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March 27, 1984

Director, Office of Nuclear Reactor Regulation
Attention: Mr. D. M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket No. 50-206
Generic Item B-24, Containment Purging/Venting
During Normal Operations
San Onofre Nuclear Generating Station
Unit 1

References: 1. SCE to NRC letter dated May 30, 1978, K. P. Baskin to D. Eisenhut

2. SCE to NRC letter dated December 30, 1976, K. P. Baskin to K. R. Goller

Your letter of February 17, 1982 requested that we commit to limiting the use of our 6-inch containment vent system to a specified annual time commensurate with plant operational safety needs, or provide a justification why such a limitation is considered unnecessary (Question 3 of Enclosure 3 of your letter). Your basis for this request stems from your position that a plant is inherently safer with closed containment purge/vent valves than with open lines which require valve closure to provide containment isolation. Based on the information provided below, limiting the use of our 6-inch containment vent system will not significantly decrease the probability of radiological releases due to fuel failure following a LOCA, and the vent isolation valves are both operable and reliable under accident or transient conditions.

The 6-inch containment vent system at San Onofre Unit 1 consists of two Fisher Controls 6-inch butterfly valves designated CV-10 and 116 and a 2-inch pneumatic diaphragm actuated 3-way control valve designated CV-40. CV-10 is located in the sphere equalizing line outside containment and CV-116 is located in the sphere equalizing line inside containment. CV-40 is located on a 2-inch line inside containment which vents the instrument air exhaust to the 6-inch equalizing line between CV-116 and the containment sphere.

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Under normal operating conditions, CV-10 and 116 are open to allow pressure inside the sphere to equalize with pressure outside the sphere. On high sphere pressure (i.e., above 1.4 psig), high radiation, or initiation of safety injection, the solenoid valves for CV-10 and 116 are deenergized, thereby securing instrument air from the pressure regulator to the valve actuator. This results in the spring return of CV-10 and 116 to the closed position which secures exhaust of containment atmosphere to the environment following a LOCA or MSLB. De-energizing the solenoid valve for CV-40 will result in a spring return of the valve to the vent port position which secures instrument air exhaust from leaving containment. In the event of power failure or loss of instrument air, these valves will fail to their post containment isolation position.

Branch Technical Position CSB 6.4 Position B.4 delineates certain criteria which must be satisfied before venting is permitted. Among these criteria it is stated that venting will be permitted only if the valves being used are known to be both operable and reliable under transient or accident conditions. By letter dated January 15, 1980, SCE provided details of the Fisher analysis of the allowable differential pressure across the valve for various openings. Notwithstanding the conclusion that the vent valves will close from the full open position in the event of a design basis LOCA, the valve vendor recommended an opening of 70°. In order to comply with the NRC interim position and the recommendation of the vendor, equipment was installed to limit the valve opening to approximately 50°.

In addition to establishing the operability and reliability of the vent valves, Position B-4 requires that the estimated amount of radioactivity released during the time required to close the valve(s) following a LOCA either:

1. does not cause the total dose to exceed 10 CFR Part 100 guidelines; then a goal should be established which represents a limit on the annual hours of purging expected through each particular valve, or

2. causes the total dose to exceed the guidelines; then purging/venting shall be limited to 90 hours/year.

In order to estimate the amount of radioactivity released during the time required to close the valve following a LOCA, it is necessary to obtain the valve closure times and the amount of contaminated containment atmosphere released prior to valve closure. As indicated by the valve vendor, the vent valves are designed to close in approximately 5 seconds. However, operating experience (i.e., full stroke testing) has indicated that the valve closure times at SONGS-1 vary between 10 and 13 seconds. SCE has determined that these closure times are not indicative of valve degradation or poor maintenance. Through discussions with the valve vendor, and review of the design of the butterfly valves and solenoid actuators, it has been determined that the orifice on the solenoid actuators are smaller than those assumed in the valve manufacturer's design verification. Using the smaller orifice increases the time required to vent the solenoid and secure instrument air from the pressure regulator to the valve actuator, ultimately resulting in longer valve closure times.

In order to calculate the dose releases resulting from a design basis accident, it is necessary to postulate the activity of the containment atmosphere prior to valve closure. Regulatory Guide 1.4 establishes guidelines for calculating dose releases due to design basis accidents. However, some of these guidelines are not applicable in determining the vent system contribution to dose releases. The methodology for determining the dose release prior to valve closure following a LOCA is explained below.

Using the ascending differential pressures generated from a LOCA, the quantity of containment atmosphere released through the vent system following a design basis LOCA was determined. Conservatively assuming a valve closure time of 14 seconds from the generation of the close signal, the quantity of air released prior to valve closure would be 119 lbm (1580 SCF).

Regulatory Guide 1.4 establishes the following guidelines for determining the source term resulting from a design basis LOCA:

1. Maximum Core Inventory

2. 100% of the noble gases in the core inventory are released and disperse in containment.

3. 25% of the iodines in the core inventory disperse in containment.

   Note: The release of iodines inside containment is currently the major contributor to radiological consequences for post LOCA dose calculations. Currently, an effort is being conducted to re-define the amount of iodines which will disperse inside containment. The work being conducted is utilizing data obtained from TMI-2 and comparing measured iodine dispersion rates with the amount recommended by Reg. Guide 1.4. Preliminary results have indicated that the recommendation of Reg. Guide 1.4 may be conservative by as much as a factor of 10. Substantiation of these preliminary results would have a significant impact on future dose calculations.

4. The noble gases and iodines dispersed in containment instantaneously and uniformly mix in the containment free space.

These initial conditions used to determine the containment source term are considered applicable for long term dose calculations. However, in determining the dose contribution of the vent system, it is necessary to determine the containment conditions immediately following the initiation of the design basis event. Based on the fact that the vent system will be isolated in approximately 14 seconds after the close signal is generated, it would be overly conservative to apply all of the Reg. 1.4 assumptions. For example, in order to obtain the source term recommended by Reg. Guide 1.4, 100% fuel failure would have to occur. This would obviously not occur in the time prior to containment isolation. The most rapid fission product release to containment occurs following a large break LOCA. Results of the limiting large break LOCA analysis (References 1 and 2) indicate that initial RCS blowdown takes approximately 18 seconds. The peak fuel rod cladding temperature during this time remains below 1500°F. Cladding rupture, which occurs prior to fuel failure, requires temperatures ranging from 1400 to 2000^{o}F (WASH-1400). Hence, rupture of only a few of the hottest rods could be ralistically postulated during this period. Cladding rupture would result in release of the fuel rod gap activity. The gap activity consists of noble gases, halogens, and volatile species which constitute, at most, a few percent of the total core inventory of fission products. Thus, it can be assumed that the source term released to containment prior to isolation of the vent system is bounded by the RCS coolant activity plus the fuel rod gap activity. This quanity represents less than 10% of the core fission product inventory. Accordingly, in determining the containment radiation conditions prior to valve closure, we have conservatively assumed a source term equivalent to 10% failed fuel.*

Instantaneous and uniform distribution of the noble gases and iodines in the containment free space are also overly conservative assumptions. The vent system is located well beyond the secondary shield approximately 6 feet from the containment sphere wall. Based on this location, release of radionuclides through the vent line would not occur until several seconds into the event. We have postulated a 5 second transit time prior to release of any radionuclides. The containment atmosphere released through the vent system subsequent to this 5 second transit time is assumed to have a uniform mixture of the noble gases and iodines dispersed in containment.

The initial conditions and assumptions described above are considered to conservatively reflect containment conditions immediately following a LOCA. Based on these conditions and assumptions, the calculated whole body and thyroid doses at the site boundary for the quantity of air released prior to valve closure would be 0.8 Rem and 118 Rem, respectively. Both of these dose releases are well within 10 CFR Part 100 limits.

The 6-inch containment vent system is used to maintain the containment atmosphere at or below atmospheric pressure. It has been the standard operating practice at SONGS 1 to maintain the vent system open continuously to satisfy this purpose. This is necessary in order that the design basis initial conditions of plant systems coincides with the conditions in which these systems, in fact operate. The impact of variance from these conditions would result in unnecessary degradation of performance and reliability of such systems.

Furthermore, limiting the use of the vent system will result in a steady increase in containment pressure, primarily due to instrument air bleed-off and nominal leakage. The Technical Specification limit for containment pressure is 0.4 psig. Containment pressure-temperature analyses have demonstrated the acceptability of having an initital containment pressure of 0.4 psig. However, instrument air bleed-off will cause contaiment pressure to increase beyond this limit. Therefore, venting would be necessary to maintain containment pressure below the Technical Specification limit.

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* This quantity does not reflect the preliminary results of the effort being conducted to re-define the iodine dispersion rates. Also, this assumption does not infer that only 10% fuel failure could occur in the event of design basis LOCA. It is our position that under no circumstances could more than 10% fuel failure occur prior to isolation of the vent system.

Isolating the vent system subsequent to establishing a lower pressure (i.e., atmospheric pressure) will, again, result in a steady increase in containment pressure. Subjecting the containment sphere, including instrumentation and equipment inside containment, to routine fluctuations in temperature and pressure is not warranted. The extent of incipient deterioration of function resulting from these fluctuations over prolonged periods of time is not known. Furthermore, vent valve seal degradation, can be expected from excessive use.

An additional area of concern resulting from limiting the use of the vent system is the added need for operator awareness and actions. Limiting the use of the vent system will require periodic surveillance of containment pressure to verify pressure is within the Technical Specification limit. Furthermore, additional operator actions would include initiating vent operations, terminating vent operations and maintaining an accurate account of the elapsed times. Based on the understanding that venting could be required as much as one to two times per shift, such venting would impose unnecessary requirements for operator actions.

Based on the information provided above, the vent system has been demonstrated capable of performing its intended isolation function under transient conditions, and, furthermore, will not contribute unacceptable radiological consequences to the total dose calculation in the event of a design basis LOCA. In addition, limiting the use of the vent system may result in unnecessary degradation of systems and components necessary for plant operation, including degradation of the containment vent system. Accordingly, limiting the use of the vent system will not provide a significant increase in system reliability or isolation capability and is not justified. Therefore, operation of the vent system should continue in accordance with present plant operating procedures.

If you have any questions or desire additional information, please call me.

Very truly yours,

M. O. Medford

cc: E. McKenna