U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-361/87-29

Docket No. 50-361

License No. NPF-10

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

Facility Name: San Onofre Nuclear Generating Station Unit 2

Inspection at: San Clemente, California

Inspection Conducted: October 26 - November 13, 1987

Inspector: _____ 12/3/87
C. Clark, Reactor Inspector Date Signed

Approved by: _____ 12/3/87
S. Richards, Chief Date Signed
Engineering Section

Inspection During the Period October 26-November 13, 1987 (Report No. 50-361/87-29)

Areas Inspected: A routine announced inspection of Unit 2 activities relating to a containment Integrated Leak Rate Test (ILRT) and followup on an IE Information Notice. The inspection included review of procedures and records, interviews with personnel, witnessing portions of the ILRT, inspection of the Containment Building, associated penetrations and piping systems. During this inspection, inspection procedures 70307, 70313 and 92701 were covered.

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

DETAILS

1. Persons Contacted

   a. Licensee

      C. Couser, Lead Compliance Engineer
      D. Irvine, Station Technical Supervisor
      *P. Blakeslee, ILRT Test Director

   b. Contractor Personnel (Bechtel Power Corporation)

      *B. Patel, ILRT Engineer

   *Denotes those personnel in attendance at an exit meeting on October 31, 1987.

   The inspector also held discussions with other licensee and contractor personnel involved with the ILRT.

2. Containment Integrated Leak Rate Test (ILRT)

   a. Procedure Review

      The inspector reviewed the Unit 2 ILRT procedures as described in the licensee's engineering procedure SO2-V-3.12, Revision 1, TCN 1-1 of October 9, 1987 (and the Temporary Change Notices issued during this inspection) entitled, "Containment Integrated Leakage Rate Test." This review was to ascertain compliance with plant Technical Specifications, regulatory requirements, and applicable industrial standards as stated in the following documents:

      - San Onofre Nuclear Generating Station, Units No. 2 and 3, Final Safety Analysis Report (FSAR) updated, Sections 6.2.6.1, "Containment Integrated Leak Rate Test," and 14.2.12.20, "Containment Leak Rate Test."

      - San Onofre Nuclear Generating Station, Unit No. 2, Technical Specifications, Sections 3/4.6.1.1, "Containment Integrity," and 3/4.6.1.2, "Containment Leakage."

      - Appendix J to 10 CFR 50, "Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors."

      - American National Standard, "Leakage-Rate Testing of Containment Structures for Nuclear Reactors," ANSI N45.4-1972.

      - Topical Report BN-TOP-1, Revision 1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants," Bechtel Corporation.

      - American National Standard, "Containment System Leakage Testing Requirements," ANSI/ANS-56.8-1981.

- IE Information Notice No. 85-71, "Containment Integrated Leak Rate Tests."

- USNRC letter (R. Dudley to K. Baskin) to SCE, dated July 2, 1987, which provided authorization to utilize BN-TOP-1, Revision 1, 1972 for a Type A Test.

During this procedure review, the inspector identified the following discrepancies:

(1) Prerequisite paragraph 3.4.5 required performance of a containment temperature survey, to include a 12-foot radius from each RTD (as practical), with the containment ventilation system/fans operating. A note in paragraph 6.2.1.4 identified that the general plan was to secure the ventilation system after reaching ILRT pressure, and this, in fact, is what happened. It was identified to the licensee during discussions with the inspector, that to obtain accurate measurements of containment temperatures and thermal variations for improvement of the accuracy of the overall weighted containment temperature used during the ILRT, a temperature survey of each containment subvolume area should be performed. The licensee was attempting to perform a short duration Type A Test per Bechtel topical BN-TOP-1, Revision 1, 1972. It was identified to the licensee that BN-TOP-1 stated in paragraph 4.2 (Drybulb Temperature), "The location of the sensors are selected, based on a temperature survey, to provide a representative sampling of containment atmosphere temperature..." and that paragraph 4.3.6 (Dewpoint Temperature [Vapor Pressure]) stated, "Dewpoint temperature sensors are located following a temperature survey - etc..." To obtain an accurate temperature survey of containment temperatures, a survey of each subvolume area used for the ILRT should be performed with the same heat loads and containment ventilation configuration it will see during the actual ILRT. The licensee did not perform a temperature survey of the containment subvolumes to verify sensor location, rather the licensee only performed a temperature survey/comparison adjacent to the sensor locations recommended by Bechtel. The licensee performed an end-to-end (sensor-to-display) check of each installed sensor by placing a portable NBS traceable standard near each installed sensor and compared the standard against the display readout. This information was documented.

The inspector considered that the temperature survey should indicate where the temperature readings were taken for each subvolume, the conditions under which they were taken (e.g., fans operating or secured and heat loads in the area), and establish an acceptance criteria for the final location of the sensor in each subvolume (e.g., placed where the temperature is within 2°F of the subvolume average). This information is essential for ensuring that the sensor location is representative of its assigned subvolume and furthermore, for ensuring that post pressurization temperature/pressure

stabilization has occurred in containment to the extent necessary to permit an accurate leakage rate measurement.

The licensee agreed that additional effort in obtaining temperature survey information could improve the accuracy of this data, however, they questioned whether the amount of improvement would justify the additional expense required to obtain it. The temperature variations recorded within the subvolumes during this ILRT were very small. As to performing a temperature survey with the same containment ventilation that would exist during the ILRT, with the existing Unit 2 contamination levels in certain areas of the containment, the licensee considered that any securing of the normal containment ventilation and other work activities in the containment prior to or after the ILRT as unacceptable. The licensee stated they would contact Bechtel to obtain additional clarification on BN-TOP-1 temperature survey requirements.

Since the licensee did not perform a short duration BN-TOP-1 test, temperature variations recorded during the ILRT were small, and the inspector concluded that there was no violation of NRC requirements. However, it was identified to the licensee that any reduction in the accuracy of containment temperature measurements could prevent the performance of an acceptable short duration ILRT test and require a minimum of a 24-hour test.

(2) Attachment 2, paragraphs 1.1 and 1.2, contained new volume fractions for each sensor used to measure temperature and humidity during the ILRT. These new volume fractions were obtained from a contractor report entitled, "Southern California Edison Company San Onofre Nuclear Generating Station Integrated Leakage Rate Test Sensor Location and Volume Fraction," dated March 1987. A review of this report identified that sheet 6 of Appendix C, "Units 2 and 3 Volume Calculations," contained an incorrect calculation of the difference, and percentage of the difference, between the new calculated volumes and the FSAR identified volume. The contractor used an incorrect FSAR volume of 2,300,000 cubic feet instead of the correct minimum value of 2,305,000 cubic feet identified in Table 6.2-3 of the FSAR. A contractor representative on site for this ILRT was asked by the licensee to verify that the use of the incorrect containment volume did not affect the accuracy of the volume fractions identified in the licensee ILRT procedure. After reviewing the subject calculations, the contractor stated this 5,000 cubic foot error did not affect the assigned volume fractions as used in the licensee procedure.

(3) Attachment 5 contained the three valves identified below and required their position to be verified:

Valve	System	Attachment 5 Page
S21901 MR 430	Quench tank make-up	21
S21301 MR 662	Main steam	43
S21301 MR 661	Main steam	44

During the ILRT valve lineups, the licensee operating staff spent several hours looking for these valves, but the licensee staff could not find the subject valves. The licensee operating staff relied only on the P&I diagrams (P&IDs) to show the correct plant configuration. Temporary Change Notices (TCN) No. 1-3 and 1-4 were issued to delete these valves from the ILRT procedures, based on the licensee's conclusion that they were nonexistent valves.

An inspector review of why the licensee could not find these three valves identified the following concerns:

(a) All the valves were identified on the applicable system P&IDs which are the normal documents relied on by the licensee to show the actual plant configuration. Discussions with the licensee revealed that in 1983 vent and drain valves were added to system P&IDs, but that neither the architect engineer nor the licensee have performed as-built walkdowns of the P&IDs to verify actual installation of vent and drain valves in the plant. The licensee stated these valves are not normally used during plant operations, and since they had not originally planned on having them on the P&IDs, they did not receive an as-built walkdown. The licensee stated they have found several vent and drain valves each year that are not correctly shown on the P&IDs, and P&ID revision requests have then been submitted. This lack of verification of actual plant configuration on the P&IDs appears to indicate inadequate management attention in this area and has apparently generated additional work delays, personnel radiation exposure, and expense for the licensee.

(b) Valves S21301 MR 661 and S21301 MR 662 were deleted from the last Unit 2 ILRT Procedure (SO23-V-3.13) in February 1985, by TCN No. 1-8, based on the reason that they were nonexistent valves. The 1985 ILRT procedure was used to write the 1987 ILRT test procedure, and the licensee review system did not identify that these two valves were deleted from the 1985 ILRT procedure. Also, while the licensee identified in February of 1985 that these two valves had never been installed in the plant, their design control system had not updated the applicable P&ID to show the actual plant configuration. Because of the two errors noted above, several hours were spent in a radiation area looking for valves that did not exist. TCN No. 1-3 was issued to remove these valves from the 1987 ILRT procedure.

(c) Valve S21901 MR 430 was deleted from the 1987 ILRT procedure per TCN No. 1-4, as a nonexistent valve, after the licensee spent several hours looking for it and could not find the valve. This valve did exist, and the licensee had found and verified the valve position in the 1985 ILRT procedure. This appears to be another example of where the licensee did not follow good ALARA practices. If the licensee knew there was a problem with the vent and drain valve configurations shown on the P&IDs, they could have instructed their personnel to have obtain additional design documents (such as piping isometrics) prior to entering a radiation area to look for this valve. Once the licensee had spent several hours looking for this valve, and could not find it, they could have then realized they needed to obtain additional design documents to find this valve. Since the licensee had already lost several hours looking for this valve, and the lack of a valve position verification signature in the ILRT procedure was delaying the ILRT, the licensee stated the valve was nonexistent and deleted it from the ILRT procedure. It was only after the inspector identified to the licensee that they had verified the valve position in 1985 and requested that they verify the valve was not in plant, that they obtained additional design documents and found the valve a week after performing the ILRT. The inspector was notified on November 13, 1987, that the valve had been located. In that the valve was found in the correct position for the ILRT, the inspector concluded that this error did not constitute a violation of NRC requirements.

b. Review of Records

The inspector reviewed calibration records for the instrumentation used in the ILRT. That is, the twenty-four resistance temperature detectors (RTDs), six dew point temperature sensors (dew cells), two pressure gauges used to measure containment air mass, and the flow element used to measure the induced leak during the verification portion of the ILRT. All instruments had been calibrated within the last six months with NBS traceability certificates available. The inspector also discussed the in situ check of the instrumentation with the licensee. It was noted that there was trouble with the in situ check of RTD TE-19 and dew cell ME-6 (which failed later during the ILRT).

The inspector reviewed the records to assure that the following required activities were performed prior to initial pressurization:

(1) Completion of all available identified local leakage rate testing and identification of leak rates prior to and after any repairs.

(2) Removal or venting of items listed on the equipment protection and venting schedule.

(3) Inspection of interior and exterior containment surfaces and components for evidence of deterioration or damage.

(4) Containment sump water levels below high level mark.

(5) ILRT measurement system properly installed and functionally checked.

(6) Pressurization system tested, including proper operation of the air compressors, after-coolers, moisture separators, air dryers, valves and blowdown muffler/silencer.

(7) Containment ventilation system adjustments completed.

(8) Valve lineups completed. See Section 2.a(3) of this report for comments in this area.

(9) Pressurization system in service. Ten (minimum 1000 cfm capacity) air compressors were set up for this ILRT.

(10) Containment temperature survey to verify temperature sensor locations. A licensee survey was performed prior to the ILRT with some containment ventilation fans running. See Section 2.a.(1) of this report for comments in this area.

No violations or deviations were identified.

c. Observation of Work and Work Activities

Prior to the ILRT, the regional inspector performed area surveys for pressurized components (such as tanks, fire extinguishers, etc.), valve lineups and instrument location assignments within the Containment Building. The purpose of the instrument survey was to locate and evaluate the placement of the temperature sensors and dewpoint sensors. This inspection revealed that the sensors were located within the tolerances of the installation procedures. The operation of the pressurization equipment (air compressors, after-coolers and air dryers) used for pressurization of the Containment Building was inspected to assure that procedures for prevention of potential problems were enforced. This included evidence of checking the pressurizing air for indications of oil contamination, establishment of communications between the ILRT control center and the pressurization station, adequate supply of cooling water to the after-coolers, and that control of the after-cooler air temperature was being maintained during pressurization.

The inspector witnessed selected portions of the following ILRT activities listed below, along with the time expended to perform each:

(1) Initial pressurization to 57.7 to 58.7 psig. Approximately 13.5 hours.

(2) ILRT stabilization. Approximately 24 hours.

(3) ILRT data acquisition.

(4) Performance of ILRT. Approximately 24 hours.

(5) Leak rate verification test stabilization. Approximately 4 hours.

(6) Leakage rate verification test. Approximately 5 hours, with an imposed leak rate of 7.86 SCFM.

(7) Containment Building depressurization.

Applicable electrical and mechanical penetrations were inspected. Applicable portions of the valve lineups were inspected to see that they were completed in accordance with procedure and that no unidentified artificial barriers were erected. Section 2.a.(3) of this report covers problems identified in the valve lineup area. During pressurization for this ILRT, leaks were discovered at the personnel escape lock, containment purge exhaust penetration No. 19 and the secondary side of steam generator E089. The licensee applied pressure to the personnel escape lock and the containment purge exhaust penetration to raise the internal pressure in these areas to just less than the ILRT test pressure and then disconnected the pressure sources. The licensee took the position that by disconnecting the pressurization sources to these areas they had not created artificial barriers, just speeded up the process of equalizing the pressure between these areas and the containment pressure to prevent any additional test delays. Acceptable local leak rate tests (LLRTs) had been performed on both areas prior to starting pressurization for this ILRT. Since containment to secondary side steam generator leakage started to reduce as the secondary side internal pressure raised, the licensee decided not to pressurized the secondary side of the steam generator. The licensee considered this steam generator secondary side leakage too small to cause failure of the ILRT.

The overall performance of the ILRT crew members was observed by the inspector. Attributes evaluated were: availability of test procedures, test prerequisites being met, proper plant systems in service, special test equipment calibrated and in service, and crew action timely and correct. Crew members had received ILRT training prior to the test, this appeared evident by satisfactory performance of their duties.

During this ILRT, absolute pressure gauge P2-2 failed at the start of pressurization, dew cell number ME-6 was lost just after reaching ILRT pressure and dew cell No. ME-4 failed approximately 30 hours after reaching ILRT pressure. The volume fractions for dew cells ME-4 and ME-6 were reassigned to other dew cells. The ILRT procedure required a minimum of sixteen RTDS (twenty four installed), four dew cells (six installed), and one pressure sensor (two installed), so the loss of the above identified sensors did not

reduce the available sensors below the required minimum number. The licensee installed additional RTDs for this test, in that the average number of RTDs installed for an ILRT is eighteen RTDs. There has been a trend lately to improve ILRT data acquisition by installing additional RTDs and dew cells. Based on the number of dew cells lost during this ILRT and the length of the ILRT, it may be beneficial for the licensee to also install additional dew cells for future ILRTs. The licensee is now considering installing additional dew cells for future ILRTs. For a period of 3 hours during the ILRT verification stabilization period, RTDs TE-2 and TE-3 temperatures dropped down and then came back up, and the data was left in, but this extended the ILRT verification stabilization period.

The licensee's preliminary results for the twenty-four hour type A test, which did not include type B or C additions, was a total time calculated leakage rate of 0.040 wt. % per day with a 95% upper confidence limit (UCL) of 0.045 wt. % per day. The licensee's maximum allowable leak rate for this test was 0.075 wt. % per day. For information only, a mass-point analysis provided a calculated leak rate of 0.042 wt. % per day with a 95% UCL of 0.043 wt. % per day. A five hour verification test was performed with an imposed leak rate of approximately 7.86 standard cubic feet per minute (SCFM) or 0.1%/day of containment air mass. The licensee verification test produced a total time calculated leak rate of 0.129 wt. % per day, with a 95% UCL of 0.184 wt. % per day. The total time analysis of the verification test leakage rate provided an acceptance criteria of 0.115 to 0.165 wt. % per day. For information only, the mass point analysis of the verification test provided a calculated leak rate of 0.120 wt. % per day with a 95% UCL of 0.129 wt. % per day, and an acceptance criteria of 0.116 to 0.166 wt. % per day. These preliminary results appear to be within the latest allowed acceptance criteria.

No violations or deviations were identified.

3. (Closed) IE Information Notice No. 85-71: Containment Integrated Leak Rate Tests

This Notice provided additional NRC information on containment ILRTs. The inspector reviewed the following documents:

- Engineering Procedure SO2-V-3.12, "Containment Integrated Leakage Rate Test."
- Engineering Procedure SO23-V-3.13, "Containment Penetration Leak Rate Testing.

Based on the review of the above documents and discussions held with the licensee personnel, it appears that the licensee has taken actions to address this new information.

This item is closed.

4. Exit Meeting

The inspector held an informal meeting with the licensee representative denoted in paragraph 1, on October 31, 1987. The scope of the inspection and the inspector's findings up to the time of the meeting, as noted in this report, were discussed. At this meeting, the inspector also identified that additional information had been requested from compliance personnel, on the three valves deleted from the ILRT procedure as nonexistent.

It was identified that this material would be reviewed in the Region V offices and the inspector's findings documented in this report. A previous informal exit meeting was held on October 30, 1987, with a licensee representative from compliance to identify similar information as that discussed above.