UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

TMI-2 SITE

4/10/79
6:30 PM

PLEASE TELECOPY ATTACHED TWO DOCUMENTS (10 PAGES) TO MR. JOSE CALVO AT NRC/NRR TMI SUPPORT GROUP IN BETHESDA, MD.

NEEDED PROMPTLY.

THANKS.

J.T. BEARD
TMI-2 TECH REVIEW GROUP
TRAILER #27.

P.S.
RETURN ORIGINAL PROMPTLY TO TRAILER #27.

7907120643

556344

POOR ORIGINAL

J.T. Board
8/10/79

Letter from E. F. Dowling to E. A. Womack dated April 1, 1979
subject Instrumentation Status

General observation of instrument status

1. Flow, level and pressure transmitters are expected to fail at some point due to two mechanisms.

   (a) high radiation or
   (b) submersion in water

2. Radiation levels (estimated at 10^3 rad/hr) should start to effect BY transmitters some time after 1200 hours on 4/1/79 (integrated dose 10^5 rad.)

   Degradation should be gradual with time, until the integrated dose reaches 10^6 to 10^7 rads (10^6 is to + 41.7 days: 10^7 equal to + 417 days) at which time the transmitter will cease to function.

3. Calculation of water level in the Reactor Building indicates that a large number of transmitters are submerged and have been for a number of days. Few failures have been reported. The transmitters are sealed and have been qualified by tests to high temperature, pressure and steam conditions (286°F, 60 psig), but have not been tested for submersion in water. There is no way to predict how long the submerged transmitters will continue to function.

4. Transmitter failure is expected to be by increase in noise level, gross deviation from redundant indications and finally loss of signal.

Attachment 1 shows which transmitters are vulnerable due to location above building floor and by virtue of radiation resistance. Attachment 2 defines alternative ways to obtain parameter measurements. This attachment will be updated when additional information is available.

Attachment 1
Attachment 2

Level (Water Volume) (Bldg Elevation) 282' 6"		10^5 Rads BY Transmitter String No., Parameter	10^7 Rads Foxboro
2'-5"	179,630 gal.		✓ SP6B-PT1 SGB Pressure
3'-0"	222,990	RC14A-DPT-3 & 4, Loop A RC Flow	
3'-6"	260,155	RC1-LT 1,2 & 3, Press. Level	✓ SP6B-PT 2 SGB Pressure
		RC14A-DPT 1 & 2, Loop A RC Flow	RC 22 - PT 1 thru 8 Reactor Coolant Pump Seal Cavity Pressure
		RC14B-DPT 3 & 4, Loop B RC Flow	Note: This group may be located at this level or the next level higher
		SP1A-LT 2 & 3, SG A Operate Level	
		SP1A-LT 4 & 5, SGA Start up Level	
		SP1B-LT 1, SGB Full Range Level	
		SP1B-LT 2 & 3, SGB Operate Level	
		SP1B-LT 4 & 5, SGB Startup Level	
5'-2"	384,038	SP1A-LT1, SGA Full Range Level	SP6A-PT 1 & 2 SG-A Pressure
			✓ RC3A-PT 3 & 4 RC Pressure Wide Range
			RC3A-PT 5 RC Pressure Low Range
			✓ RC3B-PT 3 RC Pressure Wide Range

POOR ORIGINAL

Assumption:

1) BY transmitter will begin to fail about 10^5 Rad.
2) Foxboro transmitter will begin to fail above 10^7 Rad.
3) Transmitters have been receiving 1000 R/hr.
4) Both BY and Foxboro transmitters may fail if submerged in water.
5) Water height is related to volume by 1 ft. per 74,330 gallons.

556346

Measurement Alternative

Parameter	Primary Source of Measurement	Alternate Source of Measurement	Reference Backup Sheet
RC Pressure	RC3A-PT 3&4 (Wide) ESFAS RC3B-PT 4 (wide) ESFAS	RC22-PT 1 thru 8	Note: Temperature vs saturation pressu via steam tables
		RCP Seal Cavity Pressure	
		RC2-TA 1&2 Pressurizer Temp.	
		CA-PI	Pressurizer steam or water sample pressu
		RC Pump Vibration	
		RC3A-PT 5 (low)	RC Pressure less th 500
RC Temperature	Incore T/Cs	RC4A-TE 2&3, T_{Hot}	
		RC4B-TE 2&3, T_{Hot}	
		RC5A-TE 2&4, T_{Cold}	
		RC5B-TE 2&4, T_{Cold}	
		RC-TE9	
		RC4A-TE 1&4, T_H	
		RC4B-TE 1&4, T_H	
		RC5A-TE 1&3, T_C	
		RC5B-TE 1&3, T_C	
		RC15A-TE1, T_H	
		RC15B-TE1, T_H	
		RC15A-TE2, T_C	
		RC15B+TE2, T_C	
		RC15A-TE3, T_C	
		RC15B-TE3, T_C	
		RC-TE11	
		MU-TE5	Accounting for Coolan

556247

Parameter	Primary Source of Measurement	Alternate Source of Measurement	Reference Backup Sheet
		DH6-TE 1&2	
		SP3A-TE 1&2	Steam Gen. Saturation Temperature
		AP3B-TE 1&2	Steam Gen. Saturation Temperature
RC Flow Loop A	RC14A DPT 1,2,3 & 4	RC Pump Motor Current	
RC Flow Loop B	RC14B DPT 1,2,3 & 4	RC Pump Motor Current	
SG Operating Level	SP1A-LT 2&3 SG-A	SP1A-LT 1 SG-A	
	SP1B-LT 2&3 SG-B	SP1B-LT 1 SG-B	
		RC Temperature	See RC Temp. Sheet
		SP1A-LT 4&5 SG-A	
		SP1B-LT 4&5 SG-B	
		Feed Water Status	
		Sample Lines as Level Indicators	
		Press. Transmitter Across Feed Water Line and Main Steam Line	
		SP3A-TE 1&2 SG-A	Use one element as heating element by applying low voltage. Other element will read different if element is covered or uncovered.
		SP3B-TE 1&2 SG-B	" " " "

556348

Parameter	Primary Source of Measurement	Alternate Source of Measurement	Reference Backup Sheet
SG Wide Range Level	SP1B-LT1 SG-B	Sample line as level indication	
	SP1A-LT1 SG-A		
Pressurizer Level	RC1-LT1, 2&3	MU14-LT 1&2 (MU Tank Level)	
		MU7-DPT 1,2,3,4 (Seal injection flow)	
		MU4-DPT (Let-down flow)	

Pressurizer Level Alternate Calculation Procedure

Procedure:

Step 1 - Record let-down flow at _____ incurements using MU4-DPT

Step 2 - Record RC pump seal injection flow at _____ increments using MU7-DPT 1,2,3 & 4

Step 3 - Record MU tank level at _____ increment using MU14-LT 1&2

Step 4 - MU tank volume is 4388 gallons. MU tank galls per inch - 31.
Pressurizer volume 11,230 gallons.
Pressurizer gallons per inch - 24.

Step 5 - Determine volume of let-down.
Item 1 x time increment = volume in gallons.

Step 6 - Determines volume of RC pump injection.
Item 2 x time increment

Step 7 - Subtract result of Step 6 from result of Step 5.

Step 8 - Subtract previous MU tank level from level determined at Step 3.

556349

TO: SIG DISTRIBUTION

B&W - Trailer #26

Bob Long - Trailer #26

Ivan Porter - Met-Ed Op.

Vic Stello - (NRC)
(Trailer #7)

Milt Levenson - Bldg. #26

Cable Spreading Room

~~[illegible]~~ Bert Ackermann - Bldg. #26

April 10, 1979

J. T. Beard
4/10/79 5:00

Attached is a status report by the Special Instrument Group on diagnostic instrumentation.

Report will be updated daily.

R. BALL

RB:dr

556350

SPECIAL INSTRUMENT GROUP - STATUS REPORT

Date 9 April

Time 2030

Instrument Type or Class	Primary Function in Recovery	Who is Using	Location & Type of Indication	Vital Signs of Health	Prior Action Results	New Action	Res[illegible]
RTD	Loop temperatures	Control Room	Computer printout		T hot is coming out on log. RTD's below flow nozzle	Determine RTD bridge availability	Schn[illegible] der
Vent Header	Pressurized to clean up					Can we find leak?	
TC on Pressurizer Relief Valve						Is being read on computer?	
Seal Temperature						What can trip primary pump and what has been disabled?	

556251

SPECIAL INSTRUMENT GROUP - STATUS REPORT

Date 9 April

Time 2030

Instrument Type or Class	Primary Function in Recovery	Who is Using	Location & Type of Indication	Vital Signs of Health	Prior Action Results	New Action	Re... si... Pe...
Pressure and level	Indicate water location for cooling	Control Room	Control Room	On-scale reading fluctuations	1) Lost B OTSG wide range level 2) Procedure written by utility to put in dP between FW flow and steam pressure 3) Have dP cell from Lynchburg 4) Tap is outside 5) Will do on both OTSG's		
Pressurizer level					Level indicator #2 indicated high noise, then OK Bailey says de-powered last longer	Check all 3 to computer Is one not powered?	Ack... wi... Sch... - ...
Pressure				Have been heavily irradiated Foxboro (not guaranteed for high radiation)	No fluctuation when pump is off-boiling not pressure source	Still monitoring of PSD's	Sch... ...

POOR ORIGINAL

5563352

SPECIAL INSTRUMENT GROUP - STATUS REPORT

Date 9 April

Time 2030

Instrument Type or Class	Primary Function in Recovery	Who is Using	Location & Type of Indication	Vital Signs of Health	Prior Action Results	New Action	Re-si-Pe
SPND (Self-powered neutron detectors)	Indicate lower part of core is whole	Core evaluation	Computer printout	Resistance greater than 10^{9} on good ones	Arkansas P&L (Jim Poale) is bringing in TDR	Review by HDW of TDR Will do TC's then SPND's	Ack man
TC's (Thermocouples)	Core top temperature Redistribution	Core Eval. Operators	Two on strip charts in S.R. Control Room computer printout	Resistance continuity and reasonable value	1) Duke is taking some TC resistance 2) Have resistors from computer terminals and to ground 3) 7F & 8F both noisy	1) Compare Duke & TMI for low resistance 2) Ackermann will show Milt 3) What did TC's do as a function of pressure	
Movable incore	Core integrity	Core Eval.	Spreading Room (S.R.)	Motion	Went 3½ ft. into core in location N-8 (3 ft. into fuel) Solid stop Practically no change in current-detector appears wet and dead		

556353

SPECIAL INSTRUM GROUP - STATUS REPORT

Date 9 [illegible] 11

Time 2030

Instrument Type or Class	Primary Function in Recovery	Who is Using	Location & Type of Indication	Vital Signs of Health	Prior Action Results	New Action	Responsible Person
Computer Backup	TC readings	Control Room	--	Continued operation		1) Cable Available 2) Hookup Put on 2 multi-point	Lionc Banda
						3) Spare core	Ken Schroder
Ex Core Detectors	Determine core relocation	Core evaluation	Safety cabinets	D.C. current Resistance (greater than 20 meg)	1) Techs can now do 2) A test procedure was written (Z98.4) ~ 3% down	1) How often does Tech group want? Ask Milt	R. M. Ball
BF_3 counters	Neutron indicator Sub-criticality	Control Room	Recorder on one at a time	Value and fluctuations	Discriminator & gain checked (plateau) 40 c/s = 1 nv_{Th}	Ask shift to record both BF_3's	Ackermann

5562354

Senkiewicz
SFT Copy

Letter from E. F. Dowling to E. A. Womack dated April 1, 1979
subject Instrumentation Status

General observation of instrument status

1. Flow, level and pressure transmitters are expected to fail at some point due to two mechanisms.

    (a) high radiation or
    (b) submersion in water

2. Radiation levels (estimated at 10^3 rad/hr) should start to effect BY transmitters some time after 1200 hours on 4/1/79 (integrated dose 10^5 rad.)

    Degradation should be gradual with time, until the integrated dose reaches 10^6 to 10^7 rads (10^6 is to + 41.7 days: 10^7 equal to + 417 days) at which time the transmitter will cease to function.

3. Calculation of water level in the Reactor Building indicates that a large number of transmitters are submerged and have been for a number of days. Few failures have been reported. The transmitters are sealed and have been qualified by tests to high temperature, pressure and steam conditions (286°F, 60 psig), but have not been tested for submersion in water. There is no way to predict how long the submerged transmitters will continue to function.

4. Transmitter failure is expected to be by increase in noise level, gross deviation from redundant indications and finally loss of signal.

Attachment 1 shows which transmitters are vulnerable due to location above building floor and by virtue of radiation resistance. Attachment 2 defines alternative ways to obtain parameter measurements. This attachment will be updated when additional information is available.

Attachment 1
Attachment 2

Burns & Roe 201-265-9512
9513

556355

POOR ORIGINAL

Parameter	Primary Source of Measurement	Alternate Source of Measurement	Reference Backup Sheet
		DH6-TE 1&2	
		SP3A-TE 1&2	Steam Gen. Saturation Temperature
		AP3B-TE 1&2	Steam Gen. Saturation Temperature
RC Flow Loop A	RC14A DPT 1,2,3 & 4	RC Pump Motor Current	
RC Flow Loop B	RC14B DPT 1,2,3 & 4	RC Pump Motor Current	
SG Operating Level	SP1A-LT 2&3 SG-A	SP1A-LT 1 SG-A	
	SP1B-LT 2&3 SG-B	SP1B-LT 1 SG-B	
		RC Temperature	See RC Temp. Sheet
		SP1A-LT 4&5 SG-A	
		SP1B-LT 4&5 SG-B	
		Feed Water Status	
		Sample Lines as Level Indicators	
		Press. Transmitter Across Feed Water Line and Main Steam Line	
		SP3A-TE 1&2 SG-A	Use one element as heating element by applying low voltage. Other element will read different if element is covered or uncovered.
		SP3B-TE 1&2 SG-B	" " " "

550756

Parameter	Primary Source of Measurement	Alternate Source of Measurement	Reference Backup Sheet
SG Wide Range Level	SP1B-LT1 SG-B	Sample line as level indication	
	SP1A-LT1 SG-A		
Pressurizer Level	RC1-LT1,2&3	MU14-LT 1&2 (MU Tank Level)	
		MU7-DPT 1,2,3,4 (Seal injection flow)	
		MU4-DPT (Let-down flow)	
Pressurizer Level Alternate Calculation Procedure			

Procedure:

Step 1 - Record let-down flow at _____ incurements using MU4-DPT

Step 2 - Record RC pump seal injection flow at ______ increments using MU7-DPT 1,2,3 & 4

Step 3 - Record MU tank level at ______ increment using MU14-LT 1&2

Step 4 - MU tank volume is 4388 gallons. MU tank galls per inch - 31.
Pressurizer volume 11,230 gallons.
Pressurizer gallons per inch - 24.

Step 5 - Determine volume of let-down.
Item 1 x time increment = volume in gallons.

Step 6 - Determines volume of RC pump injection.
Item 2 x time increment

Step 7 - Subtract result of Step 6 from result of Step 5.

Step 8 - Subtract previous MU tank level from level determined at Step 3.

556257

Step 9 - Multiply result of Step 8 by MU tank volume per inch given in Step 4.

Step 10 - Add or subtract the results of Step 9 to the results of Step 7.

Step 11 - Divide the result of Step 10 by pressurizer gallons/inch to obtain the change in pressurizer level.

Assumptions:

1. Only source of make up is to RC pump seal.
2. No RC leakage other than let down.
3. Constant RC pressure (Procedure can be modified to accommodate varying RC pressure)

Level (Water Volume) (Bldg Elevation) 282' 6"	10^5 Rads BY Transmitter String No., Parameter	10^7 Rads Foxboro
2'-5" 179,630 gal.		SP6B-PT1 SGB Pressure #IH213
3'-0" 222,990	RC14A-DPT-3 & 4, Loop A RC Flow (IH 214, IH 215)	
3'-6" 260,155	RC1-LT 1,2 & 3, Press. Level #424, #426	SP6B-PT 2 SGB Pressure #428
	RC14A-DPT 1 & 2, Loop A RC Flow	RC 22 - PT 1 thru 8 Reactor Coolant Pump Seal Cavity Pressure
	RC14B-DPT 3 & 4, Loop B RC Flow	Note: This group may be located at this level or the next level higher
	SP1A-LT 2 & 3, SG A Operate Level	
	SP1A-LT 4 & 5, SGA Start up Level	
	SP1B-LT 1, SGB Full Range Level	
	SP1B-LT 2 & 3, SGB Operate Level	
	SP1B-LT 4 & 5, SGB Startup Level	
5'-2" 384,038	SP1A-LT1, SGA Full Range Level #426	SP6A-PT 1 & 2 SG-A Pressure #426 #424
		RC3A-PT 3 & 4 RC Pressure Wide Range #425 #427
		RC3A-PT 5 RC Pressure Low Range #424
		RC3B-PT 3 RC Pressure Wide Range #429

Assumption:

1) BY transmitter will begin to fail about 10^5 Rad.
2) Foxboro transmitter will begin to fail above 10^7 Rad.
3) Transmitters have been receiving 1000 R/hr.
4) Both BY and Foxboro transmitters may fail if submerged in water.
Water height is related to volume by 1 ft. per 74,330 gallons.

556259

Measurement Alternative

Parameter	Primary Source of Measurement	Alternate Source of Measurement	Reference Backup Sheet
RC Pressure	& 425 & 427 RC3A-PT 3&4 (Wide) ESFAS	RC22-PT 1 thru 8	Note: Temperature vs saturation pressure via steam tables
	RC3B-PT 4 (wide) ESFAS	RCP Seal Cavity Pressure	
		RC2-TA 1&2 Pressurizer Temp.	
		CA-PI	Pressurizer steam or water sample pressure
		RC Pump Vibration	
		RC3A-PT 5 (low)	RC Pressure less than 500
RC Temperature	Income T/Cs	RC4A-TE 2&3, T_{Hot}	
		RC4B-TE 2&3, T_{Hot}	
		RC5A-TE 2&4, T_{Cold}	
		RC5B-TE 2&4, T_{Cold}	
		RC-TE9	
		RC4A-TE 1&4, T_H	
		RC4B-TE 1&4, T_H	
		RC5A-TE 1&3, T_C	
		RC5B-TE 1&3, T_C	
		RC15A-TE1, T_H	
		RC15B-TE1, T_H	
		RC15A-TE2, T_C	
		RC15B+TE2, T_C	
		RC15A-TE3, T_C	
		RC15B-TE3, T_C	
		RC-TE11	
		MU-TES	Accounting for Coolant

556360