U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos.: 50-361/92-15 and 50-362/92-15

Docket Nos.: 50-361 and 50-362

License Nos.: NPF-10 and NPF-15

Licensee: Southern California Edison Company
Irvine Operations Center
23 Parker Street
Irvine, California 92718

Facility Name: San Onofre Units 2 and 3

Inspection at: San Onofre, San Clemente, California

Inspection date: April 6 through May 19, 1992

Inspectors: C. Clark, Reactor Inspector, Team Leader, Region V
H. Freeman, Reactor Inspector, Region V
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Approved by: A. T. Gody, Jr., Acting Chief — 7/14/92
Engineering Section — Date Signed

Inspection Summary:

Inspection during the period April 6 - May 19, 1992 (Report Nos. 50-361/92-15 50-362/92-15)

Areas Inspected: This inspection reviewed the licensee's program for Inservice Testing (IST) of check valves in safety-related systems. Except for general scope and schedule, the inspectors did not review the licensee's IST check valve program for Unit 1.

Temporary Instruction 2515/110 was used as guidance for the inspection.

Safety Issues Management System (SIMS) Item:

SIMS Issue Number GL 89-04 [Multiple Plant Action (MPA) Item Number A025] (OPEN)

Results:

General Conclusions and Specific Findings:

- In general, the inspection found that the licensee was developing a comprehensive program for assuring check valve reliability.
- Program development appeared to be in its early stages even though industry guidance had been available since 1986 and the licensee had direct check valve failure experience since 1985.
- A lack of check valve reverse flow surveillance testing was identified.
- Weaknesses were noted in the areas of maintenance and training of personnel.

Significant Safety Matters: None.

Summary of Violation or Deviations: One non-cited violation was identified in paragraph 5.5.

Open Items Summary: Two new follow-up items were identified in Section 5.7.

Details

1. Persons Contacted

Southern California Edison Company

*D. Axline, Engineer, Onsite Nuclear Licensing (ONL)
*P. Blakeslee, Supervising Engineer, Station Technical (ST)
*C. Brandt, Lead Engineer, Quality Assurance (QA)
*D. Brevig, Supervisor (ONL)
*F. Briggs, Supervising Engineer (ST)
*L. Cash, Manager, Maintenance
*D. Chiang, Engineer (ST)
*P. Croy, IST Engineer (ST)
M. Farr, Engineer Aide (ONL)
*M. Herschthal, Assistant Manager (ST)
*J. Hirsch, Supervisory (ST)
*J. Jamerson, Lead Engineer (ONL)
*B. Joyce, Maintenance Manager, Units 2 and 3
*I. Katter, Supervising Engineer, Nuclear Engineering Design Organization (NEDO)
*B. Katz, Manager, Nuclear Oversight
*R. Krieger, Station Manager
J. Mangum, Maintenance Training Supervisor, Nuclear Training Division
*H. Merten, Manager, Maintenance Engineering
*H. Morgan, Vice President and Site Manager
*D. Niebruegge, Supervising Engineer (ST)
*R. Plappert, Supervisor, Compliance Engineering
*J. Rainsberry, Manager, Plant Engineering
*J. Reilly, Manager, Nuclear Engineering and Construction
*M. Rodin, Supervisor, Reliability Engineering
*S. Scholl, Supervising Engineer (ST)
*H. Schutter, Senior Engineer
M. Short, Manager (ST)
*K. Slagle, Deputy Station Manager
*R. Stoker, Engineer, Independent Safety Engineering (ISEG) Group A
J. Vanoerbroek, Supervisor, Compliance Engineering
*R. Waldo, Manager, Operation
*M. Wharton, Manager, NEDO

Others

*C. Caldwell, Senior NRC Resident Inspector
*C. Townsend, NRC Resident Inspector

The inspectors also held discussions with other licensee and contractor personnel during the course of the inspection.

*Denotes those attending the exit meeting on May 1, 1992.

2. Background

NRC regulations and the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) required that check valves be periodically tested in a manner that provided assurance of their performance. Numerous events involving safety-related check valves, including the water hammer event at San Onofre Nuclear Generating Station (SONGS) in 1985, demonstrated to the NRC staff that additional inspection effort should be dedicated toward the review of licensee check valve programs against NRC and ASME Code requirements.

On August 29, 1988, the NRC issued Information Notice (IN) 88-70, "Check Valve Inservice Testing Program Deficiencies." This IN described the result of inspections of check valve activities at several nuclear power plants. These inspections found that some check valves within Inservice Testing (IST) programs were not being tested in a manner that verified their ability to perform their safety-related functions.

On April 3, 1989, the NRC issued Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." This GL provided clarification of ASME Code requirements in an effort to assist licensees in correcting deficiencies that the NRC had found in IST programs. The minutes of a public meeting dated October 25, 1989, held by the NRC, provided detailed information on the implementation of the GL.

As part of an action plan to inspect licensee's check valve IST activities, the NRC developed Temporary Instruction (TI) 2515/110, "Performance of Safety-Related Check Valves," to assess the effectiveness of licensee check valve programs.

3. Inspection Plan

The inspectors used TI 2515/110 to develop an inspection plan for the check valve program at SONGS Units 2 & 3. The purpose of the inspection was to verify that the licensee had a program in place to verify operational readiness of check valves in safety-related systems.

The inspectors characterized the objectives of the inspection during the entrance meeting. The licensee provided a brief overview of their check valve-related activities and provided copies of an in-house Senior Management Check Valve Program assessment memorandum. The presentation and memorandum assisted the inspectors in identifying the programmatic and organizational aspects of the check valve IST program.

During the inspection, the inspectors: 1) conducted an in-depth review of a sample of check valves to verify the implementation of an acceptable testing program, 2) reviewed corrective and preventative maintenance activities, 3) determined the extent of the licensee's design application reviews, 4) performed system walkdowns, 5) reviewed the adequacy of the trending of check valve failures and subsequent corrective actions, and 6) assessed the degree of licensee management involvement in the development and implementation of the check valve program.

4. General Comments

GL 89-04 listed SONGS 2 and 3 in Table 1. Plants listed on Table 1 of the GL had NRC Safety Evaluation Reports (SERs) pending on their IST programs at the time GL 89-04 was issued. GL 89-04 specifically indicated that there was no need for these plants to review their IST programs for conformance to GL 89-04 unless a change to the licensee's IST program was necessary. GL 89-04 contained positions used in the preparation of the SERs and provided guidance to licensees for correcting generic procedure and program deficiencies. The NRC issued the SONGS 2 and 3 IST program SER on September 24, 1990. The NRC's SER documented the review of the SONGS IST program scope and proposed alternatives to ASME Code requirements.

5. Check Valve Program Review

5.1 Scope

The SONGS check valve program was described in Station Technical Order SO123-CV-1, "Check Valve Program." This document specified that check valves important to plant safety, plant reliability, and personnel safety would be included in either the IST program or the Supplemental Check Valve program.

The licensee's documentation identified that the check valve program was established based upon industry guidance and NRC GL 89-04.

The inspectors identified the following background information relating to the present check valve program for SONGS 2 and 3:

- On November 15, 1985, the SONGS 1 water hammer event occurred.
- On May 18, 1990, NRC Inspection Report (IR) No. 90-10 identified that the licensee had not established a specific check valve program to address the latest check valve concerns in the industry.
- On June 25, 1990, the licensee identified, in a letter to the NRC, that a dedicated program specific to check valves would be established by October 1, 1990.
- On September 21, 1990, the licensee issued Station Technical Order SO123-CV-1, Revision 0, "Check Valve Program," to establish the check valve program.
- On August 22, 1991, the licensee issued Temporary Change Notice (TCN) No. 0-2 to Station Technical Order SO123-CV-1, Revision 0, to increase the scope of the check valve program by adding a list of check valves not included in the IST program.

The inspectors reviewed licensee Station Technical Order SO123-CV-1, Revision 0, TCN No. 0-2 and other available documents and identified the following:

- There were 36 non-IST check valves identified in the licensee check valve program for Units 2 and 3.

- There was no guidance established which prioritized check valves for potential degradation, or for the impact of degradation on plant safety. There was also no grouping of similar valves.

- Check valve program status information was not generally available for management review.

After April 10, 1992, the licensee established a multi-divisional team to perform an assessment of their check valve program. Licensee actions taken as a result of this assessment are summarized below:

- On April 22, 1992, the licensee issued Revision 1 to Station Technical Order SO123-CV-1 to provide additional guidance and instructions for check valve activities. Revision 1 expanded the licensee's check valve program.

- On April 22, 1992, the licensee issued Engineering Procedures SO123-V-5.22, Revision 0, "Supplemental Check Valve Program," to implement the check valve program for non-IST valves.

- On April 26, 1992, the licensee issued the results of the check valve program assessment in an internal memorandum, "Check Valve Program Assessment San Onofre Nuclear Generating Station, Units 1, 2, and 3." (See Section 5.3)

- On April 27, 1992, the licensee issued TCN No. 0-1 to Engineering Procedure SO123-V-5.22, Revision 0 to add additional valves to the program.

The inspectors reviewed the later versions of the procedures and noted an improvement in the specification of criteria for determining check valve inclusion in the supplemental check valve program. However, the inspectors noted that these criteria were not supported with design application reviews to aid in making these determinations. (See Section 5.4)

Attachment 1 to SO123-V-5.22 contained a list of check valves included in the Supplemental Check Valve Program. The program contained 182 Unit 2 and common check valves and 132 Unit 3 check valves. Of these valves, 23 in Unit 2 and 24 in Unit 3 were also contained in the IST program. The inspector noted that 111 of the 132 Unit 2 Valves were Respiratory and Service Air check valves,

which were included in the program in consideration of their potential impact on personnel safety, and 44 of the Unit 2 check valves were associated with the Emergency Diesel Generators. Similar numbers were noted for Unit 3. Testing procedures or repetitive maintenance orders (RMOs) were identified for each valve in the attachment. The list of IST valves included in the Supplemental Check Valve Program addressed the large valves in the Emergency Core Cooling Systems (Containment Spray, HPSI, LPSI).

The inspectors concluded that the scope of the licensee's revised check valve program was improved from the original and was generally acceptable. Specific findings are discussed in the following sections.

5.2 Management Involvement

The inspectors reviewed the following background information, and evaluated the degree of management involvement in the present check valve program for SONGS 2 and 3:

- The SONGS 1 water hammer event on November 15, 1985.
- On April 30, 1987, SONGS Independent Safety Engineering Group (ISEG) documented its evaluation of the SONGS IST program as it related to the latest industry guidance in ISEG Evaluation Report 86-ISEG-187. This report concluded that the licensee's recently augmented IST programs were generally adequate to cover the industry recommendations for check valve test and inspection programs.
- On May 18, 1990, NRC Inspection Report (IR) No. 90-10 identified that the licensee management had not established a specific check valve program to address the latest check valve concerns in the industry.
- On June 25, 1990, licensee management identified, in a letter to the NRC, that a dedicated program specific to check valves would be established by October 1, 1990.
- On September 21, 1990, the licensee issued Station Technical Order SO123-CV-1, Revision 0, "Check Valve Program," to establish a check valve program.

The inspectors reviewed these documents and interviewed licensee personnel to assess the degree of management support and involvement in the licensee's check valve activities, programs and their implementation.

This review identified that between September 21, 1990 and April 10, 1992, there was no documented evidence of management assessment, involvement or overview of the licensee's check valve program activities.

The inspectors concluded that senior management involvement in check valve program implementation and assessment was not readily apparent.

5.3. Industry Experience and Licensee's Check Valve Program Assessment

The licensee's evaluation of Information Notice 88-70, "Check Valve Inservice Testing Program Deficiencies" was documented in ISEG evaluation 88-ISEG-148 dated December 6, 1988. This ISEG evaluation concluded that both the IST component scope and backflow testing issues were addressed in the ISEG evaluation 86-ISEG-187 (Section 5.2), and further concluded that no action was required.

The inspectors reviewed ISEG evaluations 86-ISEG-187 and 88-ISEG-148 and noted that these evaluations failed to recognize that no reverse-flow testing of certain check valves which had a safety function of preventing reverse flow was being performed. The inspectors also noted that these evaluations did not verify that all required valves were in the IST program.

The inspectors also reviewed the licensee's "Check Valve Program Assessment" dated April 26, 1992. The inspectors noted that the licensee's assessment of the check valve program again failed to identify that reverse flow testing of check valves was not taking place.

The inspectors concluded that the failure to identify this deficiency in 1988 was a self assessment capability weakness.

5.4 Design Application Review

Industry guidance, such as Electric Power Research Institute (EPRI) Report NB-5479, "Application Guidelines for Check Valves in Nuclear Power Plants," recommended that licensees perform a design application review of the check valve installations for valves in the check valve program. The design application review was intended to identify check valves subject to potentially severe service conditions.

In reviewing the licensee's Check Valve Program Assessment document, the inspectors noted that the licensee did not perform a check valve design application review for Units 2 and 3. Following the Unit 1 loss of power and waterhammer incident of November 21, 1985, design application reviews were initially performed by the licensee for check valves subject to adverse operating conditions in Unit 1. The licensee concluded after its experience with SONGS Unit 1, that findings from visual inspections were more useful than design

application reviews in determining suitability of check valves for system service. The licensee substantiated this position at that time by reviewing the results of disassembly and inspection of a number of swing and tilting disc check valves during outages on Units 2 and 3.

As discussed in Section 5.1, the Supplemental Check Valve Program described in SO123-V-5.22 established criteria to determine which check valves should be included in the program. The inspectors observed that some of these criteria could not be applied thoroughly without performing design application reviews.

The inspectors concluded that the licensee's approach to utilize check valve visual inspection information to assess which check valves should be included in the check valve program rather than performing a design application review was weak in one aspect. This aspect was that check valves which could be considered susceptible to adverse operating conditions would not be identified until after they had been degraded by the harsh service conditions. The inspectors concluded that the lack of design application reviews as recommended by industry guidance was a program weakness.

5.5 Check Valve Testing Program

The inspectors reviewed a sample of check valves in several SONGS plant systems to determine; 1) the adequacy of the licensee's system review to identify and include safety-related valves in the IST program, 2) if the selected valves were in the Units 2 and 3 IST program, 3) if valves in the IST program were tested in an appropriate manner for their safety-related functions, 4) if the selected test methodology demonstrated valve operability, 5) if test procedures correctly identified appropriate acceptance criteria, and 6) if the Code clarifications in GL 89-04 were properly addressed in a testing program.

The inspectors selected 48 check valves from the Diesel Generator Fuel Oil, Emergency Diesel Generator, High Pressure Safety Injection (HPSI), Low Pressure Safety Injection (LPSI), Saltwater Cooling, Component Cooling Water (CCW), Nuclear Service Water, Main Steam, Main Feedwater and Auxiliary Feedwater Systems. The inspectors selected Pressure Isolation Check Valves (PIVs), pump discharge check valves, and containment isolation check valves.

The inspectors selected the Emergency Diesel Generator and associated support systems to assess the degree to which safety-related skid mounted check valves were addressed in a testing program.

5.5.1 Plant Equipment Data Management System

The inspectors obtained descriptive information from the Plant Equipment Data Management System (PEDMS) files in the plant computer system for each valve. The inspectors reviewed this information against information contained in the IST Program document, SO23-V-3.5, "Inservice Testing of Valves Program," Revision 7 with TCN 7-20, and procedure SO123-V-5.20, "Valve Inservice Testing Program - Scope Analysis," Revision 0, TCN 0-1. The inspectors noted the following discrepancies between the documentation on the plant computer and the procedures:

- The computer files showed the Auxiliary Feedwater supply valves S21305MU124 and S21305MU448 to be 4 inch valves but procedure SO23-V-3.5 showed these valves to be 6 inch valves. The licensee changed these valves from 6 inch to 4 inch valves during installation of plant modifications in Units 2 and 3 but did not update the IST program documentation on the computer.

- The computer files showed the Nuclear Service Water supply check valves to CCW, S21203MU268 and S21203MU269, to be 3 inch valves but procedure SO23-V-3.5 showed these valves to be 1 inch valves.

- The scoping analysis numerical designation used to locate the justification referenced in the computer for valves S21301MU005, S21203MU101, S21203MU102 and S21203MU103 appeared to be incorrect.

The licensee acknowledged the inspectors' findings and committed to correct the identified documentation errors.

5.5.2 Valve Inservice Testing Programs - Scope Analysis

The inspectors noted that the scope analysis in procedure SO123-V-5.20 would be a valuable first step in providing justifications for the scope of the IST Program. The inspectors noted that SO123-V-5.20 could be strengthened by a more rigorous definition of check valve safety functions and more thorough consideration of guidance provided by GL 89-04.

5.5.3 Test Acceptance Criteria

The inspectors reviewed procedure SO23-V-3.5.4, "Inservice Testing of Check Valves (Quarterly Frequency)," Revision 0 with TCN 3-5. and found that several of the valve tests identified in the following attachments contained weaknesses:

- Attachment 2, Diesel Fuel Transfer System Check Valves, Steps 6.2, 6.4, 6.7 and 6.9, tested the transfer pump discharge check valves open by observing a visible increase in the day tank level. The test did not require a specific increase over a time interval in order to quantify check valve performance and trend possible degradation.

- Attachment 4, Low Pressure Safety Injection System Check Valves, Steps 6.1 and 6.2, tested the LPSI pump miniflow check valves by observing a temperature change of the miniflow line downstream of the check valve. The procedure did not quantify this temperature change, therefore full opening of the check valve was not confirmed.

- Attachment 5, Containment Spray (CS) System Check Valves, Steps 6.1 and 6.2, tested the CS pump miniflow check valves open using an unquantified temperature change, as above.

- Attachment 1, Component Cooling Water Check Valves; Attachment 3, High Pressure Safety Injection System Check Valves; Attachment 6, Charging System Check Valves; Attachment 8, Saltwater Cooling Check Valves; and Attachment 9, Main Steam System Check Valves all specified acceptance criteria of flows greater than Technical Specification requirements or other system specific requirements in order to verify full opening of valves. This practice did not comply with Position 1, Question 7 of the minutes of industry meetings on Generic Letter 89-04. This position stated that this type of acceptance criteria would not allow trending of system flows in order to determine check valve degradation.

The licensee committed to review and revise the appropriate procedures. The inspectors requested that the licensee provide a schedule for these actions.

5.5.4 Check Valve Reverse Flow Testing

The inspectors reviewed the testing requirements established for the Emergency Diesel Generator (EDG) check valves located in the EDG Starting Air System and in fuel, lube oil and cooling water systems connected directly to the diesel engine. Testing of the suitable function of these safety-related check valves was accomplished by the performance of the monthly operability surveillance of the EDG set. Functionality of the valves was documented as part of the surveillance test, which was acceptable to the NRC as a suitable means to address skid-mounted valve operability.

The inspectors identified that existing safety-related pump discharge check valve testing was of special interest to the team. The licensee then reported to the NRC that reverse flow testing of the Auxiliary Feedwater pump discharge check valves and other check valves in the Auxiliary Feedwater System had not been performed. A Limiting Condition for Operation (LCO) was entered for Unit 2 and a test procedure was developed and successfully performed for the check valves in question.

The inspectors reviewed other pump discharge and check valves in safety-related systems such as the HPSI, LPSI, Containment Spray, Boric Acid Makeup and Diesel Fuel Transfer Systems and found that most had not been backflow tested.

The licensee's check valve program assessment dated April 26, 1992, recommended that a systematic reverification of the IST program be performed to ensure it complied with Code requirements and licensee commitments. Additionally, the licensee's check valve program assessment noted that an inservice testing topical scope Design Basis Document (DBD) was being performed. The inspector concluded that these recommendations and actions would be sufficient to identify any failures to perform Code required testing.

During and subsequent to the inspection the licensee indicated to the inspector that an extensive review of check valve testing revealed that a total of approximately 49 check valves had not been tested in the reverse flow direction.

One violation was identified. The violation was a failure to develop tests and acceptance criteria as required by 10 CFR 50, Appendix B, for check valves with a safety function to prevent reverse flow, such as the pump discharge check valves in the shutdown cooling system. It is not being cited because the criteria specified in Sections VII.B.2 of the NRC Enforcement Policy were satisfied (NCV 50-361/92-15-01). The valves of concern that were not reverse flow tested were the two LPSI pump discharge stop check valves and the three HPSI pump discharge stop check valves. While these valves were not reverse flow tested, the associated pumps also had suction check valves installed to prevent recirculation through non-operating pumps.

In a letter to the NRC dated June 22, 1992, the licensee indicated that a number of check valves in both SONGS Units 2 and 3 were satisfactorily tested in the reverse flow direction prior to May 31, 1992. Additionally, the licensee committed to perform a complete review of all safety-related valves to ensure the IST program complied with the guidance contained within GL 89-04 by November 1, 1992. Finally, the licensee committed to perform any plant modifications required to perform the Code required testing by May 1, 1994.

5.7 Maintenance Program

The inspectors reviewed aspects of the licensee's maintenance program for check valves to determine whether processes and programs existed to identify degradation before failure and whether appropriate corrective actions were taken to address problems based on the maintenance results. This review identified the following:

5.7.1 Administrative Procedures

The licensee could not identify any administrative procedures addressing check valve maintenance activities.

5.7.2 Maintenance Procedures

A review of check valve maintenance procedures identified the following poor maintenance practices and procedure weaknesses:

5.7.2.1 Lock Tab Washers

Procedure S023-I-6.19, Revision 2, TCN 2-2, "Valve-Bolted Bonnet Swing Disc Check Valves", Sections 6.4 and 6.9 did not provide instructions for replacement of previously installed hinge support locking tab washers or guidance for reuse after valve disassembly. The subject valves were Anchor Darling swing disc check valves, with the hinge support separate from the bonnet. Industry practice is to install new internal lock tab washers in a valve once the tabs on the original lock tab washer have been straightened. The reuse of previously bent lock tab washers at other nuclear power plants has lead to the failure of the lock tab washers and resulted in the loss of previously bent tabs into the piping system. The failure of a lock tab washer could result in the failure of a safety related check valve to perform its safety function.

The inspectors reviewed maintenance history and identified that in the last year two Unit 2 check valves (SA 2301MU061 and SA 2301MU095) were disassembled and reassembled using previously bent lock tab washers. Valve SA 2301MU095 was later replaced prior to system operation with a new valve and new lock tab washers.

After the inspectors identified a concern in this area, the licensee issued nonconformance report (NCR) 92050001 on May 1, 1992, to document and evaluate the installed configuration of fire protection check valve SA 2301MU061. The licensee evaluated valve SA 2301MU061 to be operable and specified that new lock tab washers be installed during the next scheduled refueling outage. The licensees also agreed that reusing internal lock tab washers was a poor practice and stated that instructions would be included in the applicable procedures to address this item. A future review of the licensee's

corrective actions taken to provide procedure instructions and training for use of lock tab washers, is identified as a followup item (50-361/92-15-02).

5.7.2.2 Cold Pulling of Piping

Licensee Procedure S023-I-6.20, Revision 2, TCN 2-2, "Valve-TRW and Techno Corporation twin flapper check valve overhaul," did not provide instructions or tolerances for piping realignment during valve reinstallation. It is not uncommon during removal and reinstallation of bolted piping flange valves, to encounter piping misalignment. The inspectors considered that industry practice required that an acceptance criteria/tolerance be provided for any piping misalignment encountered during valve installation.

The inspectors reviewed maintenance history and identified that during reinstallation of two similar valves in Units 2 and 3, approximately two inches of piping misalignment were encountered for each valve. The valves were the 24 inch outlet check valves (S21204MU003 and S31204MU003) from the containment emergency sump. In both cases it appeared that maintenance personnel used hydraulic jacks to jack/cold-pull the 24 inch diameter piping downward approximately two inches. No engineering guidance or evaluation was requested. The inspectors considered this a poor maintenance practice. The inspectors further considered that without approved written engineering instructions, an engineering review should have been requested to evaluate the effect of the cold pull on adjacent piping welds, anchor points, restraints, and supports.

During discussions with the licensee on May 12, 1992, the inspectors determined that the licensee was aware of this problem with maintenance procedures, and that they were developing a procedure (S0123-V-7.20.b) to provide guidance for cold pulling piping. Since maintenance appeared to have performed cold pulling of piping without written instructions and engineering evaluation, this concern is identified as a follow-up item (50-361/92-15-03). An inspector will review the licensee follow-up actions to address this concern.

The inspectors concluded, based on a review of maintenance procedures, history, and maintenance orders, that while maintenance on check valves was generally accomplished effectively, additional management attention in this area was required.

5.8 Trending Program

The licensee employed a computerized work tracking system to track work in progress as well as maintenance work history. The maintenance work records were readily retrievable. The Check Valve Program Order S0123-CV-1 and Supplemental Check Valve Program

S0123-V-5.22 provided some trending information guidance. The primary responsibility for the evaluation of data, determining action levels and the thresholds, and developing appropriate actions was assigned to the cognizant engineer. The inspectors noted that the licensee did not appear to trend check valve data prior to April 7, 1992 since there was no documentation of check valve trending activities.

The licensee recently developed two trending documents. These documents "Nuclear Plant Reliability Data System Check Valve Data Review Plant Level," dated April 18, 1992, and "Check Valve Trend Report, Revision 1, San Onofre Nuclear Generating Station, Units 2 and 3," dated April 21, 1992, appeared to provide useful initial trending information. The licensee indicated that these initial documents would be revised and expanded as they develop and implement new trending guidelines for check valves.

The inspectors concluded that the licensee's check valve trending program was still in the development stage.

5.9 Corrective Action Program

The inspectors reviewed the licensee's programs for identifying check valve operability and programmatic concerns, and the means utilized to evaluate the reportability of identified concerns. General Procedures S0123-XV-5, "Nonconformance Reports," and S0123-XV-31, "Root Cause Evaluations," defined these programs. The inspectors focused their review on check valve deficiencies which had been identified by the licensee. These deficiencies were reviewed to determine the adequacy of evaluations and the implementation of the corrective actions.

The inspectors requested copies of nonconformance reports (NCRs) issued on check valves over the last four years for Units 2 and 3. A review of these NCR's identified that once an NCR was issued, normally the cause of the condition was established, corrective action taken, and the retest successfully completed; the valve was then returned to service. In Section 5.7 of this report, the inspectors identified nonconformance conditions associated with check valve work that did not appear to have been implemented into the NCR process.

The inspectors concluded that the licensee had a program for identifying and correcting check valve deficient conditions, and that the program was being implemented. Where engineering evaluations for acceptance, operability, and reportability were performed as required, the inspectors considered the actions to be appropriate.

5.10 Preventive Maintenance

The licensee provided the inspectors with a presentation of the reliability centered maintenance (RCM) program undertaken during the past several years. The licensee expected the RCM program, by addressing all components in the selected systems, to encompass check valves and establish condition-directed and time-directed maintenance tasks to improve the reliability of these and other system components. The licensee identified that the RCM review and approval of the Auxiliary Feedwater System was completed toward the end of 1991. The inspectors questioned why identification of the need for AFW check valve backflow testing and the prevention of recent degradations of check valves in the steam supply lines to the turbine driven Auxiliary Feedwater pump were not identified by the RCM review processes. The licensee agreed that these items could be used as lessons learned, and committed to perform feedback investigations of the RCM program for the AFW system based on these valve failures.

5.11 Use of Non-Intrusive Test Methods

The licensee informed the inspectors that current non-intrusive testing consisted mainly of radiography to determine check valve closure. The licensee indicated that they had not recently evaluated the application of ultrasonic and acoustic techniques in determining valve disc position (open or closed), disc oscillation and wear of internal parts, and that past evaluations of available equipment had led to less than satisfactory results. The licensee indicated that they were following the activities of Nuclear Industry Check Valve Group (NIC) in this area, and were hopeful that the development of external alternating current magnetic flux monitors would be successful. Their current commitment was to perform a large number of disassembly inspections and hand stroking of check valves. The licensee indicated they would not purchase non-intrusive testing equipment until a mature technique was established by industry.

5.12 Training

The inspectors reviewed the training provided to licensee personnel involved in the engineering review, maintenance, inspection, testing, and diagnostic evaluation of check valves.

The licensee trained various station technical personnel generally on Anchor-Darling valves in January of 1992. It appeared that the only check valve training maintenance personnel received since approximately 1985, was a yearly discussion of current industry events. The licensee's April 26, 1992 check valve program assessment recommended that the training currently offered to maintenance personnel be reviewed and additional training developed as required.

The inspectors concluded that the maintenance organization's capabilities for performance of adequate check valve maintenance was largely gained through on-the-job experience in lieu of any recent formal training. During discussions with the licensee on check valve training, the licensee identified that they would also review the subject of additional training in this area during their normal training review process.

6. Walkdown Observations

During the period of the inspection, the licensee was not performing any inspection, maintenance or testing of check valves. The inspectors performed a walkdown of various check valve installations in several systems to verify external valve conditions and configurations. No deficiencies were observed.

7. Conclusions

The inspectors concluded that there appeared to have been prior opportunities for SONGS to determine that the operability testing for the AFW pumps and other pump parallel path discharge check valves required reverse-flow testing. Two of these prior opportunities are discussed below:

- One of the corrective actions, detailed in NRC Inspection Report 50-206/86-16, was that the licensee would evaluate test requirements for all safety-related check valves to ensure that the specified tests were adequate to provide assurance of proper reverse flow check valve operability. Although this commitment applied only to SONGS 1, the inspectors concluded that the licensee missed an opportunity to have conducted this kind of review on all of its units.

- The inspectors also considered that any licensee's review of the adequacy of the operability tests should have included a review of the SONGS 2 & 3 Final Safety Analysis Report (Updated). A review of the auxiliary feedwater system section would have revealed that Section 10.4.9.2.2.3 stated that, "Check valves are located close to each pump discharge to prevent backflow through a shutdown pump in the event of a loss-of-pump failure." The inspectors considered this statement clearly indicated that the existing operability tests of the AFW pump discharge check valves were inadequate since they did not include a reverse-flow test.

The inspectors concluded that the licensee actions taken in 1986 were inadequate, in that they did not identify the required reverse-flow testing for the valves identified in this report.

Finally, the inspectors concluded that, based on the results of this inspection, the licensee appeared to have not fully developed their check valve reliability program prior to the inspection. Based on the licensee actions and commitments made during and subsequent to the inspection, the inspectors concluded that the licensee's proposed program improvements appeared adequate.

8. Exit Meeting

The inspector's met with the licensee management representatives denoted in Section 1, on May 1, 1992. The scope of the inspection and the inspector's findings up to the time of the meeting were discussed. At this meeting the inspector identified that additional information would be reviewed in order to complete the inspection. Additional dialogue with the licensee, and review in the Region, of pertinent documents necessary to complete the inspection, were concluded June 22, 1992. The findings of this additional review were included in Section 5 of this report.

In a letter to the NRC dated June 22, 1992, the licensee committed to: (1) review the IST program utilizing the guidance provided in GL 89-04 by November 1, 1992 and, (2) to complete plant modifications required for testing by May 1, 1994.