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July 16, 1990

Mr. Dennis F. Kirsch, Chief Reactor Safety Branch
U. S. Nuclear Regulatory Commission, Region V
1450 Maria Lane, Suite 210
Walnut Creek, California 94596

Dear Mr. Kirsch:

Subject: **Docket Nos. 50-206, 50-361 and 50-362**
Engineering Program Weaknesses
San Onofre Nuclear Generating Station, Units 1, 2 and 3

The purpose of this letter is to summarize the evaluation by Southern California Edison (SCE) of several NRC comments and findings in a series of three special unannounced inspections of our engineering program supporting San Onofre.

Your letters dated May 25 and June 11, 1990 forward related NRC Inspection Reports No. 90-14 and No. 90-15, respectively. Your June 11 letter includes the following comment:

> "This inspection identified several engineering weaknesses associated with the design change packages being implemented during recent Unit 2 and 3 outages. The noted weaknesses included inadequacies in engineering review, design implementation and design control. Continued management attention appears to be warranted in this area."

In addition, preliminary results of the third inspection, which will be documented in Inspection Report No. 90-16, were discussed in an exit interview conducted at San Onofre on June 15, 1990.

The SCE engineering program in support of San Onofre has been the subject of special SSFI inspections conducted in 1988 and 1989, and numerous, extensive changes have been made to the program in response to the findings of the SSFI inspections. SCE management in general, and I in particular, do continue to provide attention to the development of the program, as suggested in your June 11 letter.

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Based on this experience, I believe it is important to summarize our evaluation of several comments and findings included in the series of three special inspections recently completed. In particular, in a number of instances problems have been attributed to engineering program weaknesses which we conclude primarily result from other causes. Also, as was acknowledged in the exit interview on June 15, a number of the problems result from prior, recognized engineering program weaknesses which have now been corrected. In all cases, it is critical that the root causes of these problems be accurately identified and corrected.

Installation of Incorrect Model of Pressure Transmitter

On May 3, 1990 SCE identified that a non-EQ qualified Series A Rosemont 1153 pressure transmitter had been installed in 1987 in one of the Unit 3 wide range pressurizer pressure transmitter channels inside containment, in lieu of the EQ qualified Series D transmitter specified. At the June 15 exit interview, this error was characterized as related to interface problems in the engineering and equipment quality program.

Our evaluation indicates that the Series A transmitter was installed instead of the Series D transmitter as a result of a mistake that occurred entirely outside our engineering program. Indeed, the error was disclosed as a result of a walk-down of EQ equipment being performed as part of our engineering program in response to our LER 89-009 (Section E.2.C.).

In March of 1987, a maintenance order was written to replace the transmitter, and it correctly specified the material code for a Series D device. Completed documentation, however, indicates that a Series A device was installed instead, as was subsequently identified. The root cause of this error remains under investigation and will be described in Revision 1 to our LER 90-007.

At the June 15 exit interview, the fact that an NCR was not written to document the identified error until May 20 was characterized as untimely. (Unit 3 was in a refueling outage at the time.) Our review of the sequence of events, in which it was first verified that a mistake in data recording had not occurred during the walk-down, indicates that the discrepancy was controlled and tracked appropriately under the circumstances and that the initiation of the NCR was not untimely.

Modifications to Hydraulic Valve Actuators

At the exit interview for the April inspection, the NRC questioned the adequacy of the seismic design associated with the result of a complex series of modifications to hydraulic valve actuators, which began in 1983 with the Main Steam Isolation Valves (MSIVs) and continued through to the present time involving the Main Feed Isolation and Block Valves. The modifications initially involved relocation of Marotta actuation (dump) valves and their eventual replacement by heavier Paul-Munroe valves.

Throughout the seven years in which these modifications were progressively designed and implemented, engineering was performed by a contractor and reviewed and approved by SCE. The principal error was that, although seismic forces were checked to verify that allowable stresses were not exceeded, deflections were not determined to verify that operability would be maintained during the seismic event. We have now performed the necessary calculations and verified that valve operability during a seismic event, as well as afterward, would be maintained.

Also, based on the existing low seismic stresses for the Marotta valve installation, piping and support stresses were not revised when the heavier Paul-Munroe valves were installed on the MSIVs. Although the results have now been shown to be acceptable, the stress calculations should have been formally revised at the time of the modification.

With respect to our current engineering program, the omission of a documented operability determination resulted from inappropriate reliance by SCE on the prior modification work. That is, we did not apply our in-house design procedures and review process to the modifications in 1989 and 1990 because they were based on apparently successful modifications performed earlier. Corrective action to prevent recurrence of this error has been taken, and a seismic/structural analysis standard will be implemented by January 1991 to define requirements for future work. A review is being conducted to identify and correct any similar omissions of documented determinations of operability during a seismic event elsewhere in the design.

With respect to the initial omission of documented consideration of operability, this omission was contrary to the contractor's procedural requirements. The contractor has also

been requested take corrective action to prevent recurrence.

Atmospheric Dump Valve (ADV) Positioner Seismic Certification

As a result of an audit, SCE identified that Units 2 and 3 ADV positioner/transmitters had not been seismically qualified. (The devices were subsequently qualified by test.) At the June 15 exit interview, the initial lack of seismic qualification was identified as resulting from a problem involving the engineering interface.

In 1989 SCE procured new devices from Control Components Incorporated (CCI), the original and still qualified supplier of the Seismic Class 1 valves. SCE specified that the devices must be fully qualified to meet seismic requirements in accordance with our detailed standard for San Onofre procurements. The SCE purchase order required both an overall certificate of conformance with the specification and a specific certification of seismic qualification.

CCI provided the required certification and the devices were installed. Subsequently, during a design audit conducted by SCE, the certification was questioned. This led eventually to SCE qualifying the devices by test and suspending CCI's vendor qualification to supply certified components to SCE.

Our review indicates that our engineering program appropriately accepted initially the certification from a qualified supplier of seismic equipment. A subsequent audit caused this qualification to be questioned, at which point proper action was promptly taken. We do not believe this event resulted from an engineering interface problem.

Engineering Review of Loop Accuracy Calculations

Inspection Report No. 90-15 includes a finding of "inadequate engineering review", based on review of certain design change packages. One example of this is summarized in the report as follows:

> "An error associated with fluctuation of containment pressure was not accounted for in the setpoint calculation for Anticipated Transients Without Scram (ATWS)/Diverse Scram System (DSS)."

In September 1989, SCE performed a loop accuracy calculation for the ATWS/DSS design change which had been engineered by a contractor. This was a new practice for SCE at the time, and the ATWS/DSS loop accuracy calculation was the basis for our subsequent development of an internal standard for such calculations. Accordingly, the standard would now call for consideration of fluctuation of containment pressure, as permitted by the Technical Specifications. However, it was not a significant variable in this instance.

Unit 3 Fault Current Calculation

A second example of "inadequate engineering review" cited in Inspection Report No. 90-15 noted that:

> "(A) Unit 2 fault current numerical value had not been deleted from the Unit 3 package. A different cable length contributed to a higher fault current value for Unit 3, and the higher fault current was not properly identified in the Unit 3 package."

Our review has concluded that the correct, higher fault current for Unit 3 was used in the analysis and properly reflected in the documentation. The documentation does include an editorial error on pg. 1,651 in which the lower fault current value for Unit 2 exists at one place in the explanatory text. This appears to have been an isolated oversight, and it did not contribute to any error in the result.

ATWS/DSS Design Implementation

Inspection Report No. 90-15 identified as an example of "inadequate engineering design implementation" a case which was described as follows:

> "(S)ignal compatibility of the ATWS modification with the existing Critical Function Monitoring System (CFMS) was not well thought through by design engineering. The ATWS system included a 14-bit analog-to-digital conversion card while the CFMS utilized a 12-bit conversion. Also, the ATWS modification used a voltage signal of 15 volts while the CFMS used a 8.3 volts signal. A review of signal compatibility should have been performed by design engineers prior to equipment purchase rather than after the equipment had been delivered to the site."

Our review indicates that this design was performed in 1987 by a contractor to SCE. The design correctly specified the requirement for interface compatibility, however the manufacturer did not meet the requirement in the delivered equipment. Field testing accurately identified the incompatibility and our engineering program provided appropriate corrective action.

While we recognize that additional engineering review of manufacturer designs can reduce the incidence of incompatible conditions, interferences, etc. developing in the field, such additional review is often inconsistent with the expedited schedules imposed on modification designs. Also, it may not be cost-effective. Therefore, we do not consider identification of problems of this kind during testing, which is planned as part of our engineering program, as necessarily evidence of program weakness. In any case, the origin of this particular problem predates recent improvements to our engineering program.

Development of Interferences In the Field

Finally, Inspection Report No. 90-15 identified as examples of "inadequate engineering design control" two cases of interference identified in the field, rather than during design development. The design involved the ATWS/DSS change which was engineered by a contractor for SCE in 1987 and implemented in 1989. During the time lapse, other changes were made to the plant which resulted in the interferences noted.

SCE's engineering program does provide for an appropriate level of field walk-down to identify interferences and for maintenance of necessary as-built drawings. However, it does not attempt to preclude any interferences in circumstances when designs are developed and implemented in parallel over an extended period. In our experience, it would be impractical as well as unnecessary to attempt by engineering review to preclude all field interferences.

CONCLUSION

SCE is making a major effort to correct previously identified engineering program weaknesses. We have substantially increased the technical depth of our in-house involvement in plant design and have recently completed a management review of product quality. This review indicates that the quality of our current engineering work is high and continues to improve.

We appreciate your continuing assessment of our progress. We have taken seriously the comments and findings of the series of three special inspections discussed above and will take corrective action accordingly. I trust that the summary of our

evaluation provided by this letter will be helpful in your continuing review of our program.

If you have any questions or comments, or if you would like additional information, please let me know.

Sincerely,

Harold B. Ray

cc: Mr. John B. Martin, Regional Administrator, Region V
Mr. C. W. Caldwell, NRC Senior Resident Inspector, SONGS
Mr. L. E. Kokajko, NRC Project Manager, SONGS 2 and 3
Mr. J. E. Tatum, NRC Project Manager, SONGS 1