10 6
PDR

ACTION PLAN # 5, 6 & 7

TITLE: SFRCS Trip/MSIV Closure

REV	DATE	REASON FOR REVISION	BY	CHAIRMAN TASK FORCE	APPR. FOR IMPL.
0	6/22/85	Initial Issue	See Rev. 0 for approvals		
1	7/3/85	Clarifications and the Incorporation of Additional Steps as a Result of Discussions with the NRC	[signature]	[signature]	

TITLE:	SFRCS Trip/MSIV Closure
REPORT BY:	F. Miller, S. Jain, L. Stalter, K. Yarger PLAN NO.: 5, 6 & 7
DATE PREPARED:	July 5, 1985 (Revision 1) PAGE 1 of 8

I. INTRODUCTION:

This report has been prepared in accordance with the "Guidelines to Follow When Troubleshooting for Performing Investigative Actions into the Root Causes Surrounding the June 9, 1985 Reactor Trip", Rev. 4.

On June 9, 1985 a low Steam Generator (SG) level full trip of the Steam and Feedwater Rupture Control System (SFRCS) occurred immediately following the main turbine trip and closure of associated stop valves. This information was observed from the alarm log of the event. Closure of both Main Steam Isolation Valves (MSIV) followed approximately 5 seconds after the SFRCS full trip. No previous spurious low SG level trips of the SFRCS have been observed at Davis-Besse (DB) prior to the 1984 Refueling Outage.

Although occurrence of a (spurious) full trip of SFRCS during the June 9, 1985 trip is evidenced by computer alarm Q963, there may be some question regarding its validity because of the observed inadequate performance of this alarm function in the recent past. This report aims at analyzing the issues of the occurrence of spurious SFRCS trip, the SFRCS full trip alarm function and the closure of MSIVs.

II. SUMMARY OF DATA

During a review of the data available from June 9, 1985 event, it was revealed that the SFRCS SG low level trip occurred immediately after the turbine trip.

The "sequence of events" computer points (monitored at a very high frequency) that are of relevance to this action plan are listed below:

1:35:30:060	X038	T-G Master Turbine Trip
1:35:30:095	X030	T-G Master Trip Solenoid Trip
1:35:30:285	X033	T-G Mechanical Trip Solenoid Trip
1:35:30:310	X032	T-G Mechancial Trip Valve Turbine Trip
1:35:30:935	Q963	SFRCS Full Trip
1:35:34:070	Q963	SFRCS Full Trip Normal

In addition, several computer points from the alarm log are listed below to aid in subsequent discussion relating to SFRCS trip and MSIV closure.

1:35:31	Q777	ARTS Trip
1:35:31	X044	SFRCS Trip of Turbine (However, turbine was already tripped)
1:35:36	Z686	MSIV 2 Closed
1:35:37	Z683	MSIV 1 Closed

From the above list, it is derived that the SFRCS full trip alarm stayed in for a duration of 3.135 seconds. It is emphasized that there is a built-in 2-second time delay in resetting of the SFRCS full trip alarm. Therefore it is possible that the full trip alarm condition may have actually stayed in for a duration of 1.135 to 3.135 seconds or less depending on the actual delay setting of the relay. From the above review, it is determined that a full trip of SFRCS indeed occurred at 1:35:31. This is supported by occurrence of computer alarms Q963, Q777 and X044 as noted above. However, all the SFRCS initiated equipment did not actuate following this full trip and only the MSIV's moved to assume their SFRCS actuated position (closed).

Review of past experience indicates the following:

1. Prior to the 1984 refueling outage, many turbine trips occurred that did not cause spurious SFRCS trips.

2. On April 24, 1985, a half trip of Channel 2 low SG level occurred on a main turbine trip and closure of associated stop valves. No full SFRCS trip was recorded during this event.

3. On June 2, 1985, a half trip of Channel 2 low SG level also occurred on a main turbine trip/stop valve closure. An SFRCS full trip alarm was also recorded on the computer at this time. No devices were actuated by this event and the SFRCS did not attempt to trip the main turbine.

MAINTENANCE AND SURVEILLANCE/TESTING HISTORY

The following is a listing of maintenance and surveillance test activities performed since the 1984 refueling outage:

1. Surveillance Test ST 5031.14 was performed on all channels for each input parameter once each month. No abnormalities were found, no drifting of components was noted since the 1984 refueling outage.

2. The apparent spurious trip of SFRCS Channel 2 was investigated under MWO 1-85-1444-00 dated 4/24/85. This MWO called for running the monthly surveillance test while checking for anomalies. No anomalies were found.

3. A relay driver board was replaced in the SFRCS logic Channel 1 for relay K201A (MWO 1-85-1552-00 dated 5/4/85).

4. A power supply was replaced in SFRCS logic Channel 2 (MWO 1-85-1843-00 dated 5/27/85).

5. The status light socket for K602A relay in the SFRCS logic channel was replaced (MWO 1-85-1860-00 dated 5/29/85).

6. Troubleshooting was performed on SFRCS alarm logic Q963 (MWO 1-85-1877-00 dated 6/2/85). This MWO called for testing the alarm logic to

determine why a full SFRCS trip alarm occurred on a half trip. In the process of checking, a connection was reterminated and the problem cleared. Testing on both SFRCS channel 2 and channel 4 was completed per section 6.4 of ST 5031.14. No drifting of setpoints or other anomalies were found.

A review of these maintenance and surveillance testing activities reveals no adverse impact on the functional operation of the SFRCS.

III. CHANGE ANALYSIS:

The following changes were completed during or after the 1984 refueling outage:

1. All SFRCS/steam generator level transmitter amplifier and calibration boards were replaced to ensure continued compliance with the environmental qualification requirements (MWO 1-84-1269-00).

   All transmitters were calibrated and response time tested through surveillance test ST-5031.16. All acceptance criteria were met.

2. The SG level transmitters providing startup level indication on the control panel and SG level control were changed from Bailey BY to Rosemount 1153 transmitters. It is noted that these transmitters are connected to the same taps and sensing lines as the SFRCS SG level sensing transmitters.

3. The Steam Generator Level Indication and Control (SGLIC) circuits were modified by FCR 80-110 which installed new analog - bistable units to add the steam generator high level trip capability. This required that the original bistables used for low level trip also be replaced to gain cabinet space. These units are now a composite unit in that the analog and bistable functions are contained in one unit as compared to separate analog and bistable units previously used for the low level trip function.

   All modules were calibrated and response time tested through surveillance test ST-5031.15. All acceptance criteria were met.

4. Both SFRCS actuation channels were modified to provide for blocking of the steam generator high level trip by FCR 80-110 Rev. A. This change was tested by surveillance test (ST-5031.14 Sections 6.1 and 6.14) This verified that the installation was correct and that the level set points for both the high trip and the low trip were set properly.

5. Both SFRCS actuation channels were modified by FCR 81-178 to provide for the additional opening of steam supply valves (MS106A & MS107A) to the auxiliary feedwater pump turbines on steam generator high or low level, high steam generator feedwater differential pressure and loss of all four reactor coolant pumps.

6. The addition of the valve actuation logic by FCR 81-178 was defeated by FCR 81-178 Rev. A as it may have caused pipe hanger damage to occur in the steam lines to the auxiliary feedwater pump turbines. FCR 81-178A was tested by TP 580.00 and all acceptance criteria were met.

7. Both SFRCS actuation channels were modified to allow operation of the steam generator blowdown valves HV 603 and HV 611 for modes 1, 2, and 3 operation. Additionally, capability to block the SFRCS trip and open these valves from the control room was also provided. This change was completed and tested (TP 520.81 and ST 5030.18) during the 1984 refueling outage.

IV. HYPOTHESES

As evident from the above evaluation, two issues need to be resolved by this report. The first relates to the spurious SFRCS full trip actuation and the second relates to closure of only the MSIV's (partial actuation of the SFRCS). Following is a listing of the hypotheses considered by TED for both of these issues. Since some postulations below may relate to the spurious SFRCS trip resulting in only the partial actuation, few of the following hypotheses may also include closure of MSIV's as an integral part. Note that the SFRCS full trip alarm function is implicitly addressed by the action plan.

Hypothesis-1 (SFRCS Trip and MSIV Closure)

It is postulated that on June 9, 1985 1/2 SG low level* trips occurred within each half of an SFRCS actuation channel with the following results:

1. They overlapped long enough to allow the following alarms to occur:

    a. Q963 SFRCS FULL TRIP; this alarm requires that both halves of an SFRCS be tripped simultaneously.

    b. Q777 ARTS TRIP (Anticipatory Reactor Trip System); this alarm indicates that the ARTS was tripped. Since no other ARTS input alarms occurred, the only way that this alarm could have actuated would be due to an SFRCS trip of ARTS.

    c. X044 T-G MN STM (Turbine-Generator Main Steam) and FW TURB TRIP (Feedwater Turbine Trip); this trip indicates that the SFRCS sent a trip signal to the main turbine. However, the main turbine had already been tripped by the reactor trip.

---

*It is noted that the scenario observed during the June 9, 1985 reactor trip could also have been attributed to the spurious high level trips within each half of an SFRCS actuation channel. However, a high level trip is considered to be less likely than a low level trip in this instance because of closer proximity of the actual steam generator levels to the low level trip setpoint (26.5" indicated) than to the high level trip setpoint (approximately 280" indicated) for the time period of interest during this transient.

As noted earlier, the actual existence of the SFRCS trip may have been of a very short duration. The cause of the half trips of SFRCS is postulated to be the SG startup range level transmitter output oscillations due to pressure oscillations from the closure of the main turbine stop valves.

2. Each half trip occurred long enough to allow the electrically operated solenoid valves and the air pilot valves in the MSIV air system to trip. These half trips overlapped long enough to allow the "seal-in" circuits to drop out, and thus, the MSIVs stayed closed after the SFRCS half trips were automatically reset.

3. The half trips did not overlap long enough to pick up and seal-in the starters on any SFRCS actuated motor operated valves (MOV). This may explain why the auxiliary feedwater pumps did not start during this spurious full trip of SFRCS. It is noted that several similar partial actuations of SFRCS (resulting in MSIV closure but not causing MOV operation) have occurred in the past. These actuations at that time were attributed to the simultaneous or nearly simultaneous occurrences of half trips in the SFRCS--that did not result in actuation of MOV's due to differences in the MSIV relaying and response time of the pneumatic valve control circuits as compared to motor operated valve control circuits.

4. Each half trip occurred long enough to allow the electrically operated solenoid valves in the Main Feedwater Startup Control Valve (SP7A, SP7B) air system to trip. However, these half trips did not overlap long enough to allow the "seal-in" circuits to drop out, and therefore, the Main Feedwater Startup Control Valves remained open.

It can also be postulated that significant noise levels (hydraulic as well as electronic) may exist in the steam generator level instrumentation strings during normal power operation. These noise levels may be substantially augmented by pressure oscillations ensuing after a turbine trip. With the replacement of Bailey BY transmitters with Rosemount 1153 transmitters in the 1984 refueling outage these noise levels may now be readily detectable by the SFRCS to result in spurious half/full trips. The attached action plan incorporates provisions for determination of such noise levels in these strings to evaluate its contribution to spurious SFRCS level trips.

Following evidence is offered in support of the above hypothesis:

Subsequent to the June 9, 1985 trip transient, it was determined that earlier test data from other plants exhibited wide oscillations in level transmitter output for about 10 seconds after a main turbine trip (and stop valve closure) from 100%. Data from another B&W Unit also supports the existence of wide oscillations in the startup range level transmitter output following a main turbine stop valve closure. A review of data from Davis-Besse preoperational testing for a turbine trip further substantiates existence of wide swings in startup range level transmitter output (See Figures 1A and 1B). It is noted that these pressure oscillations are judged to have no impact on steam generator or NSS integrity.

Preliminary information is available which indicates that the response characteristic of a given transmitter can change radically when a transmitter of a different style and using the same level taps is replaced as noted in Item 2 of the "Change Analysis" Section.

Special tests are required to determine the duration of SFRCS trip on June 9, 1985, the trip and trip reset response times for the components in the MSIV and the Main Feedwater Startup Control Valve control circuits. Provisions for these tests are incorporated in the attached action plan.

Hypothesis-2 (SFRCS TRIP)

The spurious full trip of SFRCS may have been caused by some cross-talk between the two logic channels of a given actuation channel. It is noted that the SFRCS contains two actuation channels. Each actuation channel consists of two logic channels (half channels). It may be hypothesized that cross-talk between the two half channels may cause spurious actuation of the respective actuation channel resulting in observed computer alarms (and closure of both MSIV's). Such spurious cross-talk may also be hypothesized to cause full SFRCS trips due to associated power supply failures or an electrical transient that may occur on a turbine-generator trip.

Possibility of the above hypothesis is, however, considered remote since the two logic channel halves of each actuation channel of the Davis-Besse SFRCS are electrically redundant and separate. The SFRCS does not utilize shared power supply commons (as is the case for the Safety Features Actuation System). Thus a path for this cross-talk is not considered possible. Moreover, one logic half of an actuation channel is AC powered and the other is DC powered. This provides additional redundancy and diversity. Further, the main turbine trip circuits are powered from non-1E power sources separate from those that power the SFRCS channels. Based on the above it is concluded that spurious cross-talk between the two halves of an actuation channel or between the main turbine trip circuits and the SFRCS circuits resulting from the above mentioned conditions, i.e. power supply failures or an electrical transient caused by a turbine-generator trip is apparently not the most probable root cause for the SFRCS full trip. However, tests for verification of such separation are included in the attached action plan.

Hypothesis-3 (SFRCS TRIP)

Because of several modifications (See Section III) made either to the SFRCS logic (FCRs 81-178 Rev. 0, and Rev. A) or to the associated analog bistable circuity (FCRs 80-110 Rev. 0 and Rev. A) in the 1984 refueling outage, it may be postulated that a logic malfunction or an SFRCS circuitry misoperation may result in inadvertent operation of an actuation channel. The observed SG low level full trip may be hypothesized to be associated with either the revised (then subsequently "restored") logic boards or the modified analog bistable circuitry.

The above hypothesis is again only remotely possible since the integrated SFRCS test (ST5031.18) conducted following the completion of FCRs 80-110 Rev. 0, Rev. A and 81-178 Rev. 0 verified proper operation of both the

system logic and the SFRCS functions associated with a low level condition in either steam generator. This test did not identify any malfunctions in system logic and function negating the hypothesis that the spurious trip may have been caused by a malfunction of SFRCS logic. However, the attached action plan addresses a review of the SFRCS surveillance test program to determine whether the system logic design is adequately tested and that the logic operation is in compliance with the design.

Hypothesis-4 (SFRCS Trip)

It may be postulated that the system modifications referenced in hypothesis 3 that were completed in the 1984 refueling outage may have affected the response characteristic of the steam generator level sensing channels and bistables such that momentary disturbances in level instrumentation output may be more readily picked up by the SFRCS to result in tripping of an actuation channel. Note that these momentary disturbances may either be caused by an electrical transient or a pressure transient resulting from turbine stop valve closure.

Required testing to verify the validity of this hypothesis is also included in the attached action plan. This is to be done by measuring the trip and reset response times of the new bistables and comparing the resultant data with the older design.

Hypothesis-5 (SFRCS Trip)

It may be postulated that the spurious SFRCS trip may have been caused by momentary swings in actual steam generator level which may have occurred either as a result of or independent of turbine stop valve closure. However it is considered physically impossible to experience such large momentary changes in the actual steam generator level since the actual water level will have to move approximately 80-100 inches per second which corresponds to about three to four thousand gallons of saturated water per second for a low steam generator level trip. For a high level trip the amount of water to be mobilized will be much higher. Because of the relative improbability of this hypothesis it is not considered further in this evaluation.

Hypothesis-6 (MSIV Closure)

Independent of the SFRCS, it may be postulated that the MSIV closure was caused by a malfunction within the MSIV closure circuitry which includes the solenoid valves and air operated pilot valves. Although the probability of such a malfunction, pre-existent or that occurring during the transient, that could affect both MSIV's is considered to be very low, the attached action plan provides for testing of this logic circuitry to verify proper operation.

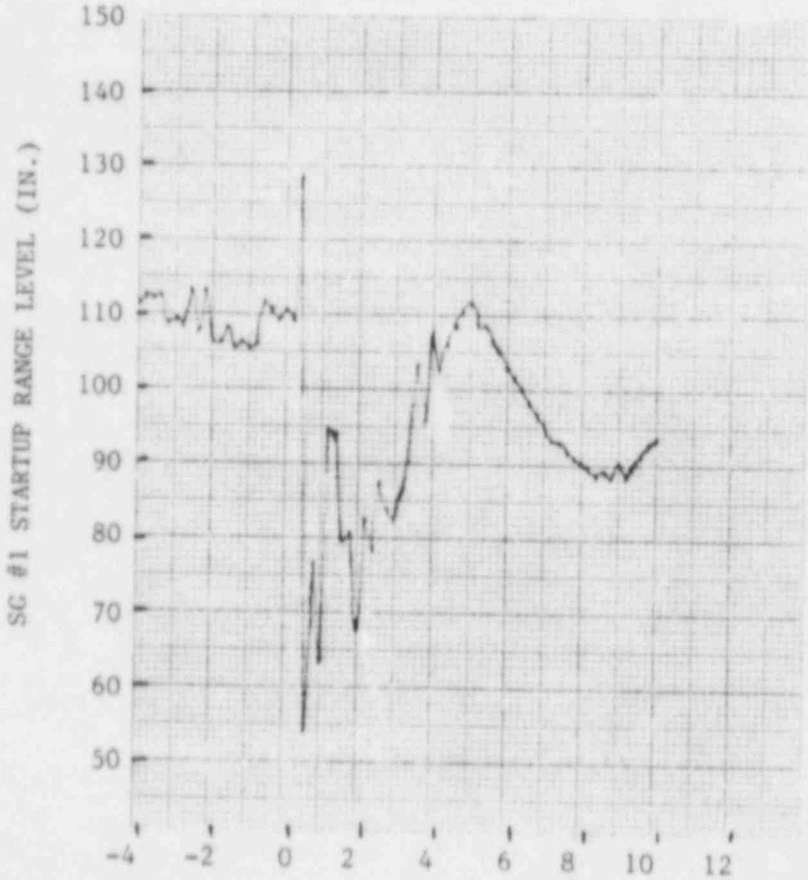
Hypothesis-7 (MSIV Closure)

At the time of the turbine trip, a severe transient in the MSIV air supply system may be postulated to occur because of operation of several pneumatic valves and air dump relay in the turbine system. This air supply system transient may have caused the closure of MSIV independently of the

momentary spurious SFRCS actuation. However, this hypothesis is ruled out since if such an air supply transient were to occur, the MSIV's would have come open once the air pressure was restored or the air pressure transient subsided.

ap 5 & 7-1
7/32/85 jsh

FIGURE 1a



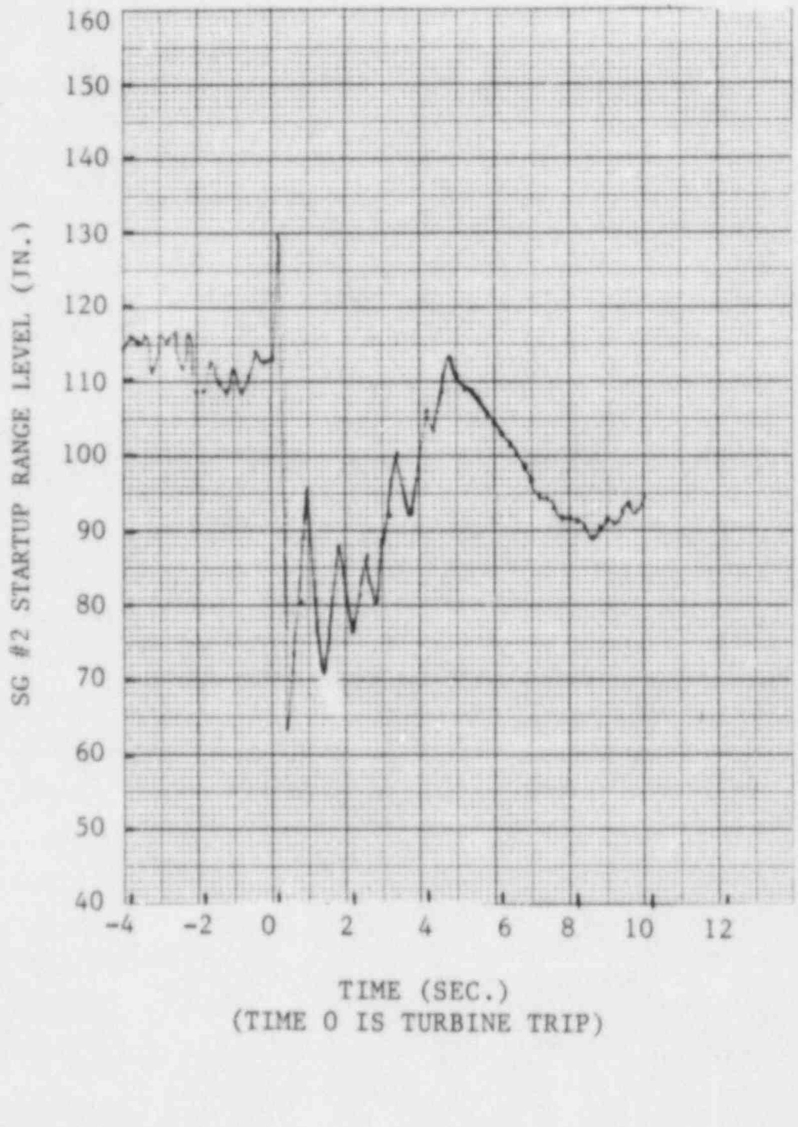
TIME (SEC.)
(TIME 0 IS TURBINE TRIP)

DRAWN BY: M. Flockenhaus 7/2/85
CHECKED BY: Sushil Jain 7/2/85

DATA FROM 75% TURBINE TRIP TEST (TP 800.14)

APRIL 2, 1978 (DELOG INTERVAL 0.2 SEC.)

FIGURE 1b



DRAWN BY: M. Flockenhaus 7/2/85
CHECKED BY: Sushil Jain 7/2/85

DATA FROM 75% TURBINE TRIP TEST

(TP 800.14) APRIL 2, 1978 (DELOG INTERNVAL 0.2 SEC.)

ACTION PLAN
ED 6408

TITLE		PLAN NUMBER	PAGE
SFRCS Trip/MSIV Closure	Rev. 1	5, 6 & 7	1 of 6
		DATE PREPARED	PREPARED BY
		7/5/85	L.C. Stalter

SPECIFIC OBJECTIVE

1. To determine the root cause of spurious full trip of SFRCS
2. To determine the root cause of MSIV closure (partial actuation of SFRCS)
3. To determine the adequacy of SFRCS full trip alarm (Q963) function

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
	All steps of this Action Plan are to be performed in accordance with the latest revision of "Guidelines to Follow When Trouble-shooting or Performing Investigative Actions into the Root Causes Surrounding the June 9, 1985 Reactor Trip".					
	The following steps may be performed in any sequence. Substeps of any step should be performed in the order listed.					
1	A. Review available data on the effects on the steam generator startup level from a turbine trip. Use available information from previous transient or available test data at Davis-Besse, and data from other plants for this review.	L. Stalter	S.Jain/F.Chen			
	B. This data will be used with data from Step 5 to evaluate the magnitude and frequency of oscillations in startup level transmitter output that exist following main turbine stop valve closure.	F. Miller	S.Jain/MPR			

ACTION PLAN
ED 6408

TITLE	Rev. 1	PLAN NUMBER	PAGE
SFRCS Trip/MSIV Closure		5, 6 & 7	2 of 6
		DATE PREPARED	PREPARED BY
		7/5/85	L.C. Stalter

SPECIFIC OBJECTIVE

1. To determine the root cause of spurious full trip of SFRCS
2. To determine the root cause of MSIV closure (partial actuation of SFRCS)
3. To determine the adequacy of SFRCS full trip alarm (Q963) function

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
2	Determine why the Main Steam Isolation Valve (MSIV) closed and other SFRCS actuated equipment did not change status.					
	A. Perform a test by injecting an analog signal or signals at the input to the Steam Generator Level Instrument Cabinets to verify that, for a "full SFRCS trip" of short time duration, the SFRCS output corresponds to that which occurred on 6/9/85.	K. Yarger	T. Czuba			
	B. Analyze the data from step 2A to verify that only the MSIV would close upon a full SFRCS trip of short time duration, and other equipment would not actuate. The response and latch times for actuation of SFRCS will be determined for each "type" of actuated equipment.	F. Miller	S.Jain/MPR			

ACTION PLAN
ED 6408

TITLE		PLAN NUMBER	PAGE
SFRCS Trip/MSIV Closure	Rev. 1	5, 6 & 7	3 of 6
		DATE PREPARED	PREPARED BY
		7/5/85	L.C. Stalter

SPECIFIC OBJECTIVE

1. To determine the root cause of spurious full trip of SFRCS
2. To determine the root cause of MSIV closure (partial actuation of SFRCS)
3. To determine the adequacy of SFRCS full trip alarm (Q963) function

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
3	A. Test the time delay relay (shown on TED drawing E-42B, sheet 54) in the SFRCS "full trip" reset logic to verify the total time the SFRCS full trip was in effect.	K. Yarger	T. Czuba			
	B. Determine the length of time the full SFRCS trip was in the tripped condition by combining this time with the sequence of events data.	F. Miller	S. Jain			
	C. Analyze this data for verification of the hypothesis.	F. Miller	S. Jain			
4	A. Visually inspect each steam generator starting level transmitter for loose connections, cleanliness.	K. Yarger	T. Czuba			
	B. Verify the response time of each Steam Generator startup level transmitter in both increasing and decreasing direction.	K. Yarger	T. Czuba			

ap 5 & 7

ACTION PLAN
ED 6408

TITLE		PLAN NUMBER	PAGE
SFRCS Trip/MSIV Closure	Rev. 1	5, 6 & 7	4 of 6
		DATE PREPARED: 7/5/85	PREPARED BY: L.C. Stalter

SPECIFIC OBJECTIVE

1. To determine the root cause of spurious full trip of SFRCS
2. To determine the root cause of MSIV closure (partial actuation of SFRCS)
3. To determine the adequacy of SFRCS full trip alarm (Q963) function

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
	C. Verify the calibration of each SFRCS steam generator startup level transmitter.	K. Yarger	T. Czuba			
	D. Analyze this data and check for anomalies.	L. Stalter	M.Bajestani			
5	Determine if the system sensitivity increased due to modifications performed during the 1984 refueling outage (Change Analysis items 1, 2, & 3), and if this sensitivity change was sufficient to initiate the SFRCS trip.	L. Stalter	L.Stalter/MPR			
	Analyze the present transmitter configuration to determine the response characteristic of the steam generator level instrumentation. Compare this analysis with th nalytical determination of configuration used prior to 19[illegible] refueling outage to determine impact on the response characteristic.					

ACTION PLAN

ID 4408

TITLE: SFRCS Trip/MSIV Closure	Rev. 1	PLAN NUMBER: 5, 6 & 7	PAGE: 5 of 6
		DATE PREPARED: 7/5/85	PREPARED BY: L.C. Stalter

SPECIFIC OBJECTIVE

1. To determine the root cause of spurious full trip of SFRCS
2. To determine the root cause of MSIV closure (partial actuation of SFRCS)
3. To determine the adequacy of SFRCS full trip alarm (Q963) function

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
5	(Continued) These analyses will consider the input piping from the steam generator pressure tap through and including the output of the transmitter which would supply the signal to the SFRCS.					
6	Perform testing of logic actuation circuits associated with the MSIV including relays, solenoids and pilot valves to ensure proper operation of the logic in the MSIV control circuits.	K. Yarger	T. Czuba			
7	Perform a review of the SFRCS surveillance tests to reverify that the surveillance tests reflect an accurate verification of the SFRCS logic.	L. Stalter	M.Bajestani/MPR			

ACTION PLAN
ED 6408

TITLE	Rev. 1	PLAN NUMBER	PAGE
SFRCS Trip/MSIV Closure		5, 6 & 7	6 of 6
		DATE PREPARED	PREPARED BY
		7/5/85	L.C. Stalter

SPECIFIC OBJECTIVE

1. To determine the root cause of spurious full trip of SFRCS
2. To determine the root cause of MSIV closure (partial actuation of SFRCS)
3. To determine the adequacy of SFRCS full trip alarm (Q963) function

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
8	Perform response time testing on the old and new bistable modules (both trip and reset times) to evaluate its overall impact on SFRCS response characteristics.	K. Yarger	T. Czuba			
9	Energize the turbine trip circuits and monitor each SFRCS channel power supply output to determine existence of power signal interference and/or cross-channeling of signals.	K. Yarger	T. Czuba			
10	Conduct a test to determine no inadvertent ties exist between the outputs of the power supplies for the two half channels in an actuation channel.	K. Yarger	T. Czuba			
11	Prior to and during Mode 1 operation, perform testing on steam generator startup range level instrumentation supplying the SFRCS to determine the magnitude and frequency of hydraulic and/or electronic noise as sensed by this instrumentation.	K. Yarger	T. Czuba			