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U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Docket No. 50-206
Supplemental Report
Licensee Event Report No. 91-001, Revision 3
San Onofre Nuclear Generating Station, Unit 1

Reference: Letter, H. E. Morgan (SCE) to USNRC Document Control Desk, dated March 22, 1991

The referenced letter provided Licensee Event Report (LER) No. 91-001, (Revision 2), for a condition involving the incorrect coupling of a containment spray flow limiter valve actuator. As discussed at a meeting between SCE management and the Region V staff on May 3, 1991, the enclosed supplemental LER provides additional information concerning the safety significance of this condition. Neither the health and safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please so advise.

Sincerely,

R W Krieger

Enclosure: LER No. 91-001, Rev. 3

cc: C. W. Caldwell (USNRC Senior Resident Inspector, Units 1, 2 and 3)
J. B. Martin (Regional Administrator, USNRC Region V)
Institute of Nuclear Power Operations (INPO)

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LICENSEE EVENT REPORT (LER)

Facility Name (1)	Docket Number (2)	Page (3)
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1	0 5 0 0 0 2 0 6	1 of 1 5

Title (4)

Containment Spray Flow Limiter Valve Actuator Incorrectly Coupled

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
Month	Day	Year	Year	///	Sequential Number	///	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
											NONE	0 5 0 0 0
0 1	0 7	9 1	9 1	---	0 0 1	---	0 3	0 5	1 3	9 1		0 5 0 0 0

OPERATING MODE (9)	6
POWER LEVEL (10)	0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

___ 20.402(b)	___ 20.405(c)	___ 50.73(a)(2)(iv)	___ 73.71(b)
___ 20.405(a)(1)(i)	___ 50.36(c)(1)	___ 50.73(a)(2)(v)	___ 73.71(c)
___ 20.405(a)(1)(ii)	___ 50.36(c)(2)	___ 50.73(a)(2)(vii)	___ Other (Specify in Abstract below and in text)
___ 20.405(a)(1)(iii)	X 50.73(a)(2)(i)	___ 50.73(a)(2)(viii)(A)	
___ 20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	___ 50.73(a)(2)(viii)(B)	
___ 20.405(a)(1)(v)	___ 50.73(a)(2)(iii)	___ 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER (AREA CODE)
R. W. Krieger, Station Manager	7 1 4 3 6 8 - 6 2 5 5

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

		Expected Submission Date (15)	Month	Day	Year
___ Yes (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On 12/23/90, with Unit 1 in Mode 6, an evaluation of the performance of a Refueling Water Pump (RWP) (which provides containment spray) full flow Inservice Test (IST) revealed that position indication for flow restricting ball valve CV-518 was reversed (i.e., the valve indicated open when in the closed position and vice versa). This dual function valve is designed to open to increase flow to the containment spray header during Loss of Coolant (LOCA) and Main Steam Line Break (MSLB) accidents, and close to reduce flow during recirculation. On 1/7/91, following investigation and analysis, it was determined that this condition existed during plant operation, and would have affected the response of the Containment Spray System (CSS) and the Containment Recirculation System (CRS) to a LOCA or MSLB inside containment.

During a February 1989 maintenance activity in which the actuator was removed from the valve, the position of the valve was improperly changed resulting in improper alignment between the valve and actuator when the actuator was reinstalled. The cause of this event included procedural deficiencies, maintenance implementation deficiencies, deficient design characteristics, and a missed opportunity to identify the misaligned valve. Corrective actions to prevent recurrence include: procedural reviews and changes, training, and design changes. Although this event had minimal direct safety significance, SCE recognizes the programmatic significance of this event and is taking necessary corrective actions.

Plant: San Onofre Nuclear Generating Station
Unit: One
Reactor Vendor: Westinghouse
Discovery Date: 12-23-90

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 6, Core Offloaded

B. BACKGROUND INFORMATION:

1. System Description

The Containment Spray System (CSS) [BE] sprays borated water into containment following a Loss of Coolant Accident (LOCA) or a Main Steam Line Break (MSLB). The CSS is designed to (1) remove thermal energy from the containment atmosphere, thereby limiting both the temperature and pressure rise inside containment to less than design values following a LOCA or MSLB, and (2) remove radioactive particulate and iodine fission products from the containment atmosphere which may be released during a LOCA, thereby reducing dose consequences due to containment leakage.

A Safety Injection Signal (SIS) is generated at the onset of either a Loss of Coolant Accident (LOCA) or Main Steam Line Break (MSLB) inside containment by either a high containment pressure or low pressurizer pressure signal. The SIS actuates a series of pumps and valves that are required to respond to the accident. These pumps and valves are components of many plant systems (such as the CSS) but are collectively called the Emergency Core Cooling System (ECCS).

The ECCS performs its post accident functions in three distinct phases; injection, transition, and recirculation.

<u>Injection Phase:</u>

During the injection phase, borated water is drawn from the Refueling Water Storage Tank (RWST) by ECCS pumps and injected into the core region (to provide core cooling) and into the containment spray header to serve the spray function. During this phase maximum flow is provided for both the containment spray and core cooling function. The high core injection flow rapidly recovers the core while the high spray flow rapidly mitigates the pressure and temperature transients and plates out much of the radioactive particulate and iodine fission products.

Transition Phase:

The injection phase continues until the RWST level has dropped to the point where high flow into the core can no longer be supported by the available Net Pump Suction Head (NPSH) from the RWST. At this point the high flow injection pumps are automatically stopped by level sensors in the RWST. The lower flow charging pump (from the Charging and Volume Control System, (CVCS) which was also actuated by the SIS) continues to inject water into the core region during transition to provide sufficient cooling to preclude boil off and core uncovery. A second charging pump is manually started from the Control Room during this time to assist in this function. High spray flow continues during this phase as adequate NPSH remains available in the RWST.

Recirculation Phase:

During the transition phase the ECCS is manually realigned to enter the recirculation phase. In response to a LOCA the recirculation pumps draw suction from the sump and provide a water source to the pumps which serve the core cooling function (the charging pumps) and the spray function (the refueling water pumps (RWPs)). In response to an MSLB, the recirculation pumps draw suction from the sump and provide a water source to the RWPs only. RCS makeup during a MSLB is normally provided via the Volume Control Tank and charging pumps. The spent fuel pit can also be used for RCS makeup if the normal source is unavailable.

Spray flow is reduced at the onset of the recirculation phase in order to ensure sufficient NPSH is available from the recirculation pump discharge to support the spray and core cooling demands. Spray flow reduction is attained by operator action taken in the Control Room to secure one of the operating RWPs and to actuate the Spray Flow Limiter System (SFLS). Figure 1 is a representation of that system. The SFLS consists of two parallel isolation valves (CV-517 and CV-518) which isolate flow to orifice RO-525. This combination of valves and orifice form a bypass loop around flow orifice RO-526. During periods of high spray flow demand (the injection and transition phases) both RO-525 and RO-526 are lined up (i.e. CV-517 and CV-518 are Open), while during periods of low spray flow demand (the recirculation phase) only RO-526 is lined up as both CV-517 and CV-518 have been manually shut by operators in the Control Room to terminate spray flow through RO-525. The SFLS was designed such that the orifices serve to dictate the flow rate, and that the valves simply act as isolation devices. Therefore, if one of the valves, either CV-517 or CV-518 were to fail shut, spray flow through RO-525 would be unaffected as the redundant valve would still be open. During periods of high spray, flow rates in excess of 1000 gpm would by indicated on FT-504. The exact flow rate would depend on the number of RWPs running and containment backpressure. During periods of low spray, flow rates would drop to approximately 500 gpm as the result of isolating the RO-525 flow path by closing CV-517 and CV-518.

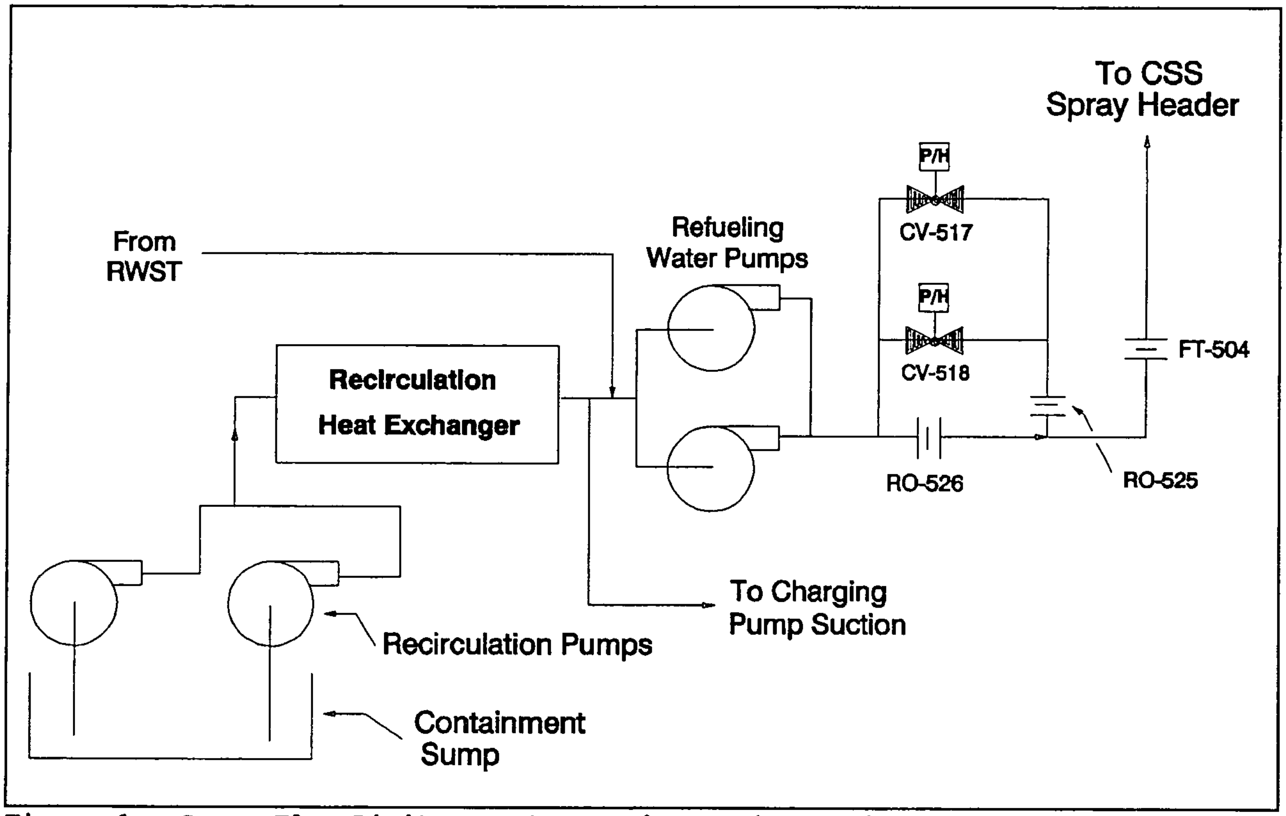

Figure 1 - Spray Flow Limiter System During Recirculation

2. Administrative Controls of Work Activities

A Work Authorization Record (WAR) is issued by the Equipment Control Section of the Operations Division and documents performance of the review and the authorization to perform work. In part, the WAR: 1) identifies the work to be accomplished, 2) documents the status of the equipment and any configuration which must be maintained to safely perform the activity, and 3) specifies the functional testing requirements which must be completed prior to returning the affected equipment to service.

A Maintenance Order is a set of instructions which address: 1) equipment disassembly, repair, and reassembly, 2) post-maintenance verification, and 3) post-maintenance functional testing, if appropriate.

C. DESCRIPTION OF THE EVENT:

1. Event:

On 12/23/90, with Unit 1 in Mode 6, a RWP full flow IST was performed requiring both containment spray system parallel flow restricting valves (CV-517 and CV-518) to be open. After establishing initial RWP flow, one of the two flow restricting valves (CV-517) was closed and a decrease in flow rate was noted. The second valve (CV-518) was then closed but rather than resulting in a decrease in downstream flow, as anticipated, an increase in flow was observed. This anomaly was promptly noted and diagnosed as most likely because the actuator for valve CV-518 was misaligned such that the valve was "open" when the actuator indicated "closed", and vice versa. The actuator had been removed during the current outage, therefore it was not immediately clear whether the misalignment had occurred during this outage, or before. On 1/7/91, following investigation and analysis, it was determined that this condition existed during plant operation, and would have affected the capability of the CSS and the Containment Recirculation System (CRS) to mitigate a Loss of Coolant Accident (LOCA) or Main Steam Line Break (MSLB) accident inside containment.

SCE's investigation concluded that the actuator and valve became misaligned in February 1989. With the valve in this condition following a CSS initiation (i.e., the valve closed when it was intended to be open), there would be sufficient spray flow during the injection phase since the parallel valve (CV-517) would have been available and open. During transition to the recirculation phase, which requires manual operator action, the two CSS flow restricting valves are closed to restrict flow such that the charging flow plus spray flow equals total recirculation flow (refer to figure). This prevents runout of the recirculation pumps, which provide recirculation flow for containment spray and reactor core cooling flow and prevents starving of the charging pump(s). Because of the misaligned actuator, CV-518 would have inadvertently been opened (rather than closed) and the system would have operated outside of the existing analyses in that the flow rate would have been greater than that for which the system has been analyzed. This condition would have existed until identified and corrected by operators monitoring plant system parameters.

2. Inoperable Structures, Systems or Components that Contributed to the Event:

   Not applicable.

3. Sequence of Events:

DATE	ACTION
01/21/89	CV-518 actuator decoupled and removed.
02/13/89	CV-518 manually opened to support leak rate testing.
02/18/89	CV-518 actuator installed following maintenance overhaul.
02/20/89	CV-518 stroked to failed position and valve position indication checked.
04/24/89	Unit 1 entered Mode 4.
06/30/90	Unit 1 refueling outage commenced.
12/23/90	Full flow IST performed on Refueling Water Pumps. Misassembly of CV-518 identified.
12/27/90	CV-518 repositioned to the proper orientation.
01/07/91	Flow test performed that determined CV-518 was misaligned prior to the current outage.

4. Method of Discovery:

   This condition was discovered during the full flow IST of the refueling water pumps.

5. Personnel Actions and Analysis of Actions:

   Not applicable.

6. Safety System Responses:

   Not applicable.

D. CAUSE OF THE EVENT:

SCE's investigation included a review of the history of CV-517 and CV-518 from the original installation and included all maintenance and construction activities which could have affected the position of the valve. The scenario resulting in the misalignment of CV-518 occurred as follows:

- The valve was CLOSED and de-energized with fuses and air supply removed for actuator overhaul maintenance [01/03/89].
- The valve actuator was decoupled and removed by Maintenance [01/21/89].
- A refueling interval recirculation system leakage test was scheduled which required CV-518 to be OPEN.
- Operations manually aligned the valve to the OPEN position using a wrench [02/13/89].
- Maintenance, assuming the valve was in the same position as when the actuator was removed, recoupled the de-energized actuator 90 degrees out of alignment [02/18/89].
- Post maintenance retest of the valve included a test of the position indicator light and a stroke time of the valve, neither of which could identify the valve/actuator misassembly [02/20/89].

1. Procedural Controls

The actuator was misaligned as a result of an evolution (i.e., the valve position was manually changed) without proper procedural controls. This resulted in a change to the plant configuration without (1) any centralized record which tracked the change in position, or (2) any documentation which required the valve to be returned to its original state.

A WAR was issued to allow the removal of the actuators from CV-517 and CV-518 for overhaul. This WAR was limited to the actuators as the maintenance activity did not require valve manipulation. The valve was closed and de-energized prior to the removal of the actuators from the valves in accordance with procedures and Maintenance Orders.

With the actuator uncoupled from the valve, a recirculation system leak rate test was performed which required that CV-518 be open. The valve was repositioned manually, but the change in valve status was not factored into the ongoing maintenance activity associated with the actuators. Consequently, the actuator was recoupled to the valve in the open, rather than in the closed position. The procedural controls governing these activities were not sufficiently rigorous to ensure that valve status was accurately tracked and accounted for.

In addition, the valve maintenance procedure includes a note requiring the valve to be closed during coupling of the actuator. However, it did not provide adequate guidance for determining valve position (such as use of scribe marks) prior to recoupling.

2. Missed Opportunity

During the root cause investigation of the incorrect coupling of CV-518, evidence of a similar problem on CV-517 was identified in a Maintenance Incident Investigation Report (MIIR). A MIIR is utilized to provide a means of investigating deficiencies of work processes within the Maintenance Division. The MIIR on CV-517 discusses similar circumstances resulting in the misalignment of a functionally identical valve at the same time in 1989 as the CV-518 event. In the case of CV-517 however, the misalignment was identified and corrected.

SCE expects that when a misassembly such as that recorded in the MIIR is identified, efforts are made to ensure similar equipment has been properly installed. This represented a missed opportunity to identify that CV-518, the parallel flow control valve, was also misaligned.

3. Verification of Maintenance Activities

a. Match-marking

Maintenance Division personnel often mark component pieces (match-marking) during disassembly to ensure correct reassembly. In this incident, craftsman did not mark the position of the valve and actuator and therefore no evidence existed that valve position had been changed prior to reassembly of the actuator. Neither the procedure nor the MO required match-marking to ensure the valve and actuator were properly aligned prior to actuator installation. The failure to match-mark the components prior to disassembly contributed to the improper realignment.

b. Post-Maintenance Testing

Upon completion of maintenance activities, testing of the actual component or verification that the maintenance activity was performed correctly is required. The post maintenance test of CV-518 included a position indication test and a stroke test. However, since the valve is a "ball" type valve, the actuator stroked properly, and the position indication changed. Thus, the post maintenance test was inadequate to ensure proper valve position. In addition, verification of proper valve position during the work activity or after completion was not accomplished.

4. Design Characteristics

The design of the CV-517 and CV-518 valve and actuator assembly (and eight other identical valves at SONGS 1) is such that there is no physical provision to avoid improper coupling. Although maintenance procedures required the valve to be closed prior to recoupling of the actuator, there was no positive visual indication of valve position which was known to the maintenance personnel.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

a. The valve and actuator have been recoupled in the correct configuration.

b. SCE has investigated this event to ensure all causes and corrective actions are properly determined.

c. Any manual or motor operated ball valve in which position misalignment is possible or valve position is uncertain, has been inspected or evaluated to ensure proper valve position.

d. A Retest Committee has been established to review the post-maintenance testing performed on certain safety-related systems. As described in LER 90-015-01 (Docket No. 50-361) this review is performed for work done on any component which affects, or could potentially affect, system operability.

e. The population of both manual and motor operated ball valves at Unit 1 has been identified. Manufacturers of these valves have been contacted and design documents reviewed to determine if other ball valves and actuators could be assembled such that the position of the valve was indeterminant. Automatic valves for which a design change could provide permanent and positive local visual position indication have been modified. Valves which cannot be similarly modified will be addressed through appropriate maintenance procedure revisions (see 2.b). Manual valves require no additional position indication other than that provided by valve handle orientation.

f. As a result of additional evaluations of the RWPs for inservice testing (IST), a flow path that permits testings of these pumps at close to full flow conditions was identified. This testing is only possible in Mode 5, and was incorporated into the IST procedures as a Refueling interval test. This method of testing would identify the misalignment of CV-517 or CV-518, whould it occur in the future.

2. Planned Corrective Actions:

a. Procedural controls for valve alignments will be revised to ensure that changes to plant configuration which could affect other maintenance activities are properly tracked.

b. Maintenance procedures will be revised to clearly and strictly define the reassembly of ball valves which can not be permanently and positively marked to verify valve position.

c. Maintenance procedures will be revised to include permanent match-marking of all ball valves prior to disassembly and post maintenance verification of correct valve position.

d. This event will be reviewed with appropriate Operations and Maintenance personnel, and will emphasize the understanding of work scope and component function. Additionally, the event will be included in the annual requalification program for Operations and Maintenance personnel.

e. Senior management will be meeting with all maintenance personnel in a series of special meetings to stress the importance of this event and the missed opportunity which prevented an early detection of the misalignment of CV-518.

F. SAFETY SIGNIFICANCE OF THE EVENT:

SCE has evaluated the safety significance of the misalignment of CV-518 to determine the potential effects of this condition on ECCS performance following either a LOCA or MSLB. The safety significance of this event is minimal due to the ability of the recirculation pumps alone to supply adequate flow to the charging (ECCS) pump suction and to the containment spray system without RWP operation in the event CV-518 was open during the recirculation phase. In addition, although not essential, it is anticipated that operator action would be taken to recognize and correct the misalignment of CV-518 during recirculation.

As discussed in Section B.1, ECCS functions occur in three distinct phases; injection, transition, and recirculation. During the first two phases, injection and transition, maximum spray flow is a desired condition. The SFLS is designed to provide maximum spray flow whether both CV-517 and CV-518 are open, or if only one is open. Therefore, the misalignment (closed) of CV-518 during these two phases has no adverse consequences since the desired flow rate is achieved by the open path provided by CV-517. Operations personnel in the Control Room would be unaware of the misalignment of CV-518 at this point as its position indication would be correct and the containment spray flow indication (FT-504) would indicate full spray flow.

The misalignment of CV-518 would become apparent during the onset of the recirculation phase when Operations personnel attempted to reduce spray flow from high to low flow conditions by closing CV-517 and CV-518. The expected decrease of spray flow as indicated on FT-504 from in excess of 1000 gpm to approximately 500 gpm would not occur. In fact, only a slight decrease in spray flow would be evident in the Control Room. Unless RO-526 had suffered a catastrophic failure which rendered it incapable of restricting flow (a highly unlikely phenomena) the operators would consider that either one of the SFLS bypass isolation valves (CV-517 or CV-518) had failed to shut or that FT-504 was malfunctioning. It is therefore expected that Operations personnel would deduce that a valve was open and take action to identify the open valve by cycling them individually from the indicated close position to the open position (i.e., actually closed). During this process, they would recognize that opening CV-518 reduced the CSS flow to the expected 500 gpm and leave the valve in the indicated open position. The response by the operators to anomalous spray flow conditions during the recirculation phase as described above is considered to be likely based on the following: 1) operators receive extensive ongoing training in all facets of reactor operation (both classroom and simulator training addresses the spray flow requirements including the anticipated reduction during recirculation), 2) the expected 500 gpm flow rate is included in the background document to the LOCA emergency operating instruction and is available to Control Room personnel, and 3) the Shift Technical Adviser (STA), who also receives extensive training regarding reactor operations, would be available to continually monitor and assess plant conditions and provide additional insight into plant system responses.

Assuming the operators did not notice that the expected decrease in spray flow did not occur or they elected to believe that the valve indication was correct and the flow indication was in error, the operating RWP would ultimately trip on an overload condition. Recently completed hydraulic calculations determined that with CV-518 open during initial recirculation, a flow demand of approximately 1500 gpm is placed on the operating RWP. The RWP has a motor rating of 150 hp with a 1250 gpm runout point. The RWP motor power demand would rise in its attempt to meet the flow demand. The RWP motor over-current trip would stop the motor at the predicted load of 190 hp in approximately 8 minutes. The charging system would remain set at the normal cold leg injection total flow of 345 gpm. The recirculation pumps have a capacity of 1100 gpm each at full load. With both recirculation pumps in service, as directed by the emergency operating instruction, the total recirculation capacity is 2200 gpm. This flow capacity exceeds the total of 1845 gpm required by the refueling water pump and charging pumps. Therefore, the recirculation and charging pumps remain within their runout limits and would not have been adversely affected. The tripping of the operating RWP would be a clear signal to the operators that FT-504 was indicating properly and that a problem existed with the SFLS bypass isolation valve alignment. The operators would start the second RWP and attempt to understand and correct the problem. If not corrected within 8 minutes, the second RWP would then trip on overload.

Assuming the operators failed to understand and correct the alignment of CV-518, adequate spray flow would still be delivered. While in an idle condition, the two parallel, single stage RWPs offer very low hydraulic resistance. In addition, the head loss, with CV-518 open, of the SFLS is also low. A hydraulic analysis of the system performance with both RWPs idled indicated that the two operating recirculation pumps would be able to supply approximately 780 gpm to the containment spray system in addition to the 345 gpm required for ECCS injection. The 780 gpm spray exceeds the 500 gpm assumed in the safety analysis and thus, is more than adequate for long term containment cooling. The RWPs are end suction, top discharge, single stage, straight-vane impeller type centrifugal pumps. The suction and discharge nozzles are an integral part of the volute type casing which is designed for smooth flow with gradual change in velocity. The cross- sectional free flow area within a pump of this type is relatively large and provides very little resistance to flow. Basically, the flow enters the idle pump axially through the 6-inch suction connection and makes a 90 degree turn to flow radially out through the impeller into the volute casing. Depending on the location in the volute, the water changes direction and flows to the 4-inch vertical outlet. An equivalent piped system consisting of an expansion joint into the pump impeller eye, two 90 degree bends, and a contraction joint from the pump casing into the 4-inch outlet pipe would have a velocity head loss factor of approximately 2. As a conservative input to the spray flow analysis, the idle RWPs were modeled as a 4-inch diameter component with a head loss coefficient of 5. The spray delivery through the idle RWPs with CV-518 open is relatively insensitive to the assumed head loss coefficient for the pumps. For instance, a 100% increase, by doubling the loss coefficient to 10, reduces the spray flow only about 4% (30 gpm) to approximately 750 gpm.

CV-517 and CV-518 are pneumatic/hydraulic, fail closed valves. Hydraulic pressure, which is required to open the valves, is provided by a hydraulic pump which is in turn driven by an instrument air operated motor. The closing force is provided by a high pressure nitrogen accumulator. A total loss of instrument air with the valves in the open position would permit a single additional valve closing stroke, thus permitting transition to recirculation. If instrument air were to be lost coincident with the postulated accident, the ability of the operators to correct the misalignment of CV-518 as discussed previously could be impaired. Although such an occurrence is possible, it is considered to be highly unlikely. The only credible causes for loss of instrument air during an MSLB or LOCA (the only events for which containment spray is necessary) are as follows:

(1) A High Energy Line Break (HELB) induced rupture of an instrument air line inside containment:

The instrument air header outside containment (CV-517/518 are located outside of containment), is protected from failure due to a header break inside containment by a pressure control valve located just outside of the sphere. Assuming a (HELB) induced rupture of the instrument air line inside of containment, the outside containment instrument air supply header pressure could drop to 60 psig at which point the pressure control valve will regulate closed as necessary to maintain 60 psig in the header outside of containment. 60 psig pressure is sufficient to operate the hydraulic pumps in the CV-517/518 actuators.

(2) A SIS/LOP (Loss of Power) condition resulting in the de-energization of the instrument air compressors:

The instrument air compressors are initially shed on LOP but automatically re-start when the SI signal is reset and the 480V buses re-energized. Once the 480V buses, which provide motive power to the instrument air compressors, are re-energized the air compressors autostart in response to low air header pressure signals. By procedure, these actions are completed prior to the alignment of the recirculation system. Therefore, the air compressors will be running after a SIS/LOP before instrument air is required to permit operation of CV-517/518.

Since the conditions noted in this LER (misalignment of CV-518) have existed since 2/89, the consequences of the misalignment in conjunction with events reported in LERs submitted in 1989, 1990 and 1991 have also been assessed. In all but one case the assessments of Safety Significance noted in the LERs remain unaffected. In the Safety Significance section of LER 90-006 (Docket 50-206), "Non-conservative Failure Mode of Chemical Volume and Control Valve CV-406B" the availability of the alternate cold leg recirculation path (used to recirculate RCS post-LOCA), was briefly noted. This LER reported that; 1) CV-406A which provides blended boric acid to the Volume Control Tank (VCT), failed open on loss of instrument air as specified on the associated Piping and Instrumentation Drawing (P&ID), and 2) CV-406B which provides blended boric acid to the charging pump suction header also failed open on loss of instrument air, contrary to its fail-safe position as specified on its associated P&ID. During the review of the valve fail-safe position testing, the potential impact on system performance during normal plant operation and certain postulated accident scenarios was identified. Specifically, it was determined that with the CV-406B installation deficiency that a potential existed for an inadvertent injection of the VCT hydrogen gas into the charging pump suction header in the event of either an assumed loss of instrument air or loss of the control power supply (120VAC) which is common to both CV-406A and CV-406B solenoid valves. At the time that this LER was submitted, SCE postulated that the inadvertent injection of the VCT hydrogen gas could result in the gas binding of the operating charging pumps with subsequent loss of cold leg recirculation capability. The LER noted that this would be an improbable occurrence, but conservatively assessed its consequences. As noted in the LER Safety Significance, the expected response would be for operations personnel to vent the suction header prior to starting the second charging pump, thus maintaining cold leg recirculation capability. In the highly unlikely event that operations personnel failed to vent the charging pump suction path, the second pump could similarly gas bind and fail. The LER noted that the alternate cold leg recirculation path was available under those conditions. However, the alternate path uses the RWPs and would not have been available as a backup until CV-518 was properly aligned and the RWPs were operable. It is to be recognized, however, that a very specific sequence of events, which is highly unlikely to occur, must in fact occur in order for the hydrogen gas from the VCT to bind both charging pumps. This sequence includes a loss of instrument air prior to the occurrence of a safety injection signal (SIS), the loss of VCT makeup prior to receipt of a SIS, the emptying of the VCT and subsequent ingestion of a significant hydrogen bubble by the operating charging pump, and finally the failure of the operators to follow procedures and vent the line prior to starting the backup charging pump.

As there was no adverse impact on any other ECCS components and since adequate spray flow would be provided, we have concluded that there is minimal direct safety significance associated with this event.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

   Not Applicable.

2. Previous LERs for Similar Events:

   Not Applicable.