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SUBJECT: Forwards test repts & procedures re adequacy of post-LOCA hydrogen monitoring sys. Summary of environ qualification of containment monitors also encl. *See RA1*

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MANAGER OF NUCLEAR ENGINEERING,
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April 20, 1983

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Director, Office of Nuclear Reactor Regulation
Attention: Mr. George W. Knighton, Branch Chief
Licensing Branch No. 3
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Unit 2 and 3

On March 31, 1983 a meeting was held between representatives of Southern California Edison Company (SCE) and the NRC staff to discuss concerns raised by NRC Region V regarding the adequacy of the post LOCA hydrogen monitoring system. The concerns raised by Region V were (1) the location of the monitors inside containment, (2) the response time of the instruments, and (3) the maintenance of containment integrity during instrument calibration. There does not appear to be any regulatory basis to require modification of the existing system. However, the staff requested that SCE provide additional information in the following areas to complete their evaluation: (1) environmental qualification of the hydrogen monitors; (2) criteria for the location and separation of the monitors; (3) adequacy of the instrument response time with regards to off design basis (e.g. TMI) hydrogen generation rates; and, (4) containment integrity during instrument calibration. This letter addresses the staff's request by providing the information which is available at this time and outlining a schedule for the remaining information.

1. Environmental Qualification

Enclosure 1 summarizes the environmental qualification of the containment post LOCA hydrogen monitors. The hydrogen sensor and pressure transducer are the only components of the instrument which are located inside containment and therefore must be qualified for the post LOCA environment. As stated in Enclosure 1, environmental qualification of the hydrogen sensor and pressure transducer were

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accomplished by type tests performed by or for the instrument vendor, General Electric. The duration of the qualification test for the post LOCA environment for the hydrogen sensor was 90 days and 31 days for the pressure transducer. Arrhenius methodology was used to extrapolate these test results to demonstrate 120 day post LOCA qualification. Details of the tests performed to support the environmental qualification of the hydrogen sensor and pressure transducer are included as Enclosure 2. SCE believes that the results of these tests adequately demonstrate that the post LOCA hydrogen monitoring system is qualified for operation in the post LOCA environment.

2. Location/Separation

The post LOCA hydrogen monitoring system is designed to provide indication of containment atmosphere hydrogen concentration subsequent to a LOCA. The monitors are located above the operating deck (elevation 63'-6") inside containment to obtain representative samples of the containment atmosphere. Factors governing monitor location were accessibility, environmental qualification and routing of high energy piping. The monitors are also located in areas of high post accident air flow to assure a representative containment atmosphere sample. The final installation of the monitors meets the Class 1E electrical separation requirements.

Location of the monitors in an area of high post accident air flow ensures that they are exposed to representative samples of containment air. Hydrogen in the post LOCA containment atmosphere will be uniformly mixed in the air by several natural and forced mechanisms. These include the initial mixing as hydrogen is released along with steam, molecular and eddy diffusion, convective mixing, forced mixing by the dome air circulators and turbulent mixing by the containment spray system. The design of the San Onofre Units 2 and 3 containments reinforces those natural and forced mixing mechanisms ensuring that the hydrogen monitors see representative samples of the post LOCA containment atmosphere.

More detailed discussions of the hydrogen monitor location and post LOCA hydrogen mixing in the San Onofre Units 2 and 3 containments are presented in Enclosure 3 and 4 respectively.

3. Instrument Response Time

The response time specified for the post LOCA hydrogen monitors is 90% of reading in two hours based upon a 4 percent step change in hydrogen concentration. The instrument design response characteristics are more than adequate to track the design basis post LOCA hydrogen generation rates discussed in FSAR Section 6.2 and illustrated on FSAR Figure 6.2-44.

The NRC staff expressed concern regarding the capability of the instrument to effectively track hydrogen concentration for off design basis generation rates similar to those which occurred at Three Mile Island. The monitor vendor, General Electric, has been contacted to evaluate the response of the instrument to an off design basis, high hydrogen generation rate scenario. The off design basis hydrogen generation scenario which the vendor is evaluating is presented in Enclosure 5. This scenario consists of four ramp increases to a 7.75% hydrogen concentration over a period of 90 minutes. The vendor will conduct a test demonstrating the instruments response to hydrogen concentration changes similar (within 10%) to this profile. Because this is not a routine test, the results and their evaluation are not expected to be available to SCE prior to mid-May, 1983. Based on receipt of the test results by May 15, 1983, SCE will transmit an evaluation of the capability of the post LOCA hydrogen monitoring system to respond to off design basis hydrogen generation rates during the week of May 16, 1983. SCE notes that there is no existing regulatory basis, nor does SCE commit, for the monitors to meet this off-design basis generation rate.

4. Containment Integrity During Instrument Calibration

The calibration gases for the post LOCA hydrogen monitors are stored outside containment. Containment isolation valves (HV 0500, HV 0501, HV 0502, HV 0503) are opened to allow the flow of the calibration gases to the hydrogen sensors for the monthly channel functional tests and quarterly calibrations. The containment isolation valves are remote manual valves with key-lock switches in the control room. The valves are opened under administrative controls for the duration of channel functional tests and calibrations. The intent of technical specifications is to have the time which these valves are opened minimized in order to preserve containment integrity. NRC Region V has expressed concern over the length of time these valves are open.

Currently, both the monthly channel functional test procedure (S023-II-1.10) and the quarterly calibration procedures (S023-II-1.11 and S023-II-1.12) require the admission of calibration gases to the hydrogen sensors. Because the instruments response is a function of the rate of diffusion of hydrogen through the sensor membrane, its response to step changes in hydrogen concentration asymptotically approaches, but never reaches, a final equilibrium value. The above procedures specify stability criteria for determining when this final equilibrium value has been approached with sufficient accuracy. Based on the current stability criteria, stabilization takes an inordinate amount of time, necessitating that the containment isolation valves remain open for this period. The

April 20, 1983

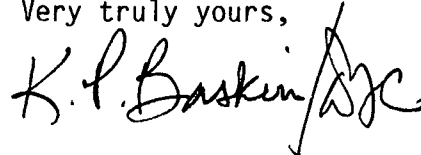
vendor has been requested to evaluate and provide guidance regarding surveillance testing in an effort to reduce the time during which containment isolation valves are open, and provide a response time based acceptance criteria. The vendor has indicated verbally that the use of the calibration gases is not required for the monthly channel functional test. This is consistent with the technical specification definition of channel functional test. Elimination of this requirement from the monthly channel functional test would result in a significant reduction in the time during which the calibration gas containment isolation valves are open. Vendor guidance regarding surveillance testing and acceptance criteria is expected to be available by May 1, 1983. Surveillance procedures will be revised, as appropriate, after receipt of the vendor input.

The NRC staff expressed concern regarding the closure of the calibration gas containment isolation valves in the event that an accident occurs during surveillance testing. As stated above, these valves are remote manual valves which can only be opened from the control room and are under administrative controls. The loss of Coolant Accident Procedure (S023-3-5.6) calls for closure of all administratively controlled containment isolation valves as a subsequent operator action in the event of a containment isolation actuation signal (CIAS). This procedure uses the hydrogen monitor containment isolation valves as an example of administratively controlled containment isolation valves.

To summarize, SCE believes that this submittal should satisfy any remaining concerns on the part of the NRC staff regarding post LOCA hydrogen monitor environmental qualification, location and containment integrity. As indicated above, SCE will submit an evaluation of the post LOCA hydrogen monitor's response to off design basis hydrogen generation rates following receipt of the test results from the vendor. At that time SCE will also address changes made to surveillance testing procedures which result from vendor input.

If you have any questions regarding the information provided by this letter, please call me.

Very truly yours,

Handwritten signature of K. P. Baskin in cursive script.

Enclosures

cc: Harry Rood, NRC (To be opened by addressee only)

J.B. Martin, Region V