

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER MET ED	CONTRACT NO. 620-0005	SPR NO. 289	REV. NO. 0
VENDOR BMO	P.O. NO.	TASK NO. 21	GROUP NO. 01
SITE ENGINEER S. P. MAINGI	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE ICS RESPONSE DURING TURBINE TRIP

DESCRIPTION OF PROBLEM During auto reactor runback to 15% following the turbine trip from 76% power, 1 1/2 minute after the trip, RC Pressure was dropping rapidly and to avoid the reactor trip, the feedwater controls had to be switched to manual.

SEE ATTACHED BMO PROBLEM REPORT.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED
 R. Maggi and L. Kolany were appraised of the problem.
 R. Rand of BMO suggested to modify the signal to FW Pump Speed Control.
 A sketch of the modification was sent to R. Maggi.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL 1. Engineering should review response of BTU limits during the turbine trip transient.
 2. Engineering should review turbine trip data and suggest modifications to ensure no tripping of reactor during auto runback to 15% power.
 3. Review and give clearance to try modification suggested in Enclosure 1. By a special test on the system. If successful, follow up by field change.

DATE OF FIELD CHANGE 11/29/74 SIGNATURE J.C. Rogers DATE 7/29/74

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	Roger J Maggi	8-1-74
TASK ENGINEER		

PROJECT MANAGER

COST CATEGORY NORM C D G L VENDOR CLAIM

AUTH CHARGE NO FIELD CHANGE REQ FC NO

SITE COMPLETION REPORT
 This SPR is being closed. A broader base SPR No. 322 was written on the subject of ICS Response following a turbine trip.

RECOMMENDED STDS. CHANGE

DEVIATIONS NONE SEE SPR REV NO. _____

DATE COMPLETED 01-13-75 SIGNED BY S. P. Maingi

S.O.M. CONSTR. REP. APPROVAL J.C. Rogers DATE 1/14/75

FINAL DISTRIBUTION

- PROJECT MANAGER
- S.O.M. / CONST. REP
- QA DOC. FILE
- CENT. ENGR
- FILE 121.2

8002100047 A

REPORT	PRODUCT SYSTEM FILE NO. (CMO)	FILE NO. (SE)	DATE OF PROBLEM 7/20/74	FROM R. S. Rand
SUPPORT NO. 408	CMO USE ONLY		BMCO S.O. NO., P. O. 150L	EMP. NO. S1239
WORK PLANT ED TMI #1			CUST. ORDER NO. 29062Z	ACCT. NO. 779
(FILL IN ONLY) AND TYPE OF SYSTEM/PRODUCT ICB RESPONSE TO TURBINE TRIP			NOMENCLATURE SERIES LABEL X	MAIL STA./DO PO Box 352 Middletown, PA 17057
			DATE CODE: X	SERIAL NO. AND/OR PART NO. X

Please see charts and write up for a turbine trip from 76% reactor power. I believe the ICB performance can be improved by the following:

1. Add a feed forward from turbine header press to feed pump speed control.

DESIRED ACTION: Please request a PCA from B&W for this change. Please ask B&W to review the response of BTU limits during this transient.

APPLIES TO OTHER NSS CONTRACTS: YES

CUSTOMER ATTITUDE

MAJOR CONCERN

CONCERNED

UNCONCERNED

EFFECT ON SYSTEM (BRIEFLY) ICB should run back to 15% reactor power on a turbine trip. Presently operator intervention is required to prevent reactor trip.

CONT'D ON SEPARATE SHEET
SIGNATURE *[Signature]* DATE 7/24/74

B&W ACTION REQUESTED

FOR FIELD USE

DAYS SERVICE _____

SERVICE \$ _____

EXPENSES \$ _____

MATERIAL \$ _____

S.E.O. NO. P72-236

ALLOCATION

PRODUCT

PRODUCT APPLICATION

SYSTEM

SYSTEM APPLICATION

WARRANTY

OTHER _____

DEFECTIVE PART RETURNED

NO

YES ON _____ DATE _____

RM NO. _____

FAILURE OCCURRED

ON RECEIPT

IN SERVICE (WARRANTY)

IN SERVICE (NON-WARRANTY)

EST. TIME IN SERVICE _____

POSSIBLE CAUSE FOR PROBLEM

B0 FAULTY MATERIAL

B1 FAULTY MANUFACTURING

B2 FAULTY DESIGN

B3 PERFORMANCE DEFICIENCY

B4 FAULTY PACKAGING

B5 COMPONENT FAILURE

B6 WEAROUT

B7 IMPROPER APPLICATION

B8 OPERATING ENVIRONMENT

B9 INSUFFICIENT INSTRUCTIONS (DOCUMENTATION)

OPERATING CONDITIONS:

AMBIENT TEMP. NA OF _____

ATMOSPHERE: CLEAN

AVERAGE DIRTY

HUMIDITY HI LO AVG.

TIME REQUIRED TO: NA

REPAIR _____ TROUBLESHOOT _____

RECALIBRATE _____

FAILURE DETAILS:

BMCO. PART NO. NA

DESCRIBE (DIODE, CAP., TRANSISTOR, ETC.) _____

CIRCUIT SYMBOL _____ (C1, R1, Q1)

MFG. OF PART (IF KNOWN) _____

HOW P. RT FAILED:

SHORT OPEN

MECH. DAMAGE

ADJUSTMENT

DIRTY UNKNOWN

OTHER (DESCRIBE) _____

PROBLEM TYPE		FAILURE CAUSE CODE	FIN. SYSTEM	ANSWER DUE	ACTION TAKEN BY	SIGNATURE	DATE	APPROVAL	DATE
COPIES:		COPIES		<input type="checkbox"/> PRELIMINARY ANS. <input type="checkbox"/> FINAL SOLUTION					
QUALITY ASSURANCE				FOLLOW UP ON CORRECTIVE ACTION				DISP. OF R.M. _____	
PROD. LIABILITY								DATE REC'D. _____	
PROD. PLANNING								DATE RETURNED _____	
N/O								HOURS SPENT SOLUTION	
FPO								DEPT. _____ MAN. _____ HRS _____	
CONTRACT OPER.									
WARRANTY REPAIR									
CORRECTION ENGR.									
COMM. SERVICES									
ORDER CENTER									
COMPONENT ENGR.									
QTY	NAME	PART NO.	COMMENTS						

Due to GE work on the EHC the turbine was accidentally tripped at about 10:15 AM on July 20, 1974.

Notes:

1. Turbine throttle pressure immediately jumped to 1060 psig.
2. BTU limits actuated to reduce FW flow demand.
3. FW valve ΔP dropped to ZERO.
4. FW error sent cross limit to the reactor.
5. The reactor ϕ error sent cross limit to the feedwater.
6. The feedwater flow dropped from 65% to 25% and then recovered.
7. The reactor average temperature went to 590°F (11°F high).
8. At 1 1/2 minutes into the transient the T_{AVE} came back to setpoint but the RC pressure was dropping close to the LO Pressure Reactor trip point. The operator took control of both FW demand stations and dropped feedwater flow to save RC pressure.

RECOMMENDATIONS

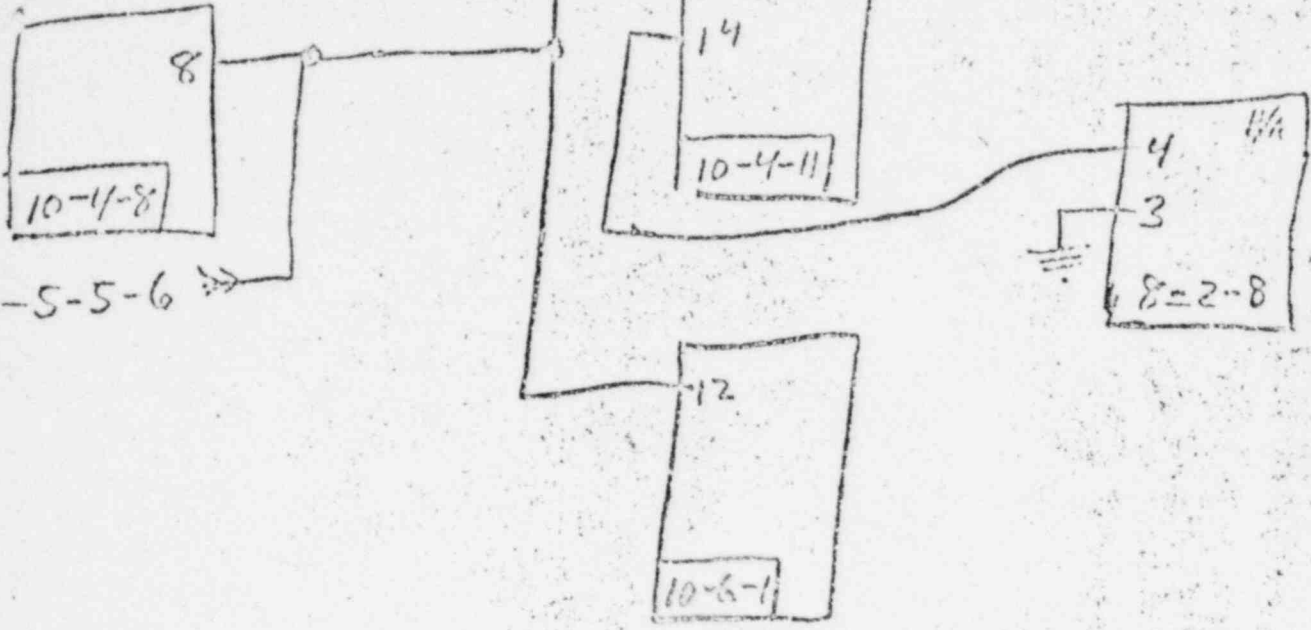
1. Add a feed forward from turbine header pressure to feed pump speed control to raise speed demand when the header pressure jumps up on turbine trip. Present 35 PSI ΔP across FW valve train is lost when the header jumps up by 170 PSI.
2. Review BTU Limit operation during this transient to see if its action was correct. In other words, do we want to immediately step FW flow down on a turbine trip.

732

Fuel pump speed

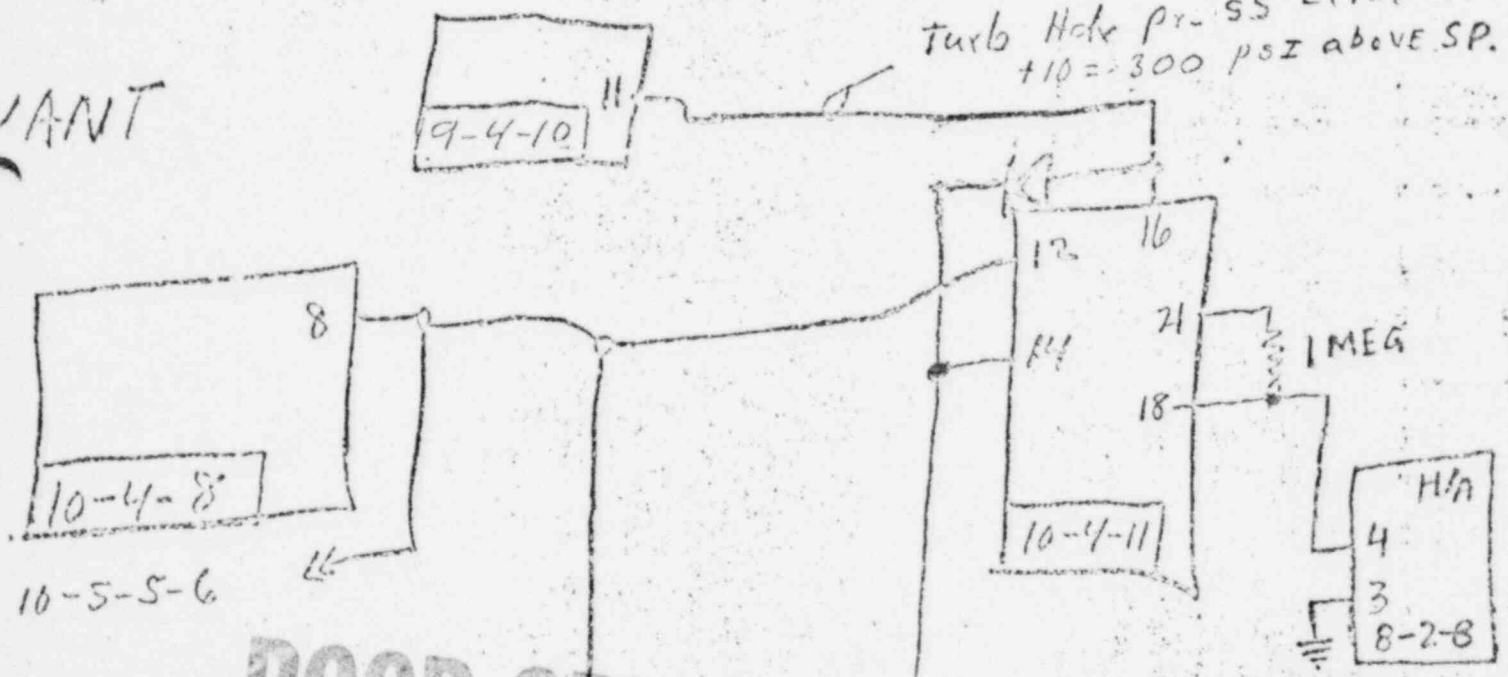
(5) 289

ENCLOSURE-1



WANT

Turb Hole pr-SS Error
+10 = 300 psz above SP.



POOR ORIGINAL

ON 10-4-11 and
10-6-1 sat
Gy to 0.727

ENCLOSURE-2

recommended for installation & test

RS-RAND BNC BARR
C. Rogers BK112

psI psI
1050 - 885 = 165 = $\Delta 27.5\%$ to change FPS
20% E. Gain = 0.727

BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

cc: E. G. Ward
J. R. Burris

R. L. PITTMAN, NUCLEAR SERVICE

From L. M. KOLONAY, CONTROL & MONITORING EQUIPMENT (2534)

BDS 663.5

Cust. METROPOLITAN EDISON COMPANY, TMI-1

File No.
or Ref. NSS-5/12E21

Subj. PROPOSED MILESTONE TEST

Date
AUGUST 2, 1974

This letter to cover one customer and one subject only.

Per the request of B&W site personnel, Control and Monitoring Equipment Engineering has reviewed the proposed milestone test described in SPR No. 289. This test calls for the modification of the main feedwater pump speed control portion of the Integrated Control System and the subsequent observation of ICS performance upon turbine trip.

As a result of our review and with Plant Design approval we conclude that performance of the subject test will have no deleterious effect on plant performance or safety. We concur with the performance of this milestone test subject to the following provisions:

1. The test shall be performed in accordance with a detailed test procedure prepared by Met. Ed. site personnel and approved by B&W site personnel.
2. At the earliest opportunity after completion of the test, the modified equipment shall be returned to its original configuration.
3. The modification to the ICS shall not be made while the plant is at power.
4. After the modification is implemented, B&W Plant Design shall be provided data to further evaluate the modification for the following operations:
 - a. Steady-state power levels between 15% and 75% power (3 or 4 levels)
 - b. Pseudo steady state (when turbine pressure is varying by 50 psi from setpoint) for 3 or 4 power levels between 15% to 75% power
 - c. Nominal ramps up and down in the 20% to 75% power range
 - d. Turbine trip from a high power level

LMK/pwc

TO

LM Kalony

FROM

R Burris, Control Analysis (X2202)

CST.

SUBJ.

SPR No 289 - ICS Response to Turb. Trips

FILE NO. OR REF.

NSS 5

DATE

Aug. 2, 19

Per our discussion today we approve the item 3 under "Further Action Recommended Site Personnel" of the subject SPR. The modification suggested is illustrated on an attachment to the SPR which understands that this modification is the addition of the throttle pressure error to a summer which provides the control action for increasing or decreasing the main feedwater pump turbine speed.

We further make these recommendations

A. This change should not be made at power.

B. After change is made provide Control Analysis data to further evaluate this revision for the following operations

a. Steady state power levels between 15 and 75 % power (3 or 4 levels)

b. Pseudo steady state (where turbine pressure is varying by 50psi from setpoint) for 3 or 4 power levels between 15 and 75 % power.

c. Nominal ramps up and down in the 20 - 75 % power level range.

d. Turbine trip from a high power level.

POOR ORIGINAL

cc:
RWK
D A I -

BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

Leo Kolony, Equipment Engineering

R.H. Roster
V.J. Galan
W.S. Delicete
S.P. Maingi
R.S. Rand
E.P. Kane
A.W. Brown
R.F. Ryan

FILE - (SPR - 289)
620-05 BOS 653.5

^{10m} R.W. Winks, Control Analysis, Ext. 2864 *RWW*

Cust. Met Ed.

File No.
or Ref.

Subj. Permanent Incorporation of Feedwater Pump Speed Signal
Due to Turbine Header Pressure Drop Signal

Date

September 6, 1974

This letter is cover one station and one system only.

- References: (1) SER No. 289, TMI-1 ICS Response to Turbine Trip
 (2) R.S. Rand & L.H. Kolony, Discussion on SER No. 289,
 dated August 8, 1974

Mr. R.S. Rand, Bailey Meter Company representative at TMI-1, proposed a modification to the ICS to correct an undesirable effect on feedwater flow during a trip of the turbine from a high power level. The need to maintain a minimum water flow during a trip of high steam generator pressure was recognized by using a turbine header pressure drop signal to increase feedwater pump speed and this modification to the ICS was described in reference (1).

Conditional approval of this temporary modification was provided in reference (2) and it also requested a limited amount of test data before committing this modification to be a permanent change to the ICS.

As a result of several large transients on the plant during August, 1974, sufficient test data has been analyzed to conclude that the new feedwater pump speed signal is a desirable improvement to the ICS.

This change to the ICS is necessary to maintain a larger feedwater flow immediately following a sudden increase in steam pressure in order to enable the heat in the primary loop to be transferred to the secondary side and avoid a reactor trip due to high R.C. pressure. Thus, this ICS modification can be applied to all other B&W plants which are similar to TMI-1.

QA: The information contained in this memo is accurate and complete.

SEP 10 1974

Rev: _____

RWW:ere

POOR ORIGINAL

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

CLEARED

**** CLEARED ****

FILE: 12M2

TO: L.C. ROGERS - TMI For Information
Central Engineering Files

CONTRACT NO: 620-00 05
SPR 289

C. C. Plunkett - Contract Admin.

TITLE ICS Response
During Turbine
Trip

C. M. Fletcher - Quality Assurance

L.M. KOLONY - Task Engineer

DATE: Jan 27, 1975

R.A. GOVERS - Proj. Manager - Nuc.SERV.

The attached, cleared SPR is submitted for your information.

- TO: J. L. Hollis - FLORIDA _____
- E. L. Logan - SMUD _____
- B. L. Day - TOLEDO _____
- R.L. PITTMAN - Nuc. SERV. _____

Attached is one copy of Site Problem Report No. 289 which was processed on Contract 620-00 05. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts NSS 6, 7, 12, 13, 14.

REMARKS: A broader base SPR (#322) was written on this subject of ICS Response following a turbine trip, therefore, this SPR is being closed.

cc: R. E. Kosiba

Roger J. Maggi
NUCLEAR SERVICE SUPPORT ENGINEER