UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 2 of the San Onofre Nuclear Generating Station	))))))	Docket No. 50-361 Amendment Application No. 101

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10 CFR 50.90, hereby submit Amendment Application No. 101.

This amendment application consists of Proposed Change Number NPF-10-346 to Facility Operating License No. NPF-10. Proposed Change Number NPF-10-346 is a request to revise Technical Specification 3/4.5.2, "ECCS SYSTEMS - T_{avg} GREATER THAN OR EQUAL TO 350^{0}F." This proposed change will remove the Shutdown Cooling (SDC) system Auto-Closure Interlock (ACI) surveillance requirement. This ACI will be removed when this proposed change is approved by the NRC. Removal of the ACI is consistent with the recommendation in Generic Letter 88-17, "Loss of Decay Heat Removal." A result of an analysis performed in response to Generic Letter 88-17 is that spurious ACI actuation throughout the industry contributes approximately 39 percent to SDC system unavailability. Removal of the ACI will enhance plant safety during mid-loop operation.

Subscribed on this 15th day of APRIL, 1991.

Respectfully submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

By: Harold B. Ray
Harold B. Ray
Senior Vice President

Subscribed and sworn to before me this
15th day of APRIL 1991.

Barbara A. McCarthy
Notary Public in and for
the State of California

OFFICIAL [illegible]
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BARBARA A. MC CARTHY
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March 31, 1995

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 3 of the San Onofre Nuclear Generating Station	))))))	Docket No. 50-362 Amendment Application No. 86

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10 CFR 50.90, hereby submit Amendment Application No. 86.

This amendment application consists of Proposed Change Number NPF-15-346 to Facility Operating License No. NPF-15. Proposed Change Number NPF-15-346 is a request to revise Technical Specification 3/4.5.2, "ECCS SYSTEMS - T_{avg} GREATER THAN OR EQUAL TO 350^{0}F." This proposed change will remove the Shutdown Cooling (SDC) system Auto-Closure Interlock (ACI) surveillance requirement. This ACI will be removed when this proposed change is approved by the NRC. Removal of the ACI is consistent with the recommendation in Generic Letter 88-17, "Loss of Decay Heat Removal." A result of an analysis performed in response to Generic Letter 88-17 is that spurious ACI actuation throughout the industry contributes approximately 39 percent to SDC system unavailability. Removal of the ACI will enhance plant safety during mid-loop operation.

Subscribed on this 15th day of April, 1991.

Respectfully submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

By: Harold B. Ray
Harold B. Ray
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OFFICIAL SEAL
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DESCRIPTION AND SAFETY ANALYSIS OF PROPOSED CHANGE NUMBER NPF-10/15-346

This is a request to revise Technical Specification 3/4.5.2, "ECCS SYSTEMS - T_{avg} GREATER THAN OR EQUAL TO 350^{0}F," and its associated Bases B3/4.5.2, "ECCS SYSTEMS - T_{avg} GREATER THAN OR EQUAL TO 350^{0}F."

Existing Specifications:

Unit 2: See Attachment "A"
Unit 3: See Attachment "B"

Proposed Specifications:

Unit 2: See Attachment "C"
Unit 3: See Attachment "D"

Description of Change

The shutdown cooling (SDC) system is not designed to accommodate full Reactor Coolant System (RCS) pressure. Therefore, isolation of the SDC system suction line is assured by interlocks on the four suction valves arranged in two parallel pairs inside containment.

An independent interlock, using pressurizer pressure, is provided for each SDC system isolation valve. Each interlock automatically closes its associated valve when pressurizer pressure is greater than or equal to 715 psia. In addition, a permissive for each valve prevents opening of the valve when system pressure is greater than or equal to 376 psia. The open permissive is not being removed from the Technical Specifications by this change.

Technical Specification (TS) 3/4.5.2, "ECCS SYSTEMS -T_{avg} GREATER THAN OR EQUAL TO 350^{0}F" requires the verification of these interlocks at least once per refueling interval. Southern California Edison (SCE) proposes to modify Action d. of TS 3/4.5.2 to remove the surveillance of this Auto-Closure Interlock (ACI) and also remove the ACI hardware.

Instead of this ACI, which is actuated at 715 psia, an existing alarm will warn operators if the RCS pressure is greater than 383 psia and any of the SDC system suction isolation valves are not fully closed. The alarm will obtain its valve position input from a source independent of valve control functions or existing position indication circuitry. The alarm will not be dependent on the availability of power to the circuit breaker for each valve. An alarm condition will result if there is a loss of power to the alarm circuit or the valve control circuit when the valve is not fully closed.

SYSTEM DESCRIPTION

The SDC system is a subsystem of the safety injection and containment spray systems. During power operation (Modes 1, 2, 3, and 4), SDC is isolated and power is removed from the isolation valves to satisfy single active failure criteria of these systems.

When the SDC system is in operation (Modes 5 and 6 only) reactor coolant from number 2 hot leg flows into the SDC suction line and splits into two parallel lines, each containing two isolation valves. The flow from both lines combines into a single line and flows out of containment to the suction of the low pressure safety injection (LPSI) pumps. The LPSI pump discharge flows combine into a single header which splits into two paths: 1) flow through the SDC heat exchangers and 2) flow that bypasses the SDC heat exchangers. The bypass flow is throttled to achieve the desired degree of cooling.

The flow to each SDC heat exchanger passes through an inlet isolation valve, through the heat exchanger, through an outlet valve, and then joins the flow from the other heat exchanger in a common line. The flow that bypasses each heat exchanger flows through an isolation valve and flow control valve and is then combined with the heat exchanger outlet flow. The combined flow passes through a flow element and into the LPSI header where flow splits into four cold leg injection lines.

The SDC suction lines are equipped with four remotely controlled isolation valves in two parallel pairs inside containment to isolate SDC piping from the reactor coolant system (RCS). Since the SDC system is not designed to accommodate full RCS pressure, isolation of the SDC system suction line is assured by interlocks on the four suction line isolation valves inside containment. Independent interlocks, utilizing pressurizer pressure, are provided for each valve. The Open Permissive Interlock is designed to prevent opening of the associated valve whenever system pressure is greater than or equal to 376 psia. The ACI provides auto-closure of the valves when pressurizer pressure is greater than or equal to 715 psia. Two bistables supplied by each pressure transducer initiate the interlock function.

BACKGROUND

Recently, considerable attention has been focused by the NRC and industry on improved reliability of decay heat removal in pressurized water reactors and, in particular, the automatic closure interlock of the shutdown cooling system suction isolation valves. Spurious operation of this interlock is the major cause of loss of shutdown cooling events in U.S. PWRs. Removal of this interlock has been encouraged by the Nuclear Regulatory Commission in Generic Letter 88-17.

SHUTDOWN COOLING SYSTEM DESIGN

The SDC system is needed to achieve and maintain a cold shutdown condition by removing residual energy from the Reactor Coolant System (RCS) and decay heat from the reactor core.

After a shutdown, the RCS is cooled by a controlled release of steam from the steam generator secondary side, from normal operating temperatures down to approximately 250°F. As the saturation temperature of water at atmospheric pressure is approached, a different heat removal scheme is required. This continued means of heat removal is provided by the SDC system.

SHUTDOWN COOLING SYSTEM SUCTION ISOLATION VALVES

The San Onofre Units 2 and 3 RCS has a design pressure of 2485 psig, and the shutdown cooling pumps and heat exchangers have a design pressure of 435 psig. Since the two piping systems of different design pressures are connected, a suitable isolation capability is provided when the RCS is operated at high pressure.

To ensure that isolation of the SDC system will remain in effect after any single credible failure has occurred, two isolation devices in series are provided, each capable of maintaining the RCS pressure boundary with the other device failed.

OVERPRESSURE PROTECTION

When the SDC system is in use, the SDC system becomes an extension of the Reactor Coolant Pressure Boundary (RCPB). Since a number of pressurization sources exist within or are connected to the high pressure RCS, the low pressure SDC system must be protected against postulated pressurization transients when the systems are connected. To accomplish this, a SDC system relief valve is provided as shown in Figure 1.

The SDC system relief valve also provides protection of the RCPB against brittle fracture due to pressurization at low temperature. This is commonly referred to as Low Temperature Overpressure Protection (LTOP).

Since the SDC system is part of the RCPB during low temperature operation, it was recognized that the SDC system relief valve could be used for LTOP. Due to the high flowrates required to mitigate the postulated LTOP transients, the relief valve is located within the containment building and discharges to the containment emergency sump.

The SDC system relief valve, set to relieve at 406 psig (421 psia) +/- 10 psi, will prevent any transient pressure from exceeding the isolation valve ACI setpoint of 715 psia.

AUTO-CLOSURE INTERLOCK & OPEN PERMISSIVE INTERLOCK

The overpressure protection of the SDC system which is provided by the SDC system relief valve is based on those transients postulated to occur during normal SDC system operation. This relief valve is not intended to protect the SDC system against overpressurization as a result of being inadvertently exposed to full RCS pressure during power operation. A relief device with the capacity to protect against this hypothetical event would not be practical. Should this event occur such that the RCS becomes connected to the SDC system during power operation, the SDC system could rupture at a point outside the containment. This is referred to as an Event V per Wash-1400. Water injected by the Emergency Core Cooling System (ECCS) to mitigate the event would escape the containment through the rupture instead of being collected in the containment sump where it can be recirculated for extended core cooling as designed. This would represent an event outside the plant design basis, and extreme caution must be used to ensure that the probability of this event is negligibly low.

Two similar but distinct instrumentation interlocks are used to reduce the probability of the inadvertent connection of the RCS to the SDC system when the RCS is pressurized. These interlocks are required by, and described in, Reactor Systems Branch Technical Position RSB 5-1 (Reference 1).

RSB 5-1, which covers a number of aspects of the SDC system design, invokes General Design Criterion 19 and requires the SDC valves to be operable from the control room and, therefore, be power operated. The two (in series) valves must have "independent diverse interlocks" to prevent their opening when RCS pressure is above the SDC system design pressure. This feature is referred to as the Open Permissive Interlock (OPI). It protects against the spectrum of events which result in the SDC system suction isolation valves being opened when the RCS is already pressurized above 376 psi. The proposed change to TS 3/4.5.2 does not change this interlock.

RSB 5-1 also mandates "independent diverse interlocks" to automatically provide a confirmatory close signal to the isolation valves when RCS pressure exceeds the SDC system design pressure. This requirement is referred to as the ACI. Removal of ACI has been proposed as a way to decrease the probability of loss of shutdown cooling events.

PURPOSE OF AUTO-CLOSURE INTERLOCK

As previously described, it is necessary to have two valves in series to create the RCPB, so that no single failure can result in a complete loss of this barrier. The double barrier is established by the operator closing both of these valves when changing from SDC system operation to steam generator cooling during plant heatup. Failure to establish this double barrier is theoretically possible due to physical failure in the valve, valve operator, or valve operator controls, or by an operator error. A credible operator error is the closure of only one valve followed by RCS pressurization. It is this operator error that ACI is intended to guard against. Failure to close both valves would prevent RCS pressurization due to the SDC system relief valve still being connected to the RCS.

It has often been erroneously stated that ACI is provided to isolate the low pressure SDC system from the RCS upon the occurrence of a pressure transient, such as those caused by mass or energy addition events with the pressurizer in a "water solid" condition. Since the stroke time of the large motor operated isolation valves is on the order of 30 - 60 seconds, mitigation of these transients can only be accomplished by quick acting pressure relief devices. Hence, transient mitigation is not a function performed by ACI or affected by its removal.

PROBLEMS WITH AUTO-CLOSURE INTERLOCK

The design of ACI has always presented a problem of competition between two safety functions. When the SDC system is needed the suction valves must be open and failures resulting in valve closure are a safety concern due to the loss of heat removal. Conversely, when ACI action is required failures which leave the valves open adversely impact safety.

The industry has experienced a number of spurious valve closure events caused at least in part by the presence of the ACI (Reference 2). A frequent cause of spurious ACI action is the accidental or intentional de-energization of a power supply during refueling. This event frequently results from the type of maintenance work performed during refueling outages. The typical ACI circuit can spuriously actuate on loss of any of two or three power supplies. A second common cause of spurious closure is the actuation of ACI resulting from invalid high RCS pressure signals due to testing. Again, this type of testing is usually performed only during outages. While re-design of the pressure loops and ACI circuit could eliminate the loss of power supply problems, it would not protect against invalid pressure signals.

EFFECTIVENESS OF AUTO-CLOSURE INTERLOCK

As previously explained, the ACI was provided to guard against an operator error, namely failure to isolate the SDC system from the RCS prior to raising the RCS pressure above the design pressure of the SDC system. The SDC system relief valve, set to relieve at 406 psig (421 psia) +/- 10 psi, will prevent any transient pressure from exceeding the isolation valve ACI setpoint of 715 psia. An existing alarm in the control room for each valve will warn the operators if the reactor coolant system pressure is greater than 383 psia and any of the SDC system suction isolation valves are not fully closed.

The potential of an inadvertent closure of the SDC system isolation valves during SDC system operation due to the ACI circuit detracts from plant safety. Therefore, the SDC system relief valve and the alarm allow for the removal of the ACI without a negative impact on plant safety.

LOSS OF SHUTDOWN COOLING ISSUE

Resolution of issues related to loss of shutdown cooling events has been of increasing concern to both the NRC and the industry for several years. Studies have been performed which have identified the causes of loss of shutdown cooling events. The conclusions of these studies have identified that spurious operation of ACI was the most frequent cause of reported loss of shutdown cooling events between 1976 and 1983.

Spurious operation of ACI results in the closure of the shutdown cooling pump suction valves. This has two potential impacts on the SDC system. The most immediate result of valve closure is loss of flow and corresponding loss of decay heat removal from the core. The resultant RCS temperature rise can result in pressurization of a closed system or loss of fluid through boiling if the reactor vessel head is removed for refueling. The second, though less frequent, result of valve closure is significant damage to the SDC pumps due to extended loss of suction. This event is serious due to the potential for complicating the short term recovery of core cooling and the long repair time and associated high cost.

Since we use the SDC system relief valve for LTOP, the loss of SDC through closure of the suction valves also increases the risk of a brittle fracture of the RCPB if a pressure transient occurs.

Since ACI is a significant contributor to loss of SDC system events, SCE and other utilities are interested in removal of ACI. The NRC has encouraged removal of ACI most recently in Generic Letter 88-17 (Reference 3). In that document, the NRC suggests that utilities seeking removal of ACI consider the approach taken by Pacific Gas and Electric in removing ACI from the Diablo Canyon Units (Reference 4). The Diablo Canyon submittal was based primarily on an NRC memo (Reference 5) which effectively changed Branch Technical Position RSB 5-1.

DISCUSSION

The NRC guidelines for removal of the auto closure interlock are found in a memo from B. W. Sheron to the Reactor Systems Branch members dated January 28, 1985 (Reference 5). This memo clarified the purpose of ACI and outlined the following issues to be considered in proposals to remove the ACI function:

1. The means available to minimize Event V concerns.

2. The alarms to alert the operator of an improperly positioned RHR MOV.

3. The RHR relief valve capacity must be adequate.

4. Means other than the ACI to ensure both MOVs are closed (e.g., single switch actuating both valves).

5. Assurance that the function of the open permissive circuitry is not affected by the proposed change.

6. Assurance that MOV position indication will remain available In the control room, regardless of the proposed change.

7. An assessment of the proposed change's effect on RHR reliability, as well as on LTOPs concerns.

SCE will comply with each of the seven NRC guidelines. It should be noted that the following discussion closely parallels that accepted by the NRC (Reference 6) in the Diablo Canyon modification. This discussion accounts for plant specific features.

1. Means Available to Prevent a LOCA Outside Containment

   The design provides for a double barrier between the RCS and the SDC system. The design is resistant to common cause failure (i.e., through the use of separate power supplies) and hence provides a very high probability that at least one barrier can be established and maintained under any postulated conditions. Procedural controls, training, alarms, and the OPI minimize the potential that the operator will fail to achieve double isolation or defeat it once established.

   Additionally, the SDC system is protected against rupture by the SDC system suction relief valve during an attempted normal heatup and pressurization of the RCS with the SDC system suction valves open.

2. Alarms to Notify the Operator that SDC system Suction Valves are Mispositioned

   Visual and audible alarms are provided in the main control room to inform the operator that any of the SDC system suction valves are not fully closed when the RCS pressure is above the SDC system pressure setpoint. The alarms will be tested at each refueling to ensure reliability and are designed to alert the operator upon alarm circuit failure.

3. Verification of the Adequacy of Relief Valve Capacity

   As a part of the original system design process, calculations were performed by Combustion Engineering (CE) for San Onofre Units 2 and 3 to ensure that relief devices in the SDC system suction line(s) had adequate capacity to prevent overpressurization of the SDC system during postulated events. These calculations have been reviewed to confirm that ACI was not credited in the selection of limiting events or mitigation of the resulting transients. Therefore, the calculations remain applicable with ACI deleted.

4. Means other than ACI to Ensure that both Isolation Valves are Closed

   The proposed modification uses alarms, position indication, procedures, and training to ensure that the double barrier is established upon heatup.

5. Assurance that the OPI is not Affected by the Change

   The OPI will be maintained in its present form.

6. Assurance that Valve Position Indication will Remain Available in the Control Room after the Change

   The proposed change does not affect the existing valve position indication in the control room.

7. Assessment of the Effect of the Proposed Change on SDC system Availability and Low Temperature Overpressure Protection

   CE conducted a generic probabilistic risk assessment to evaluate the effect of removal of the ACI on the probability of Event V LOCAs, SDC system availability, and low temperature overpressure protection (Reference 7). A copy of reference 7 will be forwarded to the NRC approximately 3 weeks from the date of this submittal.

   The risk assessment considers changing the modeled facility, starting with ACI and with or without a "Valve Open at High Pressure" alarm, to a facility with an alarm but without ACI. The risk assessment indicates a negligible increase in Event V LOCA risk which is accompanied by a substantial improvement in shutdown cooling and LTOP availability.

   Although installed in a single line, the parallel valve arrangement at San Onofre yields a reliability model identical to that used for the model case. As a result, the results of the generic study are applicable to San Onofre Units 2 and 3.

PLANT SPECIFIC CHANGES REQUIRED TO ACHIEVE CONFORMANCE WITH THE MODELED CONFIGURATION

The following discussion is provided to identify the scope of the modifications required for San Onofre Units 2 and 3. The configuration of San Onofre Units 2 and 3 is shown in Figure 1. The needed changes to meet the NRC guidelines and the CE Owners Group (CEOG) recommendations are:

- A) Disconnect ACI circuits
- B) Provide independent position indication input for valve position alarm.
- C) Revise UFSAR to commit to alarm testing.
- D) Revise procedures to be consistent with NRC guideline #4.
- E) Delete ACI surveillance technical specification.

SCE, in following the above NRC guidelines and CEOG recommendations, is requesting to remove the ACI. The existing "Pressurizer Pressure Above Setpoint Valve Not Closed" alarm in the control room will be retained with valve position input from a source independent of valve control functions and valve position indication. This alarm is to warn operators if the RCS pressure is 383 psia or greater and any of the SDC suction isolation valves is not fully closed.

Safety Analysis

The proposed change described above shall be deemed to involve a significant hazards consideration if there is a positive finding in any one of the following areas:

1. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The ACI is intended to guard against an overpressure condition of the SDC system due to operator error (i.e. the closure of only one SDC system isolation valve followed by a reactor coolant system pressurization). The reason for removing the ACI is to minimize potential loss of SDC due to inadvertent actuation.

   Protection of the SDC system from an overpressure condition will still be provided by the open permissive interlock designed to prevent opening of its associated isolation valve whenever system pressure is greater than or equal to 376 psia. Other protective features are the low temperature overpressure protection (LTOP) provided by the SDC system relief valve, individual valve position indication, and alarms to notify operators of valve misposition.

   The potential loss of SDC due to the inadvertent operation of the ACI outweighs the redundant protection the ACI provides. Therefore, removal of the SDC system ACI will provide a significant decrease in the probability of a loss of SDC and will not increase the probability or the consequences of SDC system overpressure.

   Therefore, this proposed change will not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Will operation of the facility in accordance with this proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

SDC system overpressure and loss of decay heat removal are the only accidents ACI impacts. The ACI is intended to guard against SDC system overpressure due to operator error; it does not protect against hardware failure. The valve misposition alarms will warn against both operator error and hardware failure.

The ACI does not protect against an overpressure transient since the stroke times of these large motor operated valves are too long compared to a pressure transient event.

The chance of the loss of decay heat removal accident is reduced by this change because the potential of the SDC system isolation valves being closed by a spurious signal will be eliminated.

Therefore, the possibility of a new or different kind of accident is not created by the removal of the ACI.

3. Will operation of the facility in accordance with this proposed change involve a significant reduction in margin of safety?

Response: No

Protection of the SDC system from an overpressure condition will still be provided by the open permissive interlock designed to prevent opening of its associated isolation valve whenever system pressure is greater than or equal to 376 psia. Other protective features are the low temperature overpressure protection (LTOP) provided by the SDC system relief valve, individual valve position indication, and alarms to notify operators of valve misposition.

SCE is following the NRC guidelines and the CEOG recommendations. The protection discussed above ensures that the removal of the ACI will not result in a significant reduction in margin of safety. Furthermore, the removal of the ACI will increase the reliability of the SDC system, which will increase the margin of safety.

Safety and Significant Hazards Determination

Based on the above Safety Analysis, it is concluded that: (1) the proposed change does not constitute a significant hazards consideration as defined by 10 CFR 50.92; and (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed change; and (3) this action will not result in a condition which significantly alters the impact of the Station on the environment as described in the NRC Final Environmental Statement.

4.0 REFERENCES

1) Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, NUREG-0800, Branch Technical Position RSB 5-1.

2) U.S. Nuclear Regulatory Commission, Office for Analysis and Evaluation of Operational Data, "Decay Heat Removal Problems at U.S. Pressurized Water Reactors", Case Study Report AEOD/C503, December 1985.

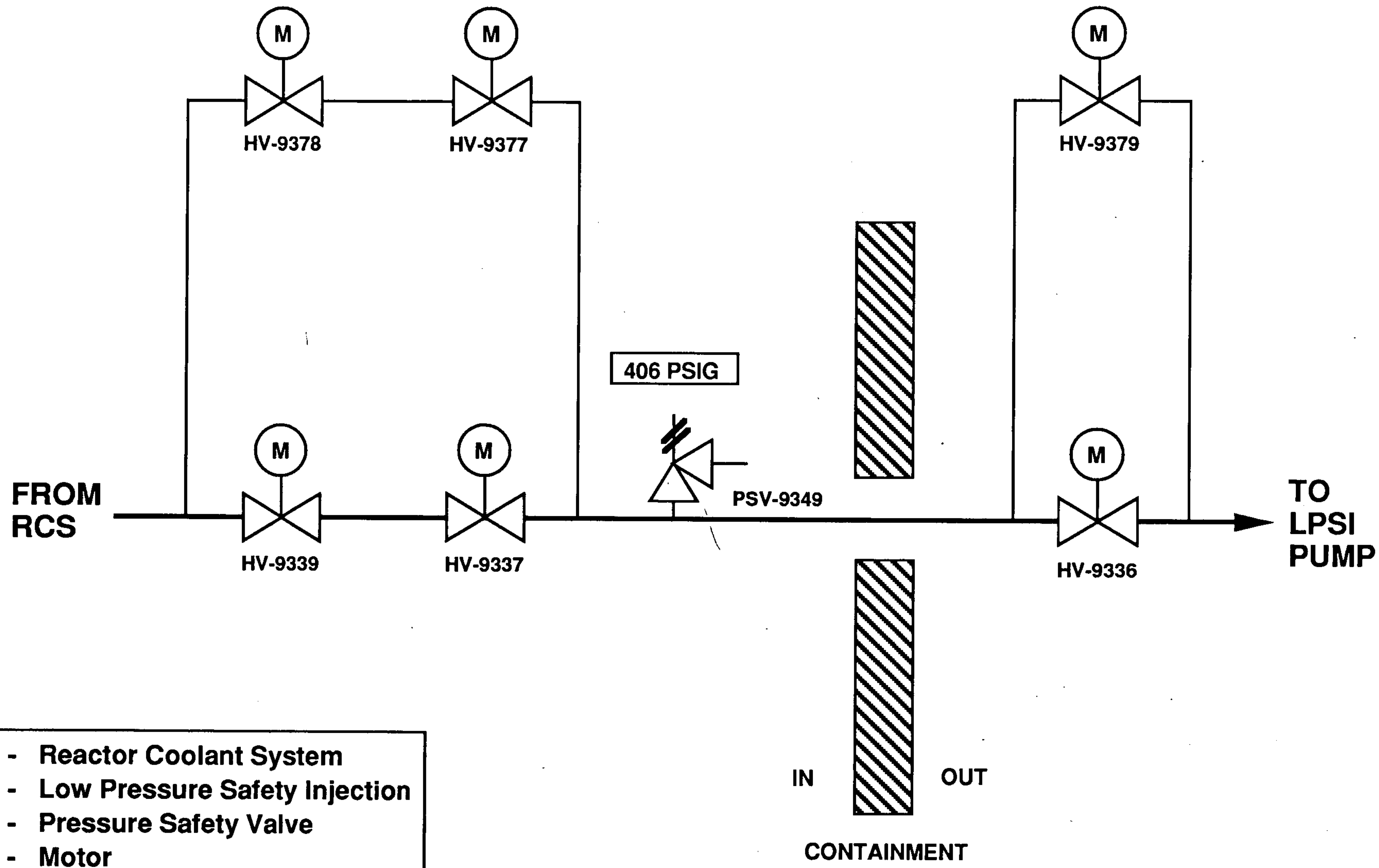
3) U.S. Nuclear Regulatory Commission, Generic Letter 88-17, "Loss of Decay Removal", October 17, 1988.

4) Pacific Gas and Electric Company, J. D. Schiffer to Nuclear Regulatory Commission, Removal of RHR System Auto Closure Interlock Function, August 4, 1987.

5) U.S. Nuclear Regulatory Commission, Memorandum from Brian W. Sheron to RSB Members, January 28, 1985.

6) Nuclear Regulatory Commission, NRR Safety Evaluation Relating to Removal of Auto Closure Interlock Function, February 17, 1988.

7) CE NPSD-550, Risk Evaluation of Removal of Shutdown Cooling System Auto-Closure Interlock Report.



RCS	-	Reactor Coolant System
LPSI	-	Low Pressure Safety Injection
PSV	-	Pressure Safety Valve
M	-	Motor

SHUTDOWN COOLING SYSTEM
SUCTION ISOLATION DRAWING

SAN ONOFRE UNITS 2 & 3
FIGURE 1