

**Donald C. Cook Nuclear Plant Units 1 & 2
Summary Report for Response Time Evaluations
Reactor Protection and Control System Replacement Project
Report Number 2985-HEI-01, Rev. 0**

Subject:

Evaluation of response times for Foxboro Spec 200 and Spec 200 Micro instrumentation equipment to be utilized in the Reactor Protection System replacement.

References:

1. Donald C. Cook Nuclear Plant Technical Specifications sections 3/4 and its associated bases. (reference Attachment #1)
2. Donald C. Cook Station Response Time Procedures IHP 4030 STP.100 A & B for Reactor Protection and Engineered Safeguards Systems Time Response, and EHP 4030 STP.205 A & B.
3. Functional Diagrams 92F12687-FD-2101 thru 2104 all sheets.
4. Foxboro letter FTAEP-020 which transmits to AEP module design response times dated 08/05/92. (reference Attachment #2)
5. Compilation of response time data collected by AEP. (reference Attachment #3)

Issue:

Compare response time of the Foxboro Spec 200 equipment to that of the existing Foxboro H-Line equipment. The H-Line equipment is being replaced as part of the Reactor Protection System (RPS) upgrade modification.

Scope:

The scope of this evaluation is to ensure that the Foxboro Spec 200 equipment response times are acceptable with respect to the Donald C. Cook Nuclear Plant licensing basis. This report shall document the results of the response time evaluation and detail the specific methodology utilized to support the conclusion.

Methodology:

The methodology utilized for the response time evaluation is illustrated in the attached Figure 1. This methodology has been established to produce two (2) sets of comparison data:

1. Comparison of Foxboro Spec 200 calculated response times vs. results of actual D. C. Cook Nuclear Plant surveillance data.
2. Comparison of Foxboro Spec 200 calculated response times vs. D. C. Cook Nuclear Plant Technical Specifications.

This process shall document the overall impact of the Foxboro Spec 200 upgrade on the Reactor Protection System response.

Discussion:

This response time evaluation has been produced to provide a level of confidence that the response time characteristics of the Foxboro Spec 200 equipment is acceptable to meet the D. C. Cook Nuclear Plant licensing basis.

This evaluation was performed in accordance with the above described methodology and documented as follows:

An evaluation of the response times of the new equipment was prepared in accordance with documentation provided by Foxboro to AEP in letter FTAEP-020 dated 08/05/92. Data from this documentation was utilized to determine which modules would be configured to replace the existing H-line equipment and what the worst case response time for that compilation of modules represents. Next, the calculated response time was compared to the response time test data as documented in the last D. C. Cook surveillance test procedure. The total loop response time was then compared to the Technical Specification requirements to assure that the loop response was still within the licensing basis. For those loops where the new response time was less than the current response time, no further action was required. For those loops where the new response time was greater than the current response time, the specific loop safety function was considered and an evaluation was performed to determine whether or not the new response spectra was acceptable with respect to the Technical Specification requirements.

Conclusions

From the documented results of the evaluation of the Reactor Trip System (Attachment #4) and the Engineered Safeguards System (Attachment #5), it is concluded that the response times for the Spec 200 and Spec 200 Micro instrumentation are superior to that of the old H-line equipment. The only challenge to the Spec 200 equipment comes in cases where the input module for the system utilizes an RTD or Thermocouple as the primary element (OT/dT and OP/dt). For these protective functions, the worst case Spec 200 module response times utilized for the comparison represent unrealistic values. The OT/dT and OP/dT comparison data utilizes a 2000 ms response for the R/I converter and 400 ms response for each of the Spec 200 Micro modules. Actual module response times for the R/I converter and the Micro modules are expected to be significantly less than published data resulting in overall response times being conservative to Technical Specifications. Therefore, the response times for the new Foxboro Spec 200 modules are found to be acceptable. Actual response times shall be verified during factory acceptance testing and post installation testing.

Approvals:

Steven C. Kincaid
Prepared By

10/29/92
Date

Daryl W. Clark
Reviewed By

10/30/92
Date

W.S. [Signature]
Approved By

11/9/92
Date

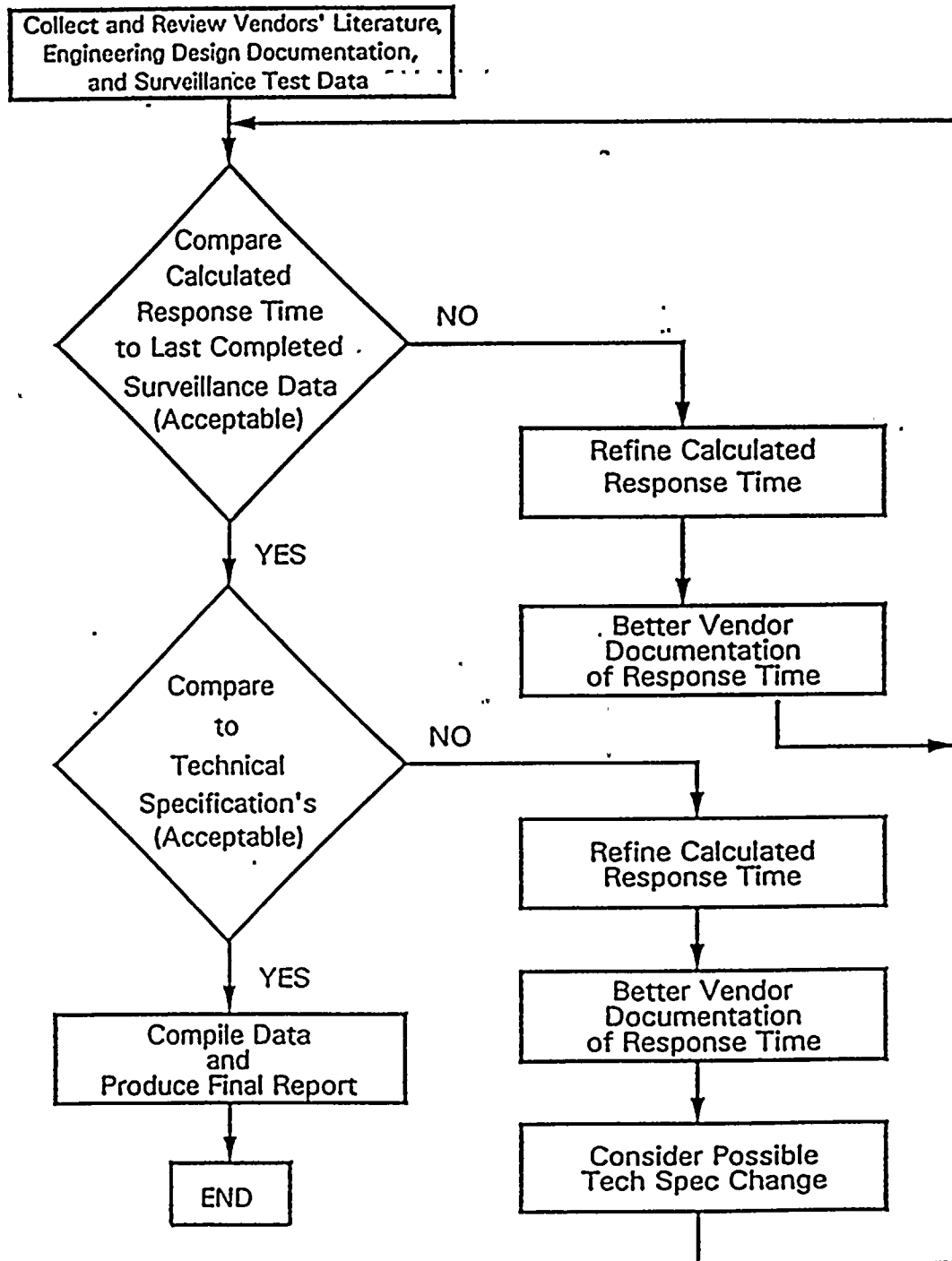


Figure 1

TABLE 3.3-5

ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION

RESPONSE TIME IN SECONDS

1. Manual

a. Safety Injection (ECCS)	Not Applicable
Feedwater Isolation	Not Applicable
Reactor Trip (SI)	Not Applicable
Containment Isolation-Phase "A"	Not Applicable
Containment Purge and Exhaust Isolation	Not Applicable
Auxiliary Feedwater Pumps	Not Applicable
Essential Service Water System	Not Applicable
b. Containment Spray	Not Applicable
Containment Isolation-Phase "B"	Not Applicable
Containment Purge and Exhaust Isolation	Not Applicable
Containment Air Recirculation Fan	Not Applicable
c. Containment Isolation-Phase "A"	Not Applicable
Containment Purge and Exhaust Isolation	Not Applicable
d. Steam Line Isolation	Not Applicable

2. Containment Pressure-High

a. Safety Injection (ECCS)	Less than or equal to 27.0@@/27.0++
b. Reactor Trip (from SI)	Less than or equal to 3.0
c. Feedwater Isolation	Less than or equal to 8.0
d. Containment Isolation-Phase "A"	Less than or equal to 18.0#/28.0##
e. Containment Purge and Exhaust Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	Not Applicable
g. Essential Service Water System	Less than or equal to 13.0#/48.0##

TABLE 3.3-5 (Continued)

ENGINEERED SAFETY FEATURES RESPONSE TIMESINITIATING SIGNAL AND FUNCTIONRESPONSE TIME IN SECONDS3. Pressurizer Pressure-Low

- | | |
|--|-------------------------------------|
| a. Safety Injection (ECCS) | Less than or equal to 27.0@@/27.0++ |
| b. Reactor Trip (from SI) | Less than or equal to 3.0 |
| c. Feedwater Isolation | Less than or equal to 8.0 |
| d. Containment Isolation-Phase "A" | Less than or equal to 18.0# |
| e. Containment Purge and Exhaust Isolation | Not Applicable |
| f. Auxiliary Feedwater Pumps | Not Applicable |
| g. Essential Service Water System | Less than or equal to 48.0++/13.0# |

4. Differential Pressure Between Steam Lines-High

- | | |
|--|------------------------------------|
| a. Safety Injection (ECCS) | Less than or equal to 27.0@@/37.0@ |
| b. Reactor Trip (from SI) | Less than or equal to 3.0 |
| c. Feedwater Isolation | Less than or equal to 8.0 |
| d. Containment Isolation-Phase "A" | Less than or equal to 18.0#/28.0## |
| e. Containment Purge and Exhaust Isolation | Not Applicable |
| f. Auxiliary Feedwater Pumps | Not Applicable |
| g. Essential Service Water System | Less than or equal to 13.0#/48.0## |

5. Steam Flow in Two Steam Lines - High Coincident with Tavg--Low-Low

- | | |
|--|------------------------------------|
| a. Safety Injection (ECCS) | Less than or equal to 29.0@@/39.0@ |
| b. Reactor Trip (from SI) | Less than or equal to 5.0 |
| c. Feedwater Isolation | Less than or equal to 10.0 |
| d. Containment Isolation-Phase "A" | Less than or equal to 20.0#/30.0## |
| e. Containment Purge and Exhaust Isolation | Not Applicable |
| f. Auxiliary Feedwater Pumps | Not Applicable |
| g. Essential Service Water System | Less than or equal to 15.0#/50.0## |
| h. Steam Line Isolation | Less than or equal to 13.0 |

TABLE 3.3-5 (Continued)

ENGINEERED SAFETY FEATURES RESPONSE TIMES

<u>INITIATING SIGNAL AND FUNCTION</u>	<u>RESPONSE TIME IN SECONDS</u>
6. <u>Steam Flow in Two Steam Lines-High Coincident With Steam Line Pressure-Low</u>	
a. Safety Injection (ECCS)	Less than or equal to 27.0@/37.0@
b. Reactor Trip (from SI)	Less than or equal to 3.0
c. Feedwater Isolation	Less than or equal to 8.0
d. Containment Isolation-Phase "A"	Less than or equal to 18.0#/28.0##
e. Containment Purge and Exhaust Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	Not Applicable
g. Essential Service Water System	Less than or equal to 14.0#/48.0##
h. Steam Line Isolation	Less than or equal to 11.0
7. <u>Containment Pressure--High-High</u>	
a. Containment Spray	Less than or equal to 45.0
b. Containment Isolation-Phase "B"	Not Applicable
c. Steam Line Isolation	Less than or equal to 10.0
d. Containment Air Recirculation Fan	Less than or equal to 660.0
8. <u>Steam Generator Water Level--High-High</u>	
a. Turbine Trip	Less than or equal to 2.5
b. Feedwater Isolation	Less than or equal to 11.0
9. <u>Steam Generator Water Level--Low-Low</u>	
a. Motor Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
b. Turbine Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
10. <u>4160 volt Emergency Bus Loss of Voltage</u>	
a. Motor Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
11. <u>Loss of Main Feedwater Pumps</u>	
a. Motor Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
12. <u>Reactor Coolant Pump Bus Undervoltage</u>	
a. Turbine Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0

TABLE 3.3-5 (Continued)

TABLE NOTATION

- * Diesel generator starting and sequence loading delays not included. Offsite power available. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps.
- ** Diesel generator starting and sequence loading delays included. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps.
- ++ Diesel generator starting and sequence loading delays included. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging, SI, and RHR pumps. Sequential transfer of charging pump suction from the VCT to the RWST (RWST valves open, then VCT valves close) is NOT included.
- @ Diesel generator starting and sequence loading delays included. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps. Sequential transfer of charging pump suction from the VCT to the RWST (RWST valves open, then VCT valves close) is included.
- @@ Diesel generator starting and sequence loading delays NOT included. Offsite power available. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps. Sequential transfer of charging pump suction from the VCT to the RWST (RWST valves open, then VCT valves close) is included.

TABLE 3.3-5

ENGINEERED SAFETY FEATURES RESPONSE TIMES

<u>INITIATING SIGNAL AND FUNCTION</u>	<u>RESPONSE TIME IN SECONDS</u>
1. <u>Manual</u>	
a. Safety Injection (ECCS)	Not Applicable
Feedwater Isolation	Not Applicable
Reactor Trip (SI)	Not Applicable
Containment Isolation-Phase "A"	Not Applicable
Containment Purge and Exhaust Isolation	Not Applicable
Auxiliary Feedwater Pumps	Not Applicable
Essential Service Water System	Not Applicable
b. Containment Spray	Not Applicable
Containment Isolation-Phase "B"	Not Applicable
Containment Purge and Exhaust Isolation	Not Applicable
Containment Air Recirculation Fan	Not Applicable
c. Containment Isolation-Phase "A"	Not Applicable
Containment Purge and Exhaust Isolation	Not Applicable
d. Steam Line Isolation	Not Applicable
2. <u>Containment Pressure-High</u>	
a. Safety Injection (ECCS)	Less than or equal to 27.0@/27.0++
b. Reactor Trip (from SI)	Less than or equal to 3.0
c. Feedwater Isolation	Less than or equal to 8.0
d. Containment Isolation-Phase "A"	Not Applicable
e. Containment Purge and Exhaust Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	Not Applicable
g. Essential Service Water System	Not Applicable

TABLE 3.3-5 (Continued)

ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION

RESPONSE TIME IN SECONDS

3. Pressurizer Pressure-Low

- | | |
|---|--|
| a. Safety Injection (ECCS) | Less than or equal to
27.0@@/27.0++ |
| b. Reactor Trip (from SI) | Less than or equal to 3.0 |
| c. Feedwater Isolation | Less than or equal to 8.0 |
| d. Containment Isolation - Phase "A" | Less than or equal to 18.0* |
| e. Containment Purge and Exhaust
Isolation | Not Applicable |
| f. Motor Driven Auxiliary Feedwater
Pumps | Less than or equal to 60.0 |
| g. Essential Service Water System | Less than or equal to
48.0++/13.0* |

4. Differential Pressure Between Steam Lines - High

- | | |
|---|---------------------------------------|
| a. Safety Injection (ECCS) | Less than or equal to
27.0@@/37.0@ |
| b. Reactor Trip (from SI) | Less than or equal to 3.0 |
| c. Feedwater Isolation | Less than or equal to 8.0 |
| d. Containment Isolation - Phase "A" | Less than or equal to
18.0*/28.0** |
| e. Containment Purge and Exhaust
Isolation | Not Applicable |
| f. Motor Driven Auxiliary Feedwater
Pumps | Less than or equal to 60.0 |
| g. Essential Service Water System | Less than or equal to
13.0*/48.0** |

5. Steam Flow in Two Steam Lines - High Coincident
with Tavg--Low-Low

- | | |
|---|----------------------------|
| a. Safety Injection (ECCS) | Not Applicable |
| b. Reactor Trip (from SI) | Not Applicable |
| c. Feedwater Isolation | Not Applicable |
| d. Containment Isolation-Phase "A" | Not Applicable |
| e. Containment Purge and Exhaust
Isolation | Not Applicable |
| f. Auxiliary Feedwater Pumps | Not Applicable |
| g. Essential Service Water System | Not Applicable |
| h. Steam Line Isolation | Less than or equal to 13.0 |

TABLE 3.3-5 (Continued)
ENGINEERED SAFETY FEATURES RESPONSE TIMES

<u>INITIATING SIGNAL AND FUNCTION</u>	<u>RESPONSE TIME IN SECONDS</u>
6. <u>Steam Line Pressure--Low</u>	
a. Safety Injection (ECCS)	Less than or equal to 27.0@/37.0@
b. Reactor Trip (from SI)	Less than or equal to 3.0
c. Feedwater Isolation	Less than or equal to 8.0
d. Containment Isolation-Phase "A"	Less than or equal to 18.0#/28.0##
e. Containment Purge and Exhaust Isolation	Not Applicable
f. Motor Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
g. Essential Service Water System	Less than or equal to 14.0#/48.0##
h. Steam Line Isolation	Less than or equal to 11.0
7. <u>Containment Pressure--High-High</u>	
a. Containment Spray	Less than or equal to 45.0
b. Containment Isolation-Phase "B"	Not Applicable
c. Steam Line Isolation	Less than or equal to 10.0
d. Containment Air Recirculation Fan	Less than or equal to 600.0
8. <u>Steam Generator Water Level--High-High</u>	
a. Turbine Trip	Less than or equal to 2.5
b. Feedwater Isolation	Less than or equal to 11.0
9. <u>Steam Generator Water Level--Low-Low</u>	
a. Motor Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
b. Turbine Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
10. <u>4160 volt Emergency Bus Loss of Voltage</u>	
a. Motor Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
11. <u>Loss of Main Feedwater Pumps</u>	
a. Motor Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0
12. <u>Reactor Coolant Pump Bus Undervoltage</u>	
a. Turbine Driven Auxiliary Feedwater Pumps	Less than or equal to 60.0

TABLE 3.3-5 (Continued)

TABLE NOTATION

- # Diesel generator starting and sequence loading delays not included. Offsite power available. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps.
- ## Diesel generator starting and sequence loading delays included. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps.
- ++ Diesel generator starting and sequence loading delays included. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging, SI, and RHR pumps. Sequential transfer of charging pump suction from the VCT to the RWST (RWST valves open, then VCT valves close) is NOT included.
- @ Diesel generator starting and sequence loading delays included. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps. Sequential transfer of charging pump suction from the VCT to the RWST (RWST valves open, then VCT valves close) is included.
- @@ Diesel generator starting and sequence loading delays NOT included. Offsite power available. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps. Sequential transfer of charging pump suction from the VCT to the RWST (RWST valves open, then VCT valves close) is included.

The Foxboro Company Foxboro, Massachusetts, U.S.A. 02035 • Telephone (617) 543-8750

FTAEP-020

TO: American Electric Power
Service Corp.
1 Riverside Plaza
Columbus, Ohio 43215

DATE: 8/5/92
REFERENCE: P.O. C-8741
S.O. 92F12687, 88

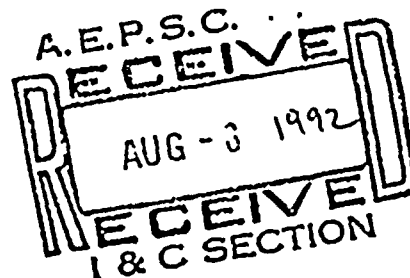
ATTENTION: Mr. William G. Sotos

GENTLEMEN: WE ARE ENCLOSING FOR YOUR USE THE FOLLOWING DOCUMENTS INDICATED BY (X).

ITEM	NUMBER	REVISION # OR DATE	PRINTS	TRANS.	MICRO- FILM	DESCRIPTION OR TITLE	PRELIM. APPROVAL	FINAL APPROVAL	INFORM.	RECORDS	
1.		8/5/92	1			Module Design Response Time		X			

IN ORDER FOR OUR WORK TO PROCEED WITHOUT DELAY, WE MUST HAVE ONE COPY OF ITEM NO.(S) _____ MARKED
WITH YOUR APPROVAL AND/OR COMMENTS, RETURNED TO US BY _____.

REMARKS:



YOURS VERY TRULY,

THE FOXBORO COMPANY

BY: Aldo Vianello
Aldo Vianello, D983/C42-2C Utility Engineering

AMERICAN ELECTRIC POWER
DONALD C COOK NUCLEAR PLANT
Module Design Response Time

Prepared by:

J. T. Keiper 7/31/92
J. T. Keiper

Approved by:

A. Vianello 8/5/92
A. Vianello

The purpose of this calculation is to document the module response time for the SPEC 200 and SPEC 200 MICRO modules used in the Reactor Protection Process Instrumentation system at the Donald C. Cook Nuclear Plant Units 1 & 2.

The response times listed are based on design values published in the Foxboro Corporate Product Specifications (CPS). The actual response of individual modules is expected to be the same (for digital modules) or better than the maximum response time values published.

<u>Model No</u>	<u>Response time</u> (milliseconds)	<u>CPS</u>
N-2AI-C2L	20	0071
N-2AI-H2V	37	0030
N-2AI-I2V	37	0030
N-2AI-P2V	2000	0028
N-2AI-T2V	1000	0027
N-2CCA-S	200	1182
N-2CCA-D	200	1182
N-2AO-V2H	80	0029
N-2AO-L2C-R	10	0096

Notes:

1. Specifications are based upon Foxboro Corporate Product Specifications (CPS) as listed.
2. For analog converter modules the response time is the maximum time required for the output to reach 90% of the final steady state value when excited by an 80% input step (10 to 90% change). This approximately corresponds to two first order time constants.

3. The response time for the relay output module, N-2AO-L2C-R, is typical.
4. The response time listed for the digital modules is the execution time for the processor. The maximum time to respond to a step change in input based upon worst case timing and loading is 400 milliseconds.

ESF RESPONSE TIMES

UNIT 1	RACK ELEC.		D/G START TIME		TOTAL TR	REQUIREMENT	MARGIN	
PARAMETER	TRANSMITTER	& BKR	ESF EQUIPMENT	D/G LOAD TIME		T/S EQUIPMENT		
1. CONTAINMENT								
PRESSURE-HIGH								
A. SI (ECCS)	0.3715		48	7.7+6.76	19.63	=<27.0	7.37	
B. RX TRIP	0.4366				0.4366	=<3.0	2.56	
(FROM SI)								
C. FWI	0.2637		4.51		4.87	=<8.0	3.13	
D. CI-PH A	0.3663/0.3693		5.6/3.9	7.7	5.96/11.97	=<18.0/28.0	12.04/16.03	
E. ESW	0.3637		0.2	7.7+19.65	0.56/27.9	=<13.0/48.0	12.44/20.1	
2. PRZ PRESSURE								
LOW								
A. SI (ECCS)	0.4815		10.5	7.7/7.7+6.76	19.74/10.98	=<27.0/13.0	7.26/2.02	
B. RX TRIP	0.6698				0.6608	=<3.0	2.33	
(FROM SI)								
C. FWI	0.4685		4.51		4.98	=<8.0	3.02	
D. CI-PH A	0.4815		3.9	7.7	12.08	=<18.0	5.92	
E. ESW	0.4685		0.2	7.7+19.65	28.01/0.6685	=<48.0/13.0	19.99/12.33	
3. STEAM LINE								
D/P -HIGH								
A. SI(ECCS)	0.4037		10.5	7.7	10.9/18.6	=<13.0/23.0	2.1/4.4	
B. RX TRIP	0.4623				0.4623	=<3.0	2.54	
(FROM SI)								
C. FWI	0.3946		4.51		4.9	=<8.0	3.1	
D. CI-PH A	0.3972/0.4004		5.6/3.9	7.7	6/12	=<18.0/28.0	12/16	
E. ESW	0.3946		0.2	7.7+19.65	0.59/27.94	=<13.0/48.0	12.41/20	

Attachment #3
Report Number 2985-HEI-01

ESF RESPONSE TIMES

UNIT 1	RACK ELECT.			D/G START TIME				
PARAMETER	TRANSMITTER	& BKR	ESF EQUIPMENT	D/G LOAD TIME	TOTAL TR	T/S REQUIREMENT	MARGIN	
4. HI STEAM FLOW/ LO-LO TAVE								
A. SI (ECCS)	1.0874		10.5	7.7	11.58/19.29	=<15.0/25.0	3.42/5.71	
B. RX TRIP (FROM SI)	1.1395				1.1395	=<5.0	3.86	
C. FWI	1.0718		4.51		5.53	=<10.0	4.47	
D. CI-PH A	1.077/1.0122		5.6/3.9	7.7	6.68/12.68	=<20.0/30.0	13.32/17.32	
E. ESW	1.0718		0.2	7.7+19.65	1.27/28.62	=<15.0/50.0	13.73/31.38	
F. SLI	1.0692		5.4		6.47	=<10.0	3.53	
5. HI STM FLOW/ LO STEAM PRESSURE								
A. SI (ECCS)	0.3206		10.5	7.7	10.82/18.521	=<13.0/23.0	21.8/4.48	
B. RX TRIP (FROM SI)	0.3206				0.3206	=<3.0	2.6794	
C. FWI	0.3076		4.5		4.82	=<8.0	3.18	
D. CI-PH A	0.3106/0.3108		5.6/3.9	7.7	5.91/11.91	=<18.0/28.0	12.09/16.09	
E. ESW	0.3076		0.2	7.7+19.65	0.51/27.85	=<14.0/48.0	13.49/20.15	
F. SLI	0.3776		5.4		5.71	=<8.0	2.29	

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ESF RESPONSE TIMES

UNIT 1		RACK ELECT.		D/G START TIME			
PARAMETER	TRANSMITTER	& BKR	ESF EQUIPMENT	D/G LOAD TIME	TOTAL TR	T/S REQUIREMENT	MARGIN
6. CTMT PRESS HI-HI							
A. CTMT SPRAY	0.3731		0.2+6.4	7.7+30.2	44.87	=<45.0	0.13
B. SLI	0.3663		5.4		5.77	=<7.0	1.23
C. CTMT RECIRC FAN	0.3698		598		598.37	=<660	61.63
7. S/G LEVEL							
HI-HI							
A. TURBINE TRIP	0.4848		0.26		0.75	=<2.5	1.75
B. FWI	0.4898		4.5		5	=<11.0	6
8. S/G LEVEL							
LO-LO							
A. MDA FWP	0.8452		0.08+2.1	7.7+24.86	35.58	=<60.0	24.42
B. TDA FWP	2.1207		10.14+13.45		25.71	=<60.0	34.29

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ESF RESPONSE TIMES

UNIT 2	RACK ELECT.		D/G START TIME				
PARAMETER	TRANSMITTER	& BKR	ESF EQUIPMENT	D/G LOAD TIME	TOTAL TR	T/S REQUIREMENT	MARGIN
1. PRE PRESS-LOW							
A. SI (ECCS)	0.4967		22/11	7.81+16.78	21.29/11.5	=<24.0/12.0	2.71/0.5
B. RX TRIP (FROM SI)	0.5701				0.5701	=<2.0	1.4299
C. FWI	0.4916		3		3.48	=<8.0	4.51
D. CI-PH A	0.4967		8.4/9.6	7.81	8.9/17.9	=<18.0/28.0	9.1/10.1
E. MDA FWP	0.4967		0.12+4.1	7.81+24.88	37.37	=<60.0	22.63
F. ESW	0.4967		0.16	7.81+19.69	28.16/0.68	=<48.0/13.0	19.84/12.34
2. STM LINE							
D/P HIGH							
A. SI (ECCS)	0.3566		11	7.81	11.36/19.17	=<12.0/24.0	0.64/4.83
B. RX TRIP (FROM SI)	0.4378				0.4378	=<2.0	5.622
C. FWI	0.3514		3		3.35	=<8.0	4.63
D. CI-PH A	0.3566		9.26/8.6	7.81	9.61/17.77	=<18.0/28.0	8.39/10.23
E. MDA FWP	0.3903		0.1+4.1	7.81+24.84	37.24	=<60.0	22.76
F. ESW	0.3903		0.16	7.81+18.59	0.55/28.06	=<13.0/42.0	12.45/19.95
3. HI STM FLOW							
LO-LO TAVG							
A. SLI 50% 1420102	0.9254		6.2		7.3	=<10.0	2.87

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ESF RESPONSE TIMES

UNIT 2		RACK ELECT.		D/G START TIME			
PARAMETER	TRANSMITTER	& BKR	ESF EQUIPMENT	D/G LOAD TIME	TOTAL TR	T/S REQUIREMENT	MARGIN
4. STM LINE							
PRESS LOW							
A. SI (ECCS)	0.3903		11	7.81	11.39/19.2	=<12.0/24.0	61/4.8
B. RX TRIP (FROM SI)	0.4741				0.4741	=<2.0	1.5251
C. FWI	0.3799		3		3.38	=<8.0	4.62
D. CI PH A	0.3851		8.9/9.6	7.81	9.29/17.8	=<18.0/28.0	8.71/1020
E. MDA FWP	0.3903		0.11+4.1	7.81+24.84	37.24	=<60.0	22.76
F. ESW	0.3903		0.16	7.81+19.69	0.55/28.05	=< 14.0/148 <i>18/2502</i>	13.45/19.95
G. SLI	0.3799		6.2		6.58	=<8.0	1.42
5. CTMT PRESS							
HI HI							
A. CTMT SPRAY	0.3798		1.01+2/49.2	7.81+30.47/7.81	39.87/57.39	=<45.0/60.0	5.13/2.61
B. SLI	0.3798		6.2		6.58	=<7.0	42
C. CTMT RECIR FAN	0.3772		534		534.38	=<600.0	65.62
6. S/E LEVEL LO-LO							
A. MDA FWP	0.339		0.08+4.1	7.81+24.84	37.17	=<60.0	22.83
B. TDA/FWP	0.3259		8.5+14.09		22.92	=<60.0	37.08

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REACTOR TRIP SYSTEM INSTRUMENTATION RESPONSE TIME

UNIT 1

PARAMETER	TRANSMITTER	RACK ELECTRONICS & BKR	TOTAL TR	T/S REQUIREMENT	MARGIN
1. OT/DT	2.5	2.2973-0.2448	4.5525	=<6.0	1.45
2. PRZ PRESS-LOW	0.39	0.4145-0.2448	0.5597	=<1.0	0.44
3. PRZ PRESS-HIGH	0.39	0.3546-0.2448	0.4998	=<1.0	0.5
4. PRZ LEVEL-HIGH	0.33	0.4405-0.2448	0.5257	=<2.0	1.47
5. RCS FLOW-LOW	0.4	0.352-0.2448	0.5072	=<0.6	0.093
6. S/G LEVEL-LOW-L	0.3	0.8624-0.2448	0.9176	=<1.5	0.58

UNIT 2

PARAMETER	TRANSMITTER	RACK ELECTRONICS & BKR	TOTAL TR	T/S EQUIPMENT	MARGIN
1. OT/DT	3.4	1.461-0.1813	4.679	=<6.0	0.32
2. PRZ PRESS-LOW	0.26	0.4964-0.1813	0.5751	=<1.0	0.42
3. PRZ PRESS -HIGH	0.35	0.3794-0.1813	0.5481	=<1.0	0.4519
4. RCS FLOW-LOW	0.42	0.3248-0.1813	0.5635	=<0.6	0.04
5. S/G LEVEL-LOW-L	0.3	0.3067-0.1813	0.4254	=<1.5	1.07

NOTES: 1. ALL TIMES ARE IN SECONDS

2. WORST CASE LOOP SHOWN

3. ALL DATA IS REPRINTED FROM MATERIAL SUPPLIED TO HEI. ORIGINAL MATERIAL DATED 04/05/90 (S. MACY)

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Attachment 4: Reactor Trip System Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>F O X B O R O</u> <u>M O D U L E</u> <u>NUMBER</u>	<u>RESPONSE</u> <u>TIME PER</u> <u>LETTER</u>	
OT Δ T	12-RPC-02 92F12687 FD-2102 SHT 1 & 3			Δ T
		N-2AI-P2V	2000MS	D E V
		N-2CCA-DC	400MS	ALARM
		N-2AD-V2H+P	<u>80MS</u>	
			2400MS	
		N-2AI-P2V	2000MS	OP Δ T
		N-2CCA-DC	400MS	RX TRIP
		N-2CCA-DC	400MS	
		N-2AD-L2C-R	<u>10MS</u>	
			2810MS	
		N-2AI-P2V	2000MS	OT Δ T
		N-2CCA-DC	400MS	RX TRIP
		N-2CCA-DC	400MS	
		N-2AD-L2C-R	<u>10MS</u>	
			2810MS	

Common for both Units 1&2

Attachment 4: Reactor Trip System Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>F O X B O R O M O D U L E NUMBER</u>	<u>R E S P O N S E T I M E P E R L E T T E R</u>
Pressurizer	12-RPC-04	N-2AI-H2V	37MS
Pressure	92F12687	N-2CCA-DC	400MS
Low-	FD#2101 SHT#1	N-2AD-L2C-R	<u>10MS</u> 447MS

Common for both Units 1 & 2

Attachment 4: Reactor Trip System Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>F O X B O R O M O D U L E NUMBER</u>	<u>R E S P O N S E T I M E P E R L E T T E R</u>
Pressurizer	12-RPC-04	N-2AI-H2V	37MS
Pressure	92F12687	N-2CCA-DC	400MS
(High)	FD#2101 SHT#1	N-2AO-L2C-R	<u>10MS</u> 447MS

Common for both Units 1 & 2

Attachment 4: Reactor Trip System Response Time Evaluation Tables

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<u>LOOP ID</u>		<u>ECP#/FD#</u>	<u>FOXBORO</u> <u>MODULE</u> <u>NUMBER</u>	<u>RESPONSE</u> <u>TIME PER</u> <u>LETTER</u>
RCS Flow (Low)		12-RPC-01	N-2AI-H2V	37MS
		92F12687	N-2CCA-DC	400MS
		FD#2101 SHT 1&3	N-2AO-L2C-R	<u>10MS</u>
				447MS

Common for both Units 1 & 2

Attachment 4: Reactor Trip System Response Time Evaluation Tables

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Originator S. Kincaid Date: 10/15/92

<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>F O X B O R O</u> <u>M O D U L E</u> <u>N U M B E R</u>	<u>R E S P O N S E</u> <u>T I M E P E R</u> <u>L E T T E R</u>
Pressurizer	12-RPC-03	N-2AI-H2V	37MS
Level (High)	92F12687	N-2CCA-DC	400MS
	FD#2101 SHT 2	N-2AO-L2C-R	<u>10MS</u>
			447MS

Common for both Units 1 & 2

Attachment 4: Reactor Trip System Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO MODULE NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
S t e a m	12-RPC-05	N-2AI-H2V	37 MS
Generator	92F12687	N-2CCA-DC	400MS
Level	FD-2101	N-2AO-L2C-R	<u>10MS</u>
low-low	SHT 5		447MS

Attachment 4: Reactor Trip System Time Response Comparison

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Loop ID	Existing Rack Electronics/Bkr	New Rack Electronics/Bkr	Existing Rack Electronics Tot. Resp Time	New Rack Electronics Tot. Resp Time	Tech Spec Time Response Requirement	Existing Time Response Margin	New Time Response Margin	New Negative Margin	Comments/ Resolutions
Unit 1									
OTDT	2.2973-0.2448 (2.0525)	2.81-0.2448 (2.5652)	2.0525+2.5 (4.5525)	2.5652+2.5 (5.0652)	<=6.0000	1.4475	0.9348	NONE	
OPDT		2.81-0.2448 (2.5652)		2.5652+2.5 (5.0652)	<=6.0000		0.9348		
Pressurizer Press (LOW)	0.4145-0.2448 (0.1697)	0.447-0.2448 (0.202)	0.39+0.1697 (0.5597)	0.202+0.39 (0.592)	<=1.0000	0.4403	0.408	NONE	
Pressurizer Press (HIGH)	0.3546-0.2448 (0.1098)	0.447-0.2448 (0.202)	0.39+0.1098 (0.4998)	0.39+0.202 (0.592)	<=1.0000	0.5002	0.408	NONE	
RCP Flow (LOW)	0.352-0.2448 (0.1072)	0.447-0.2448 (0.202)	0.4+0.1072 (0.5072)	0.4+0.202 (0.602)	<=1.0000	0.4928	0.398	NONE	
Pressurizer Level (HIGH)	0.4405-0.2448 (0.1957)	0.447-0.2448 (0.202)	0.33+0.1957 (0.5257)	0.33+0.202 (0.532)	<=2.0000	1.4743	1.467	NONE	
S/G Level-low low	0.8624-0.2448 (0.6176)	0.447-0.2448 (0.202)	0.3+0.6176 (0.9176)	0.3+0.202 (0.502)	<=1.5000	0.5824	0.998	NONE	

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Attachment 4: Reactor Trip System Time Response Comparison

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Loop ID	Existing Rack Electronics/Bkr	New Rack Electronics/Bkr	Existing Rack Electronics Tot. Resp Time	New Rack Electronics Tot. Resp Time	Tech Spec Time Response Requirement	Existing Time Response Margin	New Time Response Margin	New Negative Margin	Comments/Resolutions
Unit 2									
OTDT	1.461-0.1813 (1.2797)	2.81-0.1813 (2.6287)	3.4+1.2797 (4.6797)	3.4+2.6287 (6.0287)	<=6.0000	1.3203		-0.0287	Neg. margin using worst response.
OPDT		2.81-0.1813 (2.6287)		3.4+2.6287 (6.0287)	<=6.0000			-0.0287	Actual times expected to be much shorter.
Pressurizer Press (LOW)	0.4964-0.1813 (0.3151)	0.447-0.1813 (0.2666)	0.3151+0.26 (0.5751)	0.2666+0.26 (0.5266)	<=1.0000	0.4249	0.4734	NONE	
Pressurizer Press (HIGH)	0.3794-0.1813 (0.1981)	0.447-0.1813 (0.2666)	0.1981+0.35 (0.5481)	0.2666+0.35 (0.6166)	<=1.0000	0.4519	0.3834	NONE	
RCS Flow	0.3248-0.1813 (0.1435)	0.447-0.1813 (0.2666)	0.42+0.1435 (0.5635)	0.2666+0.42 (0.6866)	<=1.0000	0.4365	0.3134	NONE	
SIG Level-High low	0.3067-0.1813 (0.1254)	0.447-0.1813 (0.2666)	0.3+0.1254 (0.4254)	0.3+0.2666 (0.5666)	<=1.5000	1.0746	0.9334	NONE	

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Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO MODULE NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
Containment Pressure- High	12-RPC-07 92F12687-FD-2103 SHT #4		
A. Safety Inj.		N-2AI-H2V N-2CCA-SC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
B. RX Trip		N-2AI-H2V N-2CCA-SC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
C. FW Isol.		N-2AI-H2V N-2CCA-SC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
D. Cont Isol.		N-2AI-H2V N-2CCA-SC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
E. Essential Service Water		N-2AI-H2V N-2CCA-SC N-2AD-L2L-R	37MS 400MS <u>10MS</u> 447MS

Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO M O D U L E NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
Pressurizer Pressure (Low)	12-RPC-04 92F12687-FD-2101 SHT 1 FD-2102 SHT 2		
A. Safety Inj.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
B. RX Trip (From SI)		N-2AI-H2V N-2CCA-DC- N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
C. FW Isol.		N-2AI-H2V N-2CCA-DC N-2AO-C2C-R	37MS 400MS <u>10MS</u> 447MS
D. Cont Isol. (PHA)		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
E. Essential Service Water		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS

Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>F O X B O R O</u> <u>MODULE</u> <u>NUMBER</u>	<u>RESPONSE</u> <u>TIME PER</u> <u>LETTER</u>
Steam Line △/P-High	12-RCP-08 92F12687-FD-2103 SHT 2		
A. Safety Inj.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
B. RX Trip (from SI)		N-AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
C. Feedwater Isol.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
D. Cont Isol. (PHA)		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
E. Essential Service Water		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS

Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO MODULE NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
High Steam Flow/Lo-Lo Tavg	12-RPC-02 92F12687 FD#2103 SHT 1 FD#2103 SHT 3		
A. Safety Inj.	FD#2104 SHT 2&4	N-2AI-P2V N-2CCA-DC N-2AO-L2C-R	2000MS 400MS <u>10MS</u> 2410MS
B. RX Trip (From SI)		N-2AI-P2V N-2CCA-DC N-2AO-L2C-R	2000MS 400MS <u>10MS</u> 2410MS
C. Feedwater Isol.		N-2AI-P2V N-2CCA-DC N-2AO-L2C-R	2000MS 400MS <u>10MS</u> 2410MS
D. Cont Isol.		N-2AI-P2V N-2CCA-DC N-2AO-L2C-R	2000MS 400MS <u>10MS</u> 2410MS
E. Essential Service Water		N-2AI-P2V N-2CCA-DC N-2AO-L2C-R	2000MS 400MS <u>10MS</u> 2410MS
F. Steam Line Isol.		N-2AI-P2V N-2CCA-DC N-2AO-L2C-R	2000MS 400MS <u>10MS</u> 2410MS

Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO MODULE NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
High Steam Flow/Low Steam Pressure	FD#2103 SHT 1&3 FD#2103 SHT 2&4		
A. Safety Inj.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
B. RX Trip		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
C. Feedwater Isol.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
D. Cont Isol.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
E. Essential Service Water		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
F. Steam Line Isol.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS

Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO MODULE NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
Low Steam Pressure	12-RPC-08 92F12687 FD#2103 SHT 2&4 FD#2104 SHT 1&3	N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS

<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO MODULE NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
Containment Pressure (Hi Hi)	12-RPC-07 92F12687 FD#2103 SHT 4		
A. Cont Sprays		N-2AI-H2V N-2CCA-SC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
B. Steam Line Isol.		N-2AI-H2V N-2CCA-SC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
C. Cont Rescirc Flow		N-2AI-H2V N-2CCA-SC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS

Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>FOXBORO MODULE NUMBER</u>	<u>RESPONSE TIME PER LETTER</u>
Steam Generator Level (Hi Hi)	12-RPC-05 92F12687 FD#2101 SHT 5		
A. Turbine Trip		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
B. Feedwater Isol.		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS

Attachment 5: Engineered Safety Features Response Time Evaluation Tables

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<u>LOOP ID</u>	<u>ECP#/FD#</u>	<u>F O X B O R O</u> <u>MODULE</u> <u>NUMBER</u>	<u>RESPONSE</u> <u>TIME PER</u> <u>LETTER</u>
S t e a m Generator Level (Lo Lo)	12-RPC-05 92F12687 FD#2101 SHT 5		
A. Motor Driven Aux Feedwater pump		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS
B. Turbine Driven Aux Feedwater pump		N-2AI-H2V N-2CCA-DC N-2AO-L2C-R	37MS 400MS <u>10MS</u> 447MS

Attachment 5: Engineered Safety Features Time Response Comparison

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Loop ID	Existing Rack Electronics/Bkr	New Rack Electronics/Bkr	Tech Spec Time Response Requirement	Existing Time Response Margin	New Time Response Margin	New Negative Margin	Comments/Resolutions
Unit 1							
High Steam Flow/Low Steam Pressure							
A. SI	0.3206	0.447	<=27.0/37.0	16.18/18.48	16.05/18.35	NONE	
B. RX trip	0.3206	0.447	<=3.0	2.6794	2.553	NONE	
C. FWI	0.3076	0.447	<=8.0	3.18	3.04	NONE	
D. CI(Ph. A)	0.3106/0.318	0.447/0.447	<=18.0/28.0	12.09/16.09	11.95/15.96	NONE	
E. ESW	0.3076	0.447	<=14.0/48.0	13.49/20.15	13.35/20.01	NONE	
F. SLI	0.3076	0.447	<=11.0	5.29	5.15	NONE	
Containment Pressure (HI-HI)							
A. Cont Spray	0.3731	0.447	<=45.0	0.1269	0.053	NONE	
B. Steam Line Isol	0.3663	0.447	<=10.0	4.42337	4.343	NONE	
C. Cont Recirc Flow	0.3698	0.447	<=660	61.6302	61.553	NONE	
Steam Generator Level (HI-HI)							
A. Turbine Trip	0.4898	0.447	<=2.5	1.7502	1.793	NONE	
B. FWI	0.4898	0.447	<=11.0	6.0002	6.043	NONE	

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Attachment 5: Engineered Safety Features Time Response Comparison

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Loop ID	Existing Rack Electronics/Bkr	New Rack Electronics/Bkr	Tech Spec Time Response Requirement	Existing Time Response Margin	New Time Response Margin	New Negative Margin	Comments/Resolutions
Cont Pressure							
High							
A. SI	0.3715	0.447	<=27.0	7.37	7.2945	NONE	
B. RX Trip	0.4366	0.447	<=3.0	2.56	2.549	NONE	
C. FWI	0.3637	0.447	<=8.0	3.13	3.046	NONE	
D. CI (Ph. A)	0.3663/0.3693	0.447/0.447	<=18.0/28.0	12.04/16.03	11.959/15.95	NONE	
E. ESW	0.3637	0.447/0.447	<=13.0/48.0	12.44/20.1	12.356/20.01	NONE	
Pressurizer							
Pressure-Low							
A. SI	0.4815	0.447/0.447	<=27.0/27.0	7.26/16.02	7.2945/16.05	NONE	
B. RX Trip	0.6698	0.447	<=3.0	2.33	2.5528	NONE	
C. FWI	0.4685	0.447	<=8.0	3.02	3.0415	NONE	
D. CI(Ph. A)	0.4815	0.447	<=18.0	5.92	5.9545	NONE	
E. ESW	0.4685	0.447/0.447	<=48.0/13.0	19.99/12.33	20.011/12.35	NONE	
Steam Line							
D/P High							
A. SI	0.4037	0.447	<=27.0/37.0	16.1/18.4	16.056/18.35	NONE	
B. RX Trip	0.4623	0.447	<=3.0	2.54	2.555	NONE	
C. FWI	0.3946	0.447	<=8.0	3.1	3.0476	NONE	
D. CI (Ph. A)	0.3772/0.4004	0.447/0.447	<=18.0/28.0	12/16	11.9302/15.95	NONE	
E. ESW	0.3946	0.447	<=13.0/48.0	12.41/20.06	12.3576/20	NONE	

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Attachment 5: Engineered Safety Features Time Response Comparison

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Loop ID	Existing Rack Electronics/Bkr	New Rack Electronics/Bkr	Tech Spec Time Response Requirement	Existing Time Response Margin	New Time Response Margin	New Negative Margin	Comments/Resolutions
High Steam Flow/LoLo TAVG							
A. SI	1.0874	2.41	<=29.0/39.0	17.42/19.71	16.0974/18.3874	NONE	
B. RX Trip	1.1395	2.41	<=5.0	3.8605	2.59	NONE	
C. FWI	1.0718	2.41	<=10.0	4.47	3.1318	NONE	
D. CI (Ph. A)	1.077/1.0122	2.41/2.41	<=20.0/30.0	13.32/17.32	11.987/15.922	NONE	
E. ESW	1.0718	2.41	<=15.0/50.0	13.73/21.38	12.3918/20.0418	NONE	
F. SLI	1.0692	2.41	<=13.0	6.53	5.1892	NONE	
Steam Generator Level (Lo-Lo)							
A. MDA FWP	0.8452	0.447	<=60.0	35.5852	35.9834	NONE	
B. TDA FWP	2.1207	0.447	<=60.0	34.2893	35.963	NONE	
Unit 2 Pressurizer Pressure Lo							
A. SI	0.4967	0.447	<=27.0/27.0	5.7033/15.5033	5.753/15.55	NONE	
B. RX Trip	0.5701	0.447	<=3.0	2.4299	2.5553	NONE	
C. FWI	0.4916	0.447	<=8.0	4.5084	4.553	NONE	
D. CI (Ph. A)	0.4967	0.447	<=18.0	9.1033	9.5533	NONE	
E. MDA FWP	0.4967	0.447	<=60.0	22.6333	22.683	NONE	
F. ESW	0.4967	0.447	<=48.0/13.0	19.8433/12.3433	19.893/12.39	NONE	

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Attachment 5: Engineered Safety Features Time Response Comparison

Loop ID	Existing Rack Electronics/Bkr	New Rack Electronics/Bkr	Tech Spec Time Response Requirement	Existing Time Response Margin	New Time Response Margin	New Negative Margin	Comments/Resolutions
Steam Line							
D/P High							
A. SI	0.3566	0.447	<=27.0/37.0	15.6434/17.8334	15.553/17.74	NONE	
B. RX Trip	0.4378	0.447	<=3.0	2.5622	2.553	NONE	
C. FWI	0.3514	0.447	<=8.0	4.6486	4.553	NONE	
D. CI(Ph. A)	0.3566	0.447	<=18.0/28.0	8.3834/10.2334	8.293/10.1426	NONE	
E. MDA FWP	0.3903	0.447	<=60.0	22.7597	22.703	NONE	
F. ESW	0.3903	0.447	<=13.0/48.0	12.4497/19.9497	12.393/19.88	NONE	
Hi Steam Flow/							
Lo-Lo TAVG							
A. SLI	0.9254	2.41	<=13.0	5.8746	4.39	NONE	
Steam Line							
Pressure Lo							
A. SLI	0.3903	0.447	<=27.0/37.0	15.6097/17.7997	15.553/17.733	NONE	
B. RX Trip	0.4741	0.447	<=3.0	2.5259	2.553	NONE	
C. FWI	0.3799	0.447	<=8.0	4.6201	4.553	NONE	
D. CI (Ph. A)	0.3851	0.447	<=18.0/28.0	8.7149/10.2049	8.653/10.142	NONE	
E. MDA FWP	0.3903	0.447	<=60.0	22.7597	22.703	NONE	
F. ESW	0.3903	0.447	<=14.0/48.0	13.4497/19.9497	13.393/19.88	NONE	
G. SLI	0.3799	0.447	<=11.0	4.4201	4.353	NONE	

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Loop ID	Existing Rack Electronics/Bkr	New Rack Electronics/Bkr	Tech Spec Time Response Requirement	Existing Time Response Margin	New Time Response Margin	New Negative Margin	Comments/Resolutions
Containment							
Pressure Hi-Hi							
A. Cont Spray	0.3798	0.447	<=45.0	5.1302	5.063	NONE	
B. SLI	0.3798	0.447	<=10.0	3.4202	3.353	NONE	
C. Cont Recirc	0.3772	0.447	<=600.0	65.6228	65.553	NONE	
Flow							
Steam Generator							
Level Lo Lo							
A. MDA FWP	0.339	0.447	<=60.0	22.831	22.723	NONE	
B. TDA FWP	0.3259	0.447	<=60.0	37.0841	36.963	NONE	

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