REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

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50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylva 05000388
AUTH.NAME AUTHOR AFFILIATION
CURTIS,N.W. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

SUBJECT: Expounds on agreements reached at 820524 meeting W/NRC re voltage study.Four design changes identified for support of Unit 1 operation.Mar test fulfills requirement for voltage verification test.Supporting documentation encl.

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	NRR/DSI/AEB	26	1	1	NRR/DSI/ASB	27	1	1
	NRR/DSI/CPB	10	1	1	NRR/DSI/CSB	09	1	1
	NRR/DSI/ETSB	12	1	1	NRR/DSI/ICSB	16	1	1
	NRR/DSI/PSB	19	1	1	NRR/DSI/RAB	22	1	1
	NRR/DSI/RSB	23	1	1	NRR/DST/LGB	33	1	1
	REG FILE	04	1	1	RGN1		2	2
EXTERNAL:	ACRS	41	10	10	BNL(AMDTS ONLY)		1	1
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	NRC PDR	02	1	1	NSIC	05	1	1
	NTIS		1	1				

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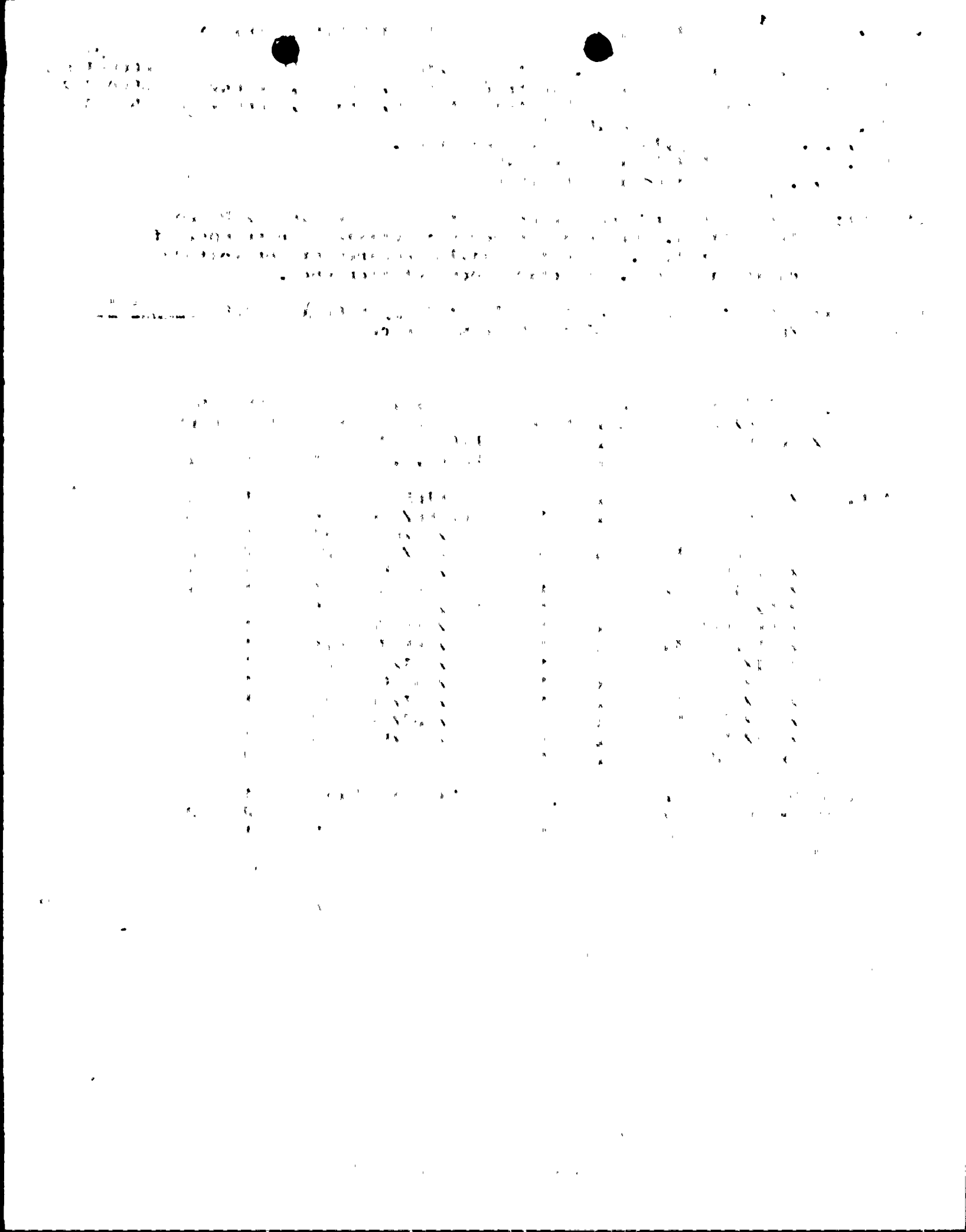

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Norman W. Curtis
Vice President-Engineering & Construction-Nuclear
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JUN 16 1982

Mr. A. Schwencer, Chief
Licensing Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
NRC MEETING MAY 24, 1982 ACTION ITEM RESPONSE
ER 100450 FILE 841-3 Docket Nos 50-387
PLA - 1137 50-388

Dear Mr. Schwencer:

On May 24, 1982 a meeting was held in Allentown between PP&L and the NRC to discuss the Susquehanna SES voltage study. Attachment 1 is the attendance sheet. In this meeting PP&L indicated the field voltage verification test on March 14, 1982 demonstrated that actual voltages were less than calculated values to the extent that voltage design criteria was no longer met for the design base accident with two units in operation. This issue was reported to the Commission in our letter PLA-1102 dated May 21, 1982.

Additionally, PP&L provided discussion on a recently completed re-study by the manufacturer of the diesel generator loading sequence. Concluded from the study was that voltage and frequency criteria was not met for the initial load step on the diesel generator. This deficiency was reported by telephone to Mr. S. D. Ebneter of NRC Region I on May 25, 1982 by Mr. A. R. Sabol of PP&L.

PP&L presented a study of Unit 1 operation only in the May 24, 1982 meeting. This study was done to show that the existing power distribution system would provide acceptable voltages in support of Unit 1 fuel load without major design changes. System changes required to support two unit operation will follow after further tests and engineering studies are completed.

As presented in the meeting, four design changes were identified for support of Unit 1 operation. They are the following:

1. Automatic trip of Unit 2 class 1E switchgear for a Unit 1 LOCA signal to assure no Unit 2 loads in the construction or testing phases affect the LOCA loading.

2. Automatic blocking of the transfer of selected Auxiliary Bus loads from the Unit Auxiliary Transformer to the Startup Transformer on a generator trip with a LOCA signal present.

B001

3. Automatic change of the Startup Transformer automatic tap changer voltage setpoint and control scheme to increase regulated voltage +1.3% on the low side of the transformer.

4. Addition of a three second time delay to the automatic start of the RHR pumps for the initial LOCA load step on the diesel generators.

These changes will be incorporated prior to the Unit 1 P100 Cold Functional test.

At the conclusion of the meeting the NRC identified the following four items for PP&L response:

1. Provide voltage data on typical limiting devices at the various voltage levels in the class 1E systems. Provide a list of class 1E equipment containing relays identified in the meeting that drop out below 85% and the effects on performance of that equipment when large motor starts occur.

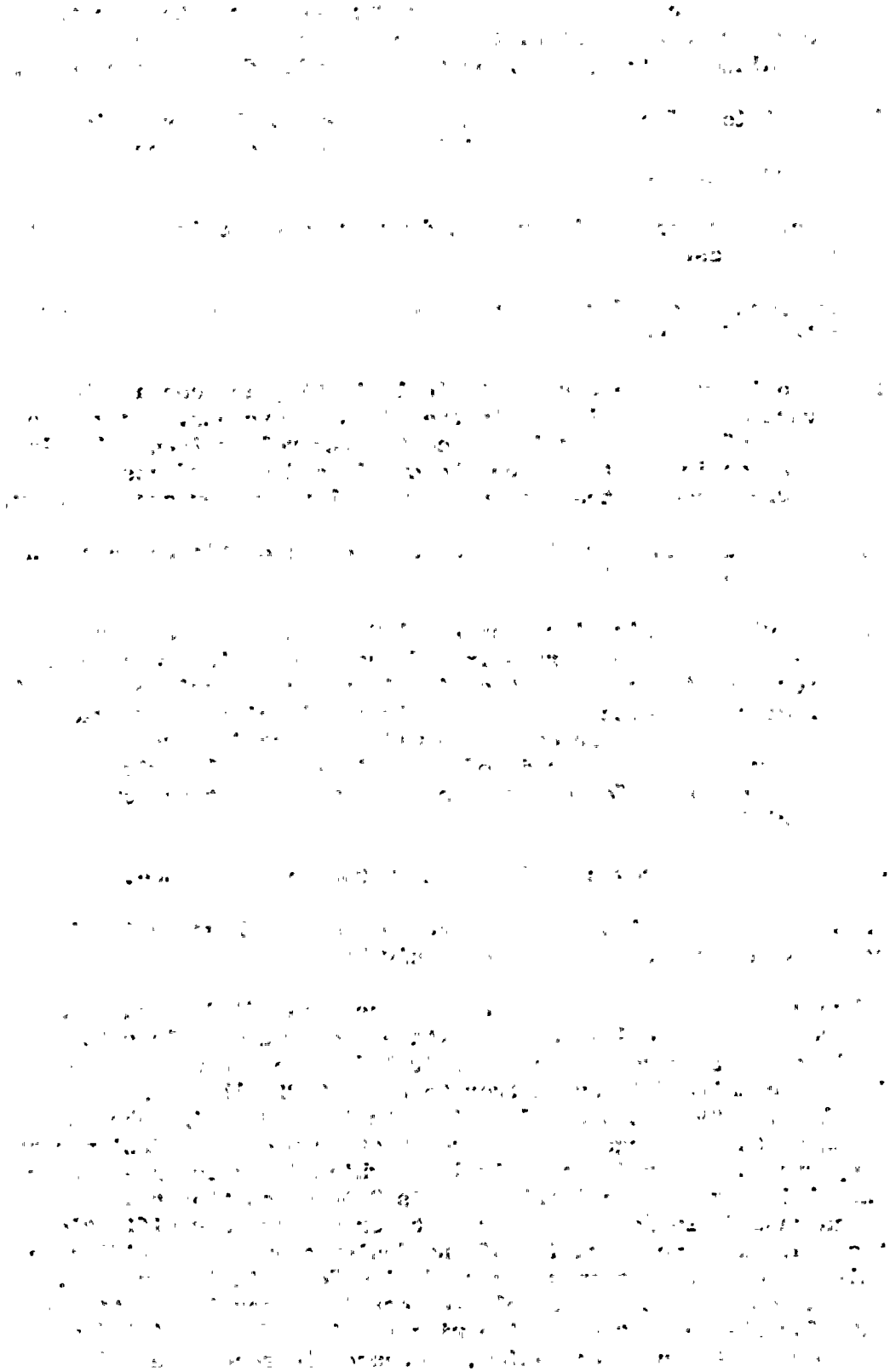
2. Provide PP&L operating experience on automatic tap changing transformer performance.

3. Provide the circuitry for the 1.3% change in the voltage setpoint of the Startup Transformer automatic tap changer for a LOCA signal and the circuitry for the trip of the Unit 2 class 1E switchgear for a Unit 1 LOCA signal. Provide assurance that the circuitry will be tested. Provide assurance that the trip of the Unit 2 class 1E switchgear will not be defeated or bypassed during construction activities.

4. Provide the revised diesel generator load sequence.

This letter transmits PP&L's responses to the above action items as Attachments 2 through 5, respectively.

Subsequent to the meeting a concern was identified by the NRC regarding the upcoming second voltage test and our plans to analyze the test results after Unit 1 fuel load but by September 1982 as committed in our letter to the NRC PLA-1102, dated May 21, 1982. PP&L has proceeded with studies and design changes based on the findings of the March test to provide a design that supports the operation of Unit 1 and which includes margin over the minimum voltage criteria. It is PP&L's position that the March test fulfulls the requirement for a voltage verification test and that incorporation of the design changes identified in this letter provides an adequate design for Unit 1 operation. The purpose of the second voltage test is to obtain additional data for the support of engineering studies of potential design changes for two unit operation. Because the second test is not



in support of Unit 1 operation, the analysis of its results is not required by Unit 1 fuel load.

We trust the Commission will find this submittal to be satisfactory to close the action items from the May 24, 1982 meeting.

Very truly yours,

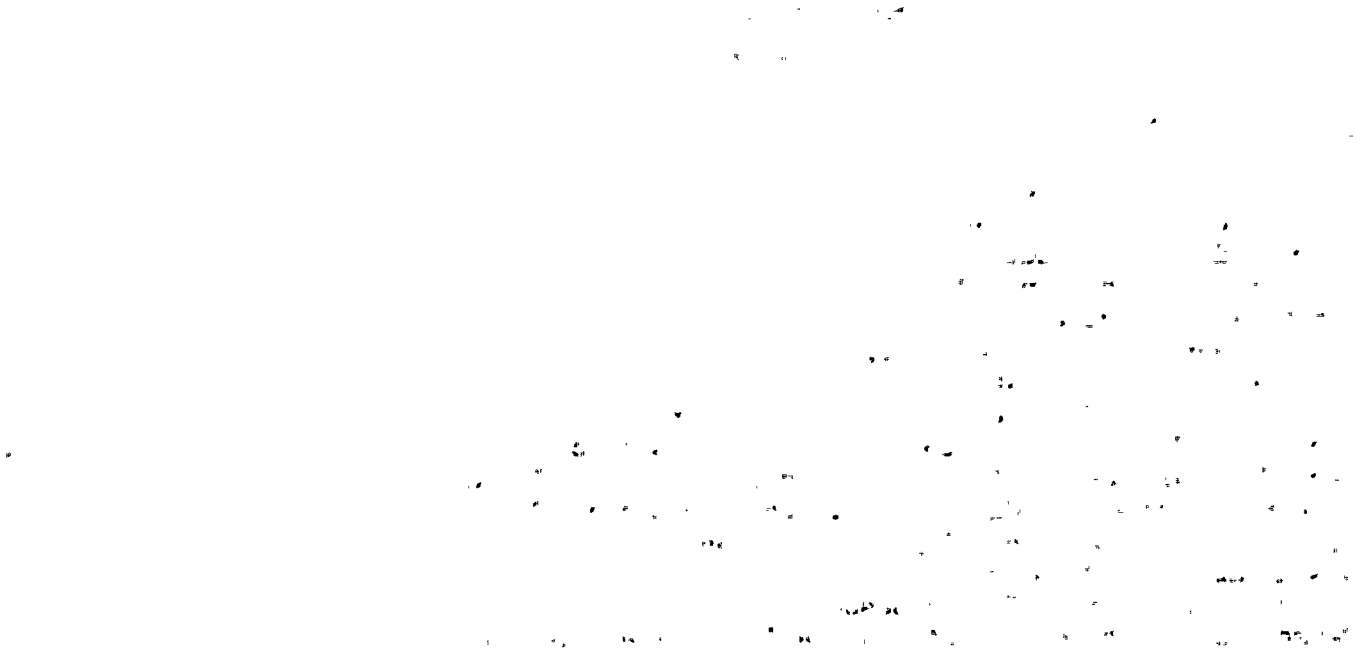
N. W. Curtis
Vice President - Engineering & Construction - Nuclear

cc: Robert Perch

Attachment 1

Attendance 5/24/82

Sam Kuhn - NPE
Don Reimert - SO Dept.
Tony Sleva - NPE-Elect
Ron Petrokonis - SSES-Elect
Vern Oheim - NPE-Elect
Ray Harris - Licensing PP&L
Tom Domin - SO Dept.
John McCann - NRC Resident Insp.
Sang Rhow - DSI/PSB/NRR
Gary Rhoads - NRC Senior Resident Inspector
Alan E. Finkel - NRC Reactor Engineering Inspector
Donald A. Beckman - Chief, Plant Systems Section, NRC Reg I
Stewart D. Ebneter - Chief Engrg. Programs Branch, NRC Reg I
Robert Perch - NRC Licensing Project Manager
Jason Saranga - PP&L NQA
Frank Wurst - PP&L Safety Assessment
Raymond J. Fernandez - System Operating - Relay Section



Attachment #2

Action Item #1

Part 1, attached, is voltage data for typical limiting devices that establish the voltage criteria for Susquehanna SES. Motors are designed to accelerate their loads at 80% motor terminal voltage and will develop 100% full load torque for voltage dips to approximately 71% terminal voltage. Motors have been specified to meet NEMA Standard MG 1-12.43 for a 10% voltage range for continuous operation.

Part 2 of the attached information provides the two relays that would drop out momentarily, if energized, during the large motor start transients. Included are the equipment in which they are installed and the impact to the operation of the equipment.

Also attached in Part 3 is a matrix showing plant voltages for various conditions as determined by calculation. Please note that column C provides the voltage criteria that includes margins for the error that was determined by the field verification test. Also, note that column G shows the Susquehanna design does meet the minimum accelerating voltage criteria for the start of the second set of RHR pumps without the Startup Transformer automatic tap changer advancing taps. This is a reversal of PP&L's statements in the May 24, 1982 meeting indicating that the 80% voltage criteria would not be met under this condition. Those statements were made without having performed a calculation of the specific case, and analysis performed subsequent to the meeting shows the criteria is met.

Action Item #1
Part 1
4KV Equipment

Excerpts from various 4KV motor data sheets

Equipment #	Load Type	Reference Drawing	Rated Hp	Breakdown Torque % of Full Load	% of Full Load Torque at 70 % Voltage
1P506 A&B 2P506 A&B	RHR Service Water Pump	FF103120 Sh0202RZ	600	200	98
0P504 A,B, C&B	Emer. Service Water Pump	FF103120 Sh0201RZ	450	200	98
1P202 A,B,C&D 2P202 A,B,C&D	RHR Pump	FF124510 Sh0402R3	2000	200	98
1P206 A,B,C&D 2P206 A,B,C&D	Core Spray Pump	FF126510 Sh0801R6	700	200	98

% Full Load Torque at 70% Voltage = $\left(\frac{70\% \text{ voltage}}{100\% \text{ voltage}}\right)^2$ X Breakdown Torque

480V Equipment

Excerpts from Material Requisition #8856-M-399B, entitled:

"IE Motors for HVAC Equipments"

Pages 10, 11, 12, & 13

Equipment #	Load Type	Rated Hp	Breakdown Torque % of Full Load	% of Full Load Torque at 70 % Voltage
0V116A&B 0V118A&B	Exhaust Fans	5hp	225	110
0V101A&B	Outside Air Fan	20hp	200	98
0V144A&B	Heating Unit Fan	5hp	289	141
1V222A&B 2V222A&B	Room Cooler Fan	15hp	204	100
0V115A&B 0V117A&B	Cooling Fan	40hp	270	132
0V103A&B	H/V Fan	50hp	330	161
0P171A&B	Chiller Water Pump	20hp	205	100
0P162A&B	Chilled Water Pump	30hp	229	112

% of Full Load Torque at 70% voltage = $\left(\frac{70\% \text{ voltage}}{100\% \text{ voltage}}\right)^2$ X Breakdown Torque

480 Equipment

Excerpts from Spec #8856-G-5, entitled:

"General Project Requirements for Integral and Fractional Horsepower Induction Motors 200 Horsepower and smaller for Susquehanna Steam Electric Station"

Paragraph 5.4 Acceleration

Motors shall be capable of accelerating the load as specified or shown on the load speed-torque curves with 80 percent rated motor nameplate voltage at the motor terminals.

Paragraph 6.5 Starting Characteristics - Integral Horsepower Motors

Integral horsepower motors shall be NEMA design B with normal starting torque and low starting current for "across-the-line" full-voltage starting, unless other characteristics are required by the driven equipment.

Paragraph 7.2 Starting Characteristics - Fractional Horsepower Motors

Three-plate motors shall be NEMA design B.

Paragraph 12.3

The seller shall include in his submittal documentation package, certifications that the equipment meets the following:

A. NEMA standards publication No. MG-1, Motors and Generators, Part MG 1-12.43 Variation from rated voltage

Action Item #1 Part 2

Devices that drop out between 70% and 85% of rated voltage.

o Allen Bradley AB-702L-COD93 contactor; 80% dropout

Location: 0C889A - Emergency Outside Air Filter Control Panel

Function: Energize Control Room Fresh Air Heaters 0E143A&B.

Discussion: The subject heaters are energized when control structure outside air supply fans 0V101A&B are running. The subject fans start automatically for a DBA LOCA.

Operation Impact: For normal plant operation the heaters are deenergized. The heaters will not energize continuously until the initial motor starting voltage transients are over at approximately 25 seconds after the LOCA occurs. This condition does not impair the operation of the Outside Air System.

o Potter and Brumfield KUP14A15; 85% dropout

Location: 1C227A - Containment Particulate Radiation Analyzer Panel.

Function: Provide indication of radiation inside containment i.e. leak detection.

Discussion: This is a local panel.

Operation Impact: Local indication of radiation inside of containment will be momentarily interrupted during the motor starting voltage transients. Since a continuous indication is not critical, at this unmanned location, temporary loss of indication is acceptable.

Action Item #1
Part 3

PLANT VOLTAGE MATRIX

	A	B	C	D	E	F	G
Minimum continuous voltage for 4.16KV equipment	3744V	71V	3815V	4118V	4096V	4102V	4037V
Minimum continuous voltage for 480V equipment	432V	10V	442V	447V	445V	446V	438V
Minimum continuous voltage for 120V equipment	108V	.5V	108.5V	114.7V	114.1V	114V	112.3V
Minimum starting voltage for 4KV motors	3200V	108V	3308V	3332V	3310V	3724V	3310V
Minimum starting voltage for 460V motors	368V	14V	382V	404V	398V	414V	398V

A - Design minimum - 90% continuous; 80% motor starting.

B - Additional margins which are required because of the results of the design voltage verification tests.

C - A + B - Design minimum with additional margins.

D - Calculated minimum with all modifications implemented

E - Calculated minimum with one startup transformer out-of-service and the design change to revise voltage schedule and initiate fast raise of LTC not implemented.

F - Calculated minimum with both startup transformers in-service but one LTC controller fails.

G - Calculated minimum with one startup transformer and one ES transformer out-of-service and an LTC controller failure.

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Attachment 3

Action Item #2

The following is a tabulation of automatic tap changing transformer failures on PP&L's system from January 1, 1977 through December 31, 1981. Transformer outages ranged from less than 24 hours to approximately one week with more than half of the failures taking less than two days to repair.

A. Transformers in-service	Quantity:
500/230Kv, 420 MVA 3	2
500/138Kv, 300 MVA 3	1 - 7/17/81 in-service
230/138Kv, 300 MVA 3	2 - 3/10/80 in-service
230/69 Kv, 150 MVA 3	30
230/Kv, 75 MVA 3	23
230/13.8Kv, 75 MVA 3	2 - 5/22/81 in-service
138/69Kv, 150 MVA 3	1 - 7/17/81 in-service
500/230Kv, 217 MVA 1	6 - 5/26/81 2nd 3 in-service

B. Transformer - months logged:

1/77 through 12/81	60 months x	58 Transf =	3480	Transf-Months
4/80 through 12/81	21 months x	2 Transf =	42	Transf-Months
6/81 through 12/81	7 months x	5 Transf =	35	Transf-Months
8/81 through 12/81	5 months x	2 Transf =	10	Transf-Months

Total Transformer - Months = 3567

C. Load Tap Changer Problems:

Failure of LTC drive motors	8
Failure of LTC controls	3
Failure of LTC current carrying components	5
Total Number of Failures	16

Attachment #4

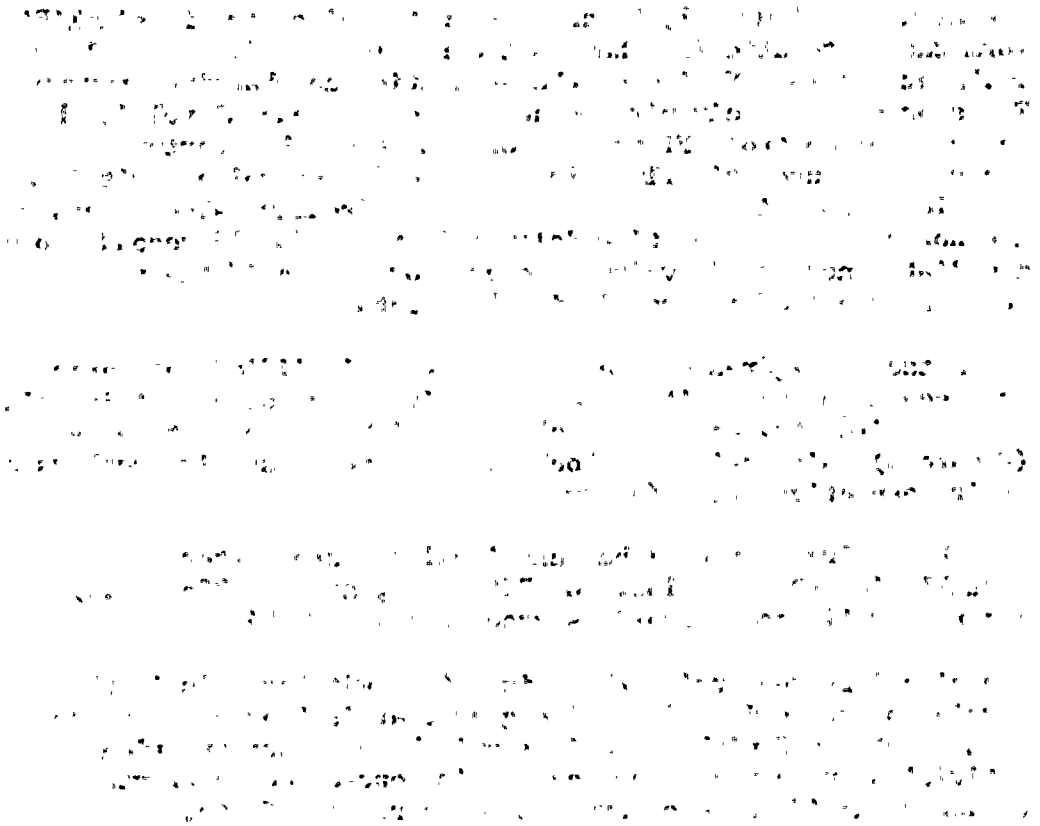
Action Item #3

The attached Figures 1, 2, and 3 show the circuitry in simplified form that automatically changes the regulated voltage level by +1.3% at the 13.8KV side of the automatic tap changing Startup Transformer. The circuitry changes the reference level in the tap changer control (Figure 2) for a LOCA so the Startup Transformer automatically maintains the 13.8KV voltage within a bandwidth 1.3% higher than normal. The circuitry also bypasses the normal tap changer time delay (Figure 3) for 15 seconds so an immediate increase in voltage occurs for a LOCA if the tap changer is out of its regulating bandwidth.

The attached Figures 4, 5 and 6 show the simplified automatic trip scheme of the Unit 2 Class 1E switchgear for a LOCA in Unit 1. The circuitry actuates each Unit 2 4KV bus lockout relay (Figure 5) which trips and locks out all power supply breakers to their respective buses (Figure 6).

The above circuitry will be functionally tested after installation (DCP 82-0138, DCP 759 Rev.0, and DCP 756 Rev.0) under Surveillance Operations Procedure 50-00-004.

The circuitry that trips the Unit 2 4KV switchgear is in the portion of the Unit 2 4KV switchgear that is "turned over" to PP&L Plant Staff with the Unit 1 switchgear. Construction activities are complete and access is controlled to prevent temporary modifications, bypasses or circuit defeats.



SIMPLIFIED CONTROL DIAGRAM TO ILLUSTRATE LOCA INITIATION OF STARTUP TRANSFORMER LOAD TAP CHARGER (LTC)

Design intent: 1) Increase startup bus voltage schedule 1.3% for a LOCA.

2) Initiate startup transformer LTC's for a LOCA. Provide for automatic release of this initiation 15 seconds after a LOCA.

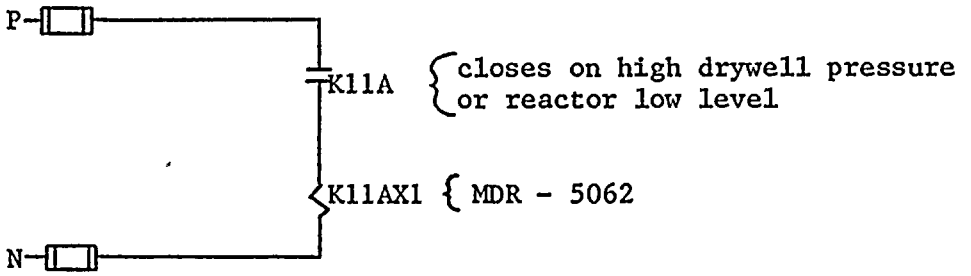


Figure 1: Reference E-102 sh. 32
Unit I LOCA contacts

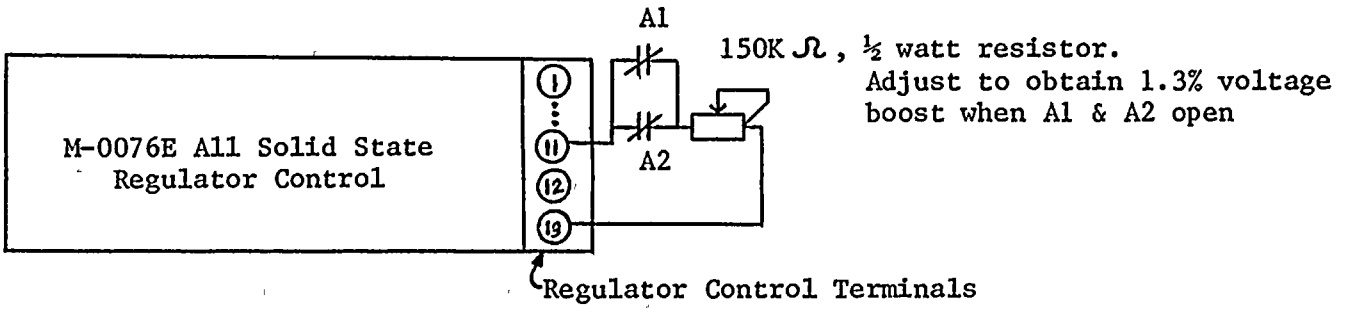


Figure 2: Reference Startup Transformer IOM Manual, Instruction IN-BR-506. The subject controller adjusts the LTC to maintain the scheduled voltage. The subject modification biases the schedule + 1.3%.

Simplified Control Diagram to Illustrate NOCA

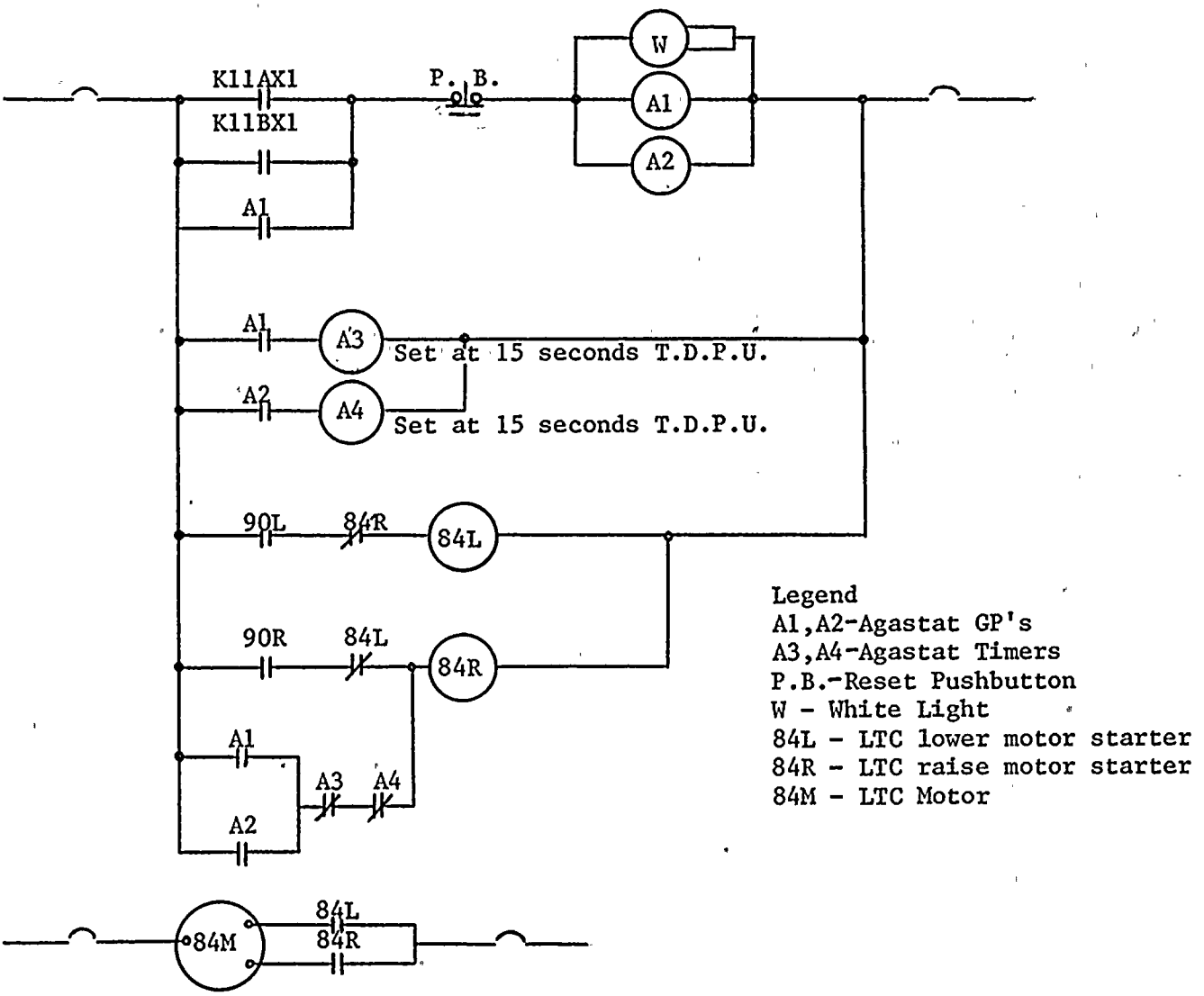
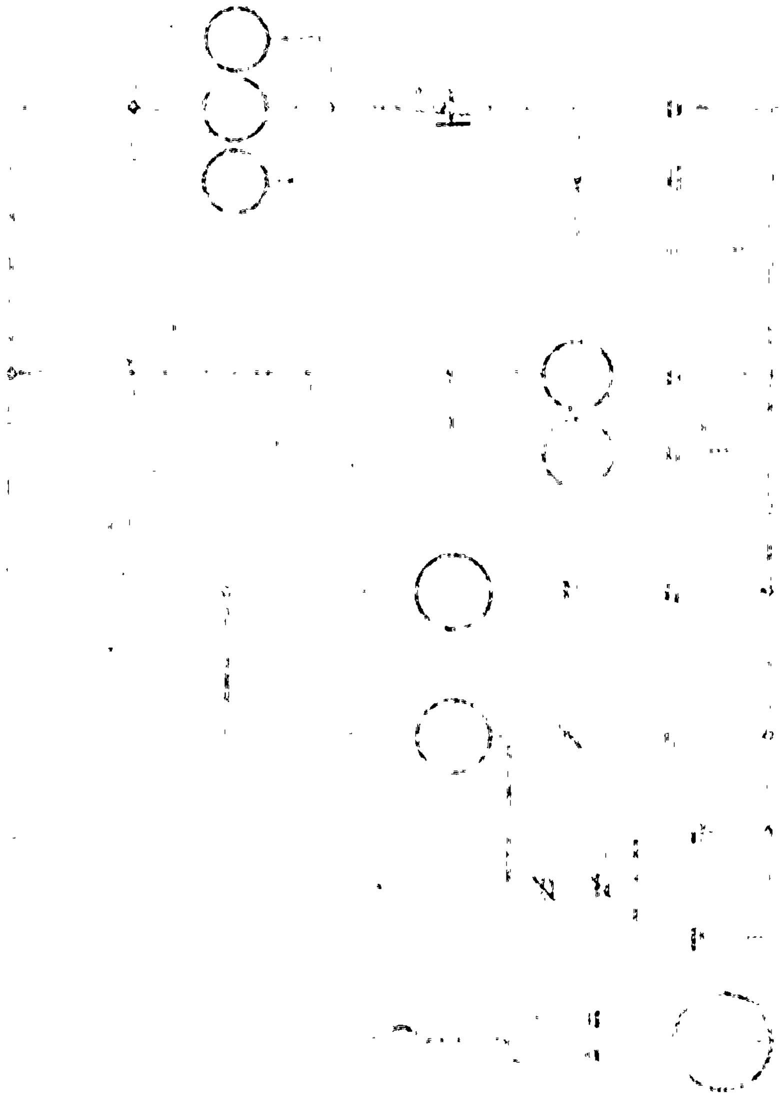


Figure 3: Reference PP&L Foreign File FF-61583, sh. 5, Rev. 1. For a DBA, A1 & A2 operate, A1 seals in, A2 alarms. When A1 and A2 operate the LTC controller is biased (Figure 2). Twenty seconds later (inherent delay in controller) controller maintains revised voltage schedule. When A1 or A2 operate, 84R is immediately energized and LTC raise is initiated. A1 and A2 energize A3 and A4 which defeat A1 or A2 LTC raise after timing out.



SIMPLIFIED CONTROL DIAGRAM TO ILLUSTRATE CIRCUITRY THAT TRIPS UNIT II 4.16KV LOADS FOR UNIT I LOCA.

Design Intent: For a Unit I LOCA, the Unit II 4.16KV bus lockout relays will operate, trip and block closing of all Unit II 4.16KV breakers.

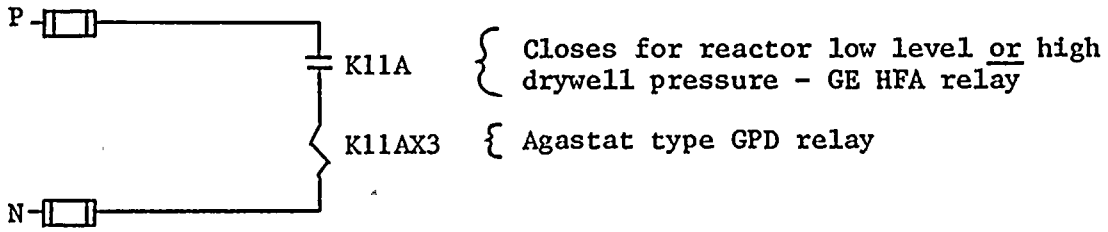
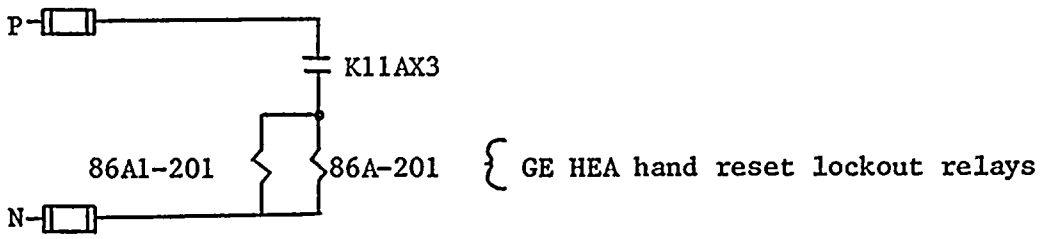


Figure 4: Reference E-102 sh. 32 (typical)
Unit I LOCA contacts



86A-201 contact development (typical)

Trip 4.16KV breaker	1 1c
Block closing 4.16KV breaker	9 9c

Figure 5: Reference E-103 sh. 14 (typical)
Unit II 4.16KV bus lockout relays which operate for Unit I LOCA

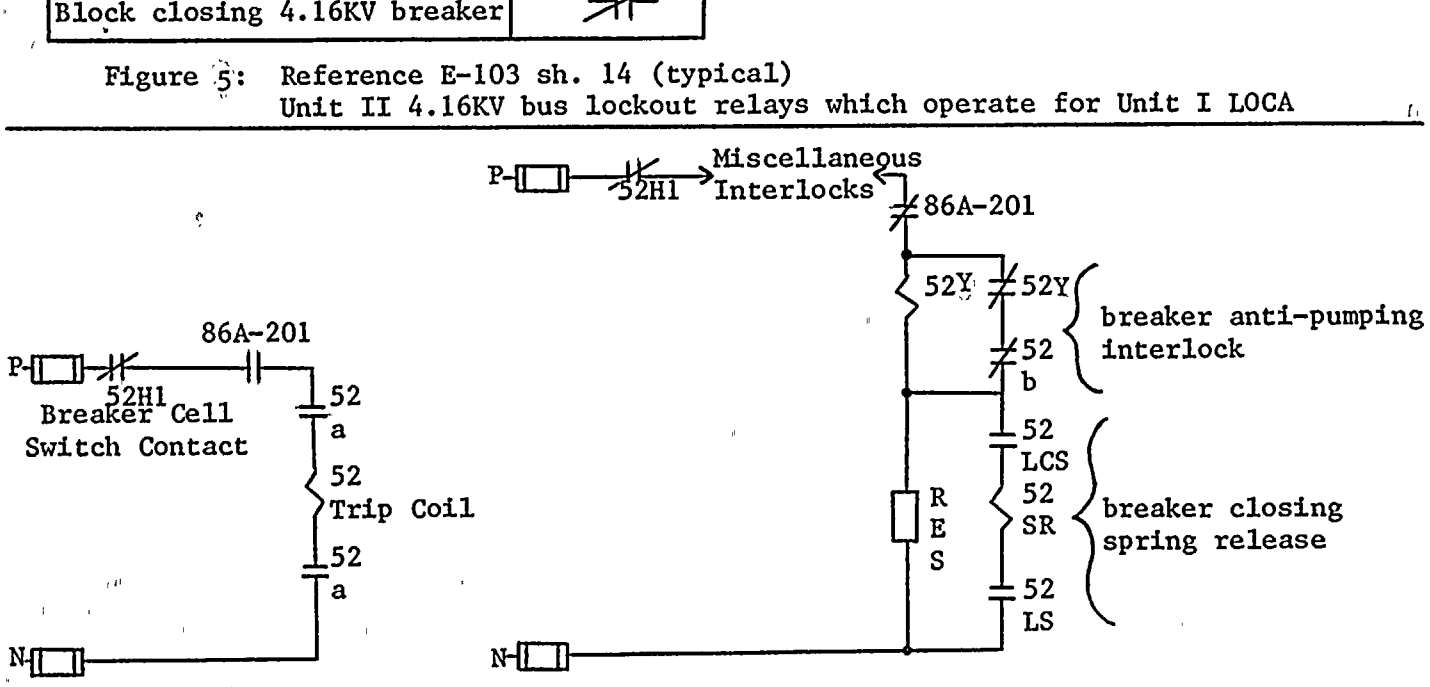


Figure 6: Reference E-103 sh. 13 (typical)
Unit II 4.16KV bus 2C incoming breaker trip and close circuitry.

ASSIGNMENT OF ESF AND SELECTED NON-ESF
LOADS TO DIESEL GENERATORS AND DIESEL RATINGS

Equipment #	Description	Rating Each, hp	Operating kW Each	Number Connected: Diesel Gen A Unit 1 Bus	Diesel Gen A Unit 2 Bus	Diesel Gen C Unit 1 Bus	Diesel Gen C Unit 2 Bus	Diesel Gen B Unit 1 Bus	Diesel Gen B Unit 2 Bus	Diesel Gen D Unit 1 Bus	Diesel Gen D Unit 2 Bus	Loading Sequence (3) (Note 3) Unit 1 - DBA Required Number	Unit 1 - DBA Time From DBA	Unit 2-Shutdown Required Number	Unit 2-Shutdown Time
	ESF Loads														
IP 206 A,B,C,D,	Reactor Core Spray Pumps	700	555	1	1	1	1	1	1	1	1	3	20 sec	-	-
IP 202 A,B,C,D	RHR Pumps	2000	1425	1	1	1	1	1	1	1	1	3	13 sec	1	30 min*
IP 506 A,B	RHR Service Water Pumps	600	460	-	1	1	-	-	1	1	-	1	10 min*	1	31 min*
IV 211 A,B,C,D	Core Spray Pump Room Unit Coolers	2	1.7	1	1	1	1	1	1	1	1	3	20 sec	-	-
	Motor Operated Valves (Note 1)	Set										Set	10 sec	Set	10 sec
IV 222 A,B	Engineered Safeguards Switchgear & L.C. Room Unit Coolers	15	12	1	1	-	-	1	1	-	-	2	130 sec	1	70 sec
OV116 A,B,	Control Structure Battery Room Exhaust Fans	5	4	-	-	1	-	-	-	1	-	1	130 sec	-	-
IV 210 A,B,C,D	RHR Pump Room Unit Coolers	10	8	1	1	1	1	1	1	1	1	3	13 sec	1	30 min
IV 208 A,B	RCIC Pump Room Unit Coolers (interlocked with steam supply valve)	1.5	1.2	1	1	1	1	-	-	-	-	1	15 sec	1	-
IE 203 A,B,C,D	MSIV-LCS Pipe Heater	-	6.6	-	-	-	-	4	4	-	-	3 (Note 6)	20 min.*	-	-
IK 208	MSIV-LCS Inboard Blower	4.5	3.6	-	-	-	-	1	1	-	-	1 (Note 6)	20 min.*	-	-
IK 209 A,B	MSIV-LCS Outboard Blower	4.5	3.6	1	1	1	1	-	-	-	-	1 (Note 6)	20 min.*	-	-
IV 209 A,B	HPCI Pump Room Unit Coolers (interlocked with steam supply valve)	1.5	1.2	-	-	-	-	1	1	1	1	1	20 sec	-	-
ID 613 to 643	Battery Chargers, 125V D.C.	-	25	1	1	1	1	1	1	1	1	3	10 sec	3	10 sec

ATTACHMENT 5

Equipment #	Description	Rating Each, hp	Operating kW Each	Number Connected: Diesel Gen A Unit 1 Bus	Diesel Gen A Unit 2 Bus	Diesel Gen C Unit 1 Bus	Diesel Gen C Unit 2 Bus	Diesel Gen B Unit 1 Bus	Diesel Gen B Unit 2 Bus	Diesel Gen D Unit 1 Bus	Diesel Gen D Unit 2 Bus	Loading Sequence (3) (Note 3): Unit 1 - DBA Required Number	Unit 1 - DBA Time From DBA	Unit 2-Shutdown Required Number	Unit 2-Shutdown Time
	ESF Loads (Cont')														
OV 512 A,B,C,D	Diesel Generator Room Ventilation Supply Fans	40	32	1	-	1	-	1	-	1	-	3	130 sec.	-	-
OP 514 A,B,C,D	Diesel Generator Diesel Oil Transfer Pumps (interlocked with day tank level)	-	2.5	1	-	1	-	1	-	1	-	3	60 min & beyond	-	-
OV 201 A,B	Reactor Building Recirc Fans	75	60	1	-	-	-	1	-	-	-	1	10 sec	-	-
OP 504 A,B,C,D	Emergency Service Water Pumps	450	360	1	-	1	-	1	-	1	-	2	55 sec	-	-
OV 109 A,B	Standby Gas Treatment System Exhaust Fans	50	40	-	-	1	-	-	-	1	-	1	10 sec	-	-
OV 115 A,B & OV 117 A,B	Control and Computer Rooms Air Cond. Unit Fans	40	32	-	-	2	-	-	-	2	-	2	130 sec	-	-
OK 507 A,B,C,D	Diesel Generator Starting Air Compressors	10	8	2	-	2	-	2	-	2	-	6	10 sec	-	-
IS 246, IS 247	LPCI MG Set	150	7	1	1	-	-	1	1	-	-	1	10 sec	1	10 sec
IEC 290	SLC Heat Trace Panel	-	21	1	-	-	-	-	-	-	-	1	10 sec	-	-
IY 216 to 246	120 V Instrument A.C. Dist. Panels	-	25	1	1	1	1	1	1	1	1	3	10 sec	3	10 sec
OV 521 A,B,C,D	Engineered Safeguards Service Water Pump House Ventilation Fans (ESWP)	5	4	2	-	-	-	2	-	-	-	2	55 sec	-	-
OP 162 A,B	Control Structure Chilled Water Circulating Pumps	30	24	-	-	1	-	-	-	1	-	1	130 sec	-	-

ATTACHMENT 5

Equipment #	Description	Rating Each, hp	Operating kW Each	Number Connected: Diesel Gen A Unit 1 Bus	Diesel Gen A Unit 2 Bus	Diesel Gen C Unit 1 Bus	Diesel Gen C Unit 2 Bus	Diesel Gen B Unit 1 Bus	Diesel Gen B Unit 2 Bus	Diesel Gen D Unit 1 Bus	Diesel Gen D Unit 2 Bus	Loading Sequence (3) (Note 3): Unit 1 - DBA Required Number	Unit 1 - DBA Time From DBA	Unit 2-Shutdown Required Number	Unit 2-Shutdown Time
	ESF Loads (Con't)														
OV 101 A,B	Control Structure Emergency Outside Air Supply Fans	20	16	-	-	1	-	-	-	1	-	1	70 sec	-	-
OK 112 A,B	Control Structure Water Chiller Compressors	351	306	-	-	1	-	-	-	1	-	1	180 sec to 16 min (Note 7)	-	-
OE 145 A,B	Control Structure Air Cond. Unit Heating Coils	-	130	-	-	1	-	-	-	1	-	1	130 sec	-	-
OV 118 A,B	Standby Gas Treatment System Equip. Room Exhaust Fans (if high temperature condition exists)	5	4	-	-	1	-	-	-	1	-	1	10 sec	-	-
IE 219/IE 220	Standby Liquid Cont. Tank Heater	-	40	-	-	1	1	-	-	-	-	1	10 sec	1	10 sec
IP 208 A,B	Standby Liquid Cont. Pumps	40	32	1	-	1	-	-	1	-	1	-	-	-	-
IC 226 A,B	H_2O_2 Analyzer Panel	-	1	1	1	-	-	1	1	-	-	1	10 sec	1	10 sec
IC 227 A,B	Cont. Partic. Rad. Analyzer Panel	-	2	1	1	-	-	1	1	-	-	1	10 sec	1	10 sec
OC 578/OC 579	ESSW Pump House HVAC Panel	-	1	1	-	-	-	1	-	-	-	1	10 sec	-	-
ID 653 A,B ID 663	Battery Chargers - 250V D.C.	-	75	1	1	1	1	1	1	-	-	1	10 sec	1	10 sec
OV 144 A,B	Standby Gas Treatment System Equip. Room Heating Unit Fans (if low temperature condition exists)	5	4	-	-	1	-	-	-	1	-	1	10 sec	-	-

ATTACHMENT 5

Equipment #	Description	Rating Each, hp	Operating kW Each	Number Connected: Diesel Gen A Unit 1 Bus	Diesel Gen A Unit 2 Bus	Diesel Gen C Unit 1 Bus	Diesel Gen C Unit 2 Bus	Diesel Gen B Unit 1 Bus	Diesel Gen B Unit 2 Bus	Diesel Gen D Unit 1 Bus	Diesel Gen D Unit 2 Bus	Loading Sequence (3) (Note 3): Unit 1 - DBA Required Number	Unit 1 - DBA Time From DBA	Unit 2-Shutdown Required Number	Unit 2-Shutdown Time
	ESF Loads (Con't)														
OV 103 A,B	Control Structure Air Cond. Unit Fans	50	40	-	-	1	-	-	-	1	-	1	130 sec	-	-
OP 122 A,B	Control Structure Chiller Comp Oil Pumps	1.5	1.2	-	-	1	-	-	-	1	-	1	153 sec to 17 min (Note 7)	-	-
OC 866 A,B,	Standby Gas Treatment System Heaters	-	90	-	-	1	-	-	-	1	-	1	10 sec	-	-
OP 171 A,B	Control Structure Chiller Condenser Water Circ Pumps	20	16	-	-	1	-	-	-	1	-	1	130 sec	-	-
IE 440 A,B,C,D	Containment Hydrogen Recombiners	-	75	1	1	1	1	1	1	1	1	2	61 min*	-	-
OE 143 A,B	Control Structure Emergency Outside Air Supply Unit Heating Coils	-	30	-	-	1	-	-	-	1	-	1	70 sec	-	-
IV 506 A,B	Engineered Safeguards Service Water Pump House Ventilation System (RHRSWP) (with RHR Service Water Pumps)	5	4	1	1	-	-	1	1	-	-	1	10 min*	1	31 min*
OE 525 A,B,C,D	DG L.O. Heater	-	9	1	-	1	-	1	-	1	-	-	Note 8	-	-
OE 508 A,B,C,D	DG Jacket Water Heater	-	15	1	-	1	-	1	-	1	-	-	Note 8	-	-
OP 530 A,B,C,D	DG Jacket Water Pump	5	4	1	-	1	-	1	-	1	-	-	Note 8	-	-
OC 577 A,B,C,D	DG HVAC Panel	-	1	1	-	1	-	1	-	1	-	3	10 sec	-	-
OP 532 A,B,C,D	DG Pre-Lube Oil Pump	10	8	1	-	1	-	1	-	1	-	-	-	-	-
OE 570 A,B,C,D	DG Space Heater		4.5	1	-	1	-	1	-	1	-	-	-	-	-
OP 112 A,B	Chiller OK 112 A,B Refrigeration Transfer Pump	2	2	-	-	1	-	-	-	1	-	-	-	-	-

ATTACHMENT 5

Equipment #	Description	Rating Each, hp	Operating kW Each	Number Connected: Diesel Gen A Unit 1 Bus	Diesel Gen A Unit 2 Bus	Diesel Gen C Unit 1 Bus	Diesel Gen C Unit 2 Bus	Diesel Gen B Unit 1 Bus	Diesel Gen B Unit 2 Bus	Diesel Gen D Unit 1 Bus	Diesel Gen D Unit 2 Bus	Loading Sequence (3) (Note 3): Unit 1 - DBA Required Number	Unit 1 - DBA Time From DBA	Unit 2-Shutdown Required Number	Unit 2-Shutdown Time
	ESF Loads (Con't)														
OP 531 A,B,C,D	Diesel Generator Standby Jacket Water Pumps	30	24	1	-	1	-	1	-	1	-	-	-	-	-
OP 533 A,B,C,D	Diesel Generator Standby Lube Oil Pumps	50	40	1	-	1	-	1	-	1	-	-	-	-	-
IV 411 - 417	Drywell Unit Area Coolers	5/10	4/8	-	-	7	7	-	-	7	7	3	3 hr*	7	10 sec
OE 144 A,B,	Standby Gas Treatment Equipment Room Heater	-	30	-	-	1	-	-	-	1	-	1	10 sec	-	-
	Non-ESF Loads														
IP 111	Turbine Generator Auxiliary (Turning gear oil pump)	40	32	-	1	-	-	1	-	-	-	1	30 sec	1	30 sec
IP 132 A,B	CRD Water Pumps	300	217	1	1	-	-	-	-	1	1	-	-	1	60 min
	Essential Lighting	-	Set	36	33	37	-	53	29	58	8	3 set	10 sec	3 sets	10 sec
IP 210 A,B	Reactor Bldg. Close Cooling Water Pumps	30	24	1	-	1	-	-	1	-	1	1	10 sec	1	10 sec
ID 666	Vital A.C. Uninterruptible Power Supply	-	30	-	-	-	-	-	1	1	-	-	-	-	-
IK 104	Main Turbine L.O. Vapor Extractor	7.5	6	1	-	-	-	-	1	-	-	-	10 sec (Note 9)	1	10 sec
IK 105	Main Turbine L.O. Oil Mist Eliminator	3	2.4	1	-	-	-	-	1	-	-	-	10 sec (Note 9)	1	10 sec
IY 128, IY 218	120V. Instrument AC Dist. Panels	-	25	-	-	1	1	-	-	1	1	1	10 sec	1	10 sec
IP 109/1S103	Turbine Generator Auxiliaries (Turning Gear and Lift Pumps)	127.5	102	-	1	-	-	1	-	-	-	1	20 min*	1	20 min
IK107 A,B	Instrument Air Compressors	100	80	-	1	-	1	1	-	1	-	-	-	-	-

ATTACHMENT 5

Equipment #	Description	Rating Each, hp	Operating kW Each	Number Connected: Diesel Gen A Unit 1 Bus	Diesel Gen A Unit 2 Bus	Diesel Gen C Unit 1 Bus	Diesel Gen C Unit 2 Bus	Diesel Gen B Unit 1 Bus	Diesel Gen B Unit 2 Bus	Diesel Gen D Unit 1 Bus	Diesel Gen D Unit 2 Bus	Loading Sequence (3) (Note 3): Unit 1 - DBA Required Number	Unit 1 - DBA Time From DBA	Unit 2-Shutdown Required Number	Unit 2-Shutdown Time
	Non-ESF Loads (Con't)														
IP103 A,B	Turbine Bldg. Cooling Water Pumps	15	12	1	1	-	-	1	1	-	-	-	-	1	60 min & beyond
ID 656	Computer Uninterruptible Power Supply	-	75	-	1	1	-	-	-	-	-	-	-	-	-
OS 108	Control Structure Passenger Elevator	30	24	-	-	1	-	-	-	-	-	-	-	-	-
IS 204	React. Bldg. Service Elevators	50	40	-	-	-	-	-	-	1	1	-	-	-	-
IC 142 A,B	Instrument Air Dryers-Compressed Air System	-	15.5	-	1	-	1	1	-	1	-	-	-	-	-
IK 205 A,B,	Instrument Gas Compressors	15	12	2	-	-	-	-	-	-	2	-	-	-	-
IP 105	Main Condensor Vacuum Pump	300	200	-	-	-	1	1	-	-	-	-	-	-	-
OX 201/OX 203	ESS Transformer Fans	2	2	1	-	-	-	1	-	-	-	1	10 sec (Note 8)	-	-
IS 237 A,B	RPS MG Set	25		1	1	-	-	1	1	-	-	-	-	-	-
1S106 A,B,C	RFPT Turning Gear	1.5	1.2	2	1	-	-	1	2	-	-	3	20 min*	3	20 min
OP 513 A,B	Spray Pond Piping Pit Drain Pumps	1.0		1	-	-	-	1	-	-	-	-	-	-	-
IV 223	Remote Shutdown Panel Transfer Fan	0.5	0.4	1	-	-	-	-	-	-	-	-	-	-	-

ATTACHMENT 5

Equipment #	Description	Rating Each, hp	Operating kW Each	Number Connected: Diesel Gen A Unit 1 Bus	Diesel Gen A Unit 2 Bus	Diesel Gen C Unit 1 Bus	Diesel Gen C Unit 2 Bus	Diesel Gen B Unit 1 Bus	Diesel Gen B Unit 2 Bus	Diesel Gen D Unit 1 Bus	Diesel Gen D Unit 2 Bus	Loading Sequence (3) (Note 3): Unit 1 - DBA Required Number	Unit 1 - DBA Time From DBA	Unit 2-Shutdown Required Number	Unit 2-Shutdown Time
	Non-ESF Loads (Con't)														
OP 170 A,B	Control Structure Chiller Condr Water Pump	20	16	-	-	1	-	-	-	1	-	-	-	-	-
IV 232	Reactor Bldg Electrical Equipment Room Supply Fan	5	4	-	-	-	-	1	-			1	10 sec	-	-

*Manual Initiation

1: MOV's maximum stroking time is 30 sec. MOV Loads are not included in diesel generator loading because of small magnitude and short duration.

2: Each diesel generator is rated as follows: 4000 kW continuous
4700 kW - 2000 hrs

3: Loading Sequence based on loss of offsite power. Unit 1 LOCA and Unit 2 shutdown is assumed. Loading sequence with offsite power available is different as indicated in Table 8.3-1b.

4: Diesel generator starting time of 10 sec is assumed.

5: Unit 1 and common equipment numbers are shown. Unit 2 equipment numbers are same as Unit 1 numbers except the prefix numbers are 2 instead of 1.

6: Either IE 203 A,B,C,D and IK 208 or IK 209 A,B are required for DBA.

7: Start time depends on operating status of Control Structure Chiller System at time of DBA.

8: May run for a short time after DG start.

9: Not required for DBA. Can be shut down manually.
