battery power supply emergency lighting units were installed in areas needed for operation of safe shutdown and in access and egress routes thereto. However, pre-operational testing of the units and determinations of acceptable illumination levels (aiming of beams, etc.) was incomplete. This is discussed in paragraph 2.c of the report.

6. Communications

Suitable communications are provided to support the safe shutdown function. Although the plant p.a. system and sound powered phones may be available, the licensee elected to use portable radios for safe shutdown. Repeaters are provided for the portable radio system to mitigate the effects of "dead" spots. However, to enhance this capability, the licensee is in the process of upgrading the portable radio system to a 800 mhz system.

No violations or deviations were identified.

7. Reactor Coolant Pump Oil Collection System (Section III.O Compliance)

The inspectors reviewed the design and installation of the reactor coolant pump lube oil collection system. The system has adequate capacity to contain all oil in the RCP lube oil systems. The system appeared to meet the requirements of Appendix R.

No violations or deviations were identified.

8. Exit Meeting

An exit meeting was held with members of licensee staff on May 23, 1986. The items mentioned in this report were discussed at that time. Telephone conversations with members of licensee staff, concerning open issues, were also conducted on June 2 and June 3, 1986. The licensee acknowledged the content and scope of the inspection findings.