

FLORIDA POWER & LIGHT COMPANY

10 CFR 50.59 SAFETY EVALUATION

**EVALUATION OF TEMPORARY OPERATING CONFIGURATION
WITH 1B MAIN TRANSFORMER OUT OF SERVICE**

ST. LUCIE NUCLEAR PLANT

UNIT 1

JPN-PSL-SEES-96-068

REVISION 1

NOT NUCLEAR SAFETY

REVIEW AND APPROVAL RECORD

PLANT ST. LUCIE UNIT 1

TITLE EVALUATION OF TEMPORARY OPERATING CONFIGURATION WITH 1B MAIN TRANSFORMER OUT OF SERVICE

LEAD DISCIPLINE ELECTRICAL

ENGINEERING ORGANIZATION ST. LUCIE ENGINEERING GROUP

REVIEW/APPROVAL:

GROUP	INTERFACE TYPE			PREPARED	VERIFIED	APPROVED	FPL APPROVED*
	INPUT	REVIEW	N/A				
MECH			X				
ELECT	X			A.R. Dodd	JH Clark	J. Tilgner	
I&C			X				
CIVIL	X	X				Dir for H&E for Telman	
DB	X			cy Wata	JH Clark	cy Wata	
CSI			X				
NUC FUEL			X				
PLUM PROT EVAL		X				Dir for H&E for Telman	

* For Contractor Evals As Determined By Projects ** Review Interface As A Min On All 10CFR50.59 Evals and PLAs

FPL PROJECTS APPROVAL:  DATE: 7/4/96

OTHER INTERFACES

NONE

ABSTRACT

While operating at 100% power, a gas detection alarm was received for the 1B Main Transformer. Investigation showed that air was being introduced into the transformer oil. Continued operation in this manner could eventually lead to a breakdown of the insulating oil with resultant loss of the main transformer.

PSL Unit 1 normally operates with both the 1A and 1B main transformers in parallel. The system design allows for operation at reduced power with a single main transformer, provided certain conditions are met, until repairs can be made and the affected transformer tested and returned to service. Operation with a single main transformer is addressed in FSAR Section 8.2.1.4 and does not reduce the required A.C. electrical power sources as addressed in Technical Specifications 3.8.1.1 or 3.8.1.2.

The conclusion of this evaluation is that operation of Unit 1 with a single main transformer does not represent an unreviewed safety question as defined in 10 CFR 50.59, does not require a change to plant Technical Specifications and does not adversely affect plant operation or safety; therefore, prior NRC approval is not required.

The main transformers and associated equipment, including the isophase bus and fire detection and deluge system, are classified as Not Nuclear Safety and are not considered important to safety. Therefore, this safety evaluation is classified as Not Nuclear Safety.

Revision 1 of this evaluation is a total rewrite to include a 10 CFR 50.59 evaluation and to revise the actions required.

BACKGROUND & PURPOSE

In response to a 1B Main Transformer gas detection alarm it was discovered that air is being introduced into the transformer oil.

PSL Unit 1 normally operates with the 1A and 1B main transformers in parallel. However, system design allows for operation with a single main transformer, provided certain conditions are met. This evaluation focuses on the required configuration related to operation of the Unit utilizing only Main Transformer 1A.

This evaluation provides for the temporary operating configuration using only Main Transformer 1A until repair and testing of the Main Transformer 1B cooling system is satisfactorily completed and the transformer can be returned to service.

LICENSING REQUIREMENTS

Technical Specifications

Technical Specification 3.8.1.1, applicable in MODES 1, 2, 3 and 4, requires as a minimum that the following A.C. electrical power sources shall be OPERABLE (Ref 3):

- a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and
- b. Two separate and independent diesel generator sets each with:
 1. Engine-mounted fuel tanks containing a minimum of 152 gallons of fuel,
 2. A separate fuel storage system containing a minimum of 16,450 gallons of fuel, and
 3. A separate fuel transfer pump.

Technical Specification 3.8.1.2, applicable in MODES 5 and 6, requires as a minimum that the following A.C. electrical power sources shall be OPERABLE (Ref 3):

- a. One circuit between the offsite transmission network and the onsite Class 1E distribution system, and
- b. One diesel generator set with:
 1. Engine-mounted fuel tanks containing a minimum of 152 gallons of fuel,

2. A fuel storage system containing a minimum of 16,450 gallons of fuel, and
3. A fuel transfer pump.

Updated Final Safety Analysis Report

Unit 1 UFSAR Section 8.2.1.4 describes the main generator, main transformer bank, and generator isolated phase bus.

The station main generator is a 1000 MVA Westinghouse generator which provides power to the offsite transmission network at various loads to a maximum of 850 MWe. The main generator data are given by Table 8.2-1.

The main generator is direct connected through a 22 kv, 28,000 ampere isolated phase bus to the main transformers, where it is stepped up to 240 kv and then tied to one bay of the outdoor switchyard.

The main transformer bank consists of two (2), three-phase transformers 475 MVA each, forced oil and air (FOA) cooled at 65°C temperature rise, connected in parallel, with separate cooling equipment such that any one transformer can be uprated to 632 MVA at 65°C rise if the other transformer is out of service and all the cooling equipment is applied to the remaining transformer.

The generator isolated phase bus is forced air cooled and is rated for both normal (two main transformers in service) and emergency operation (one main transformer out, the other uprated to 632 Mva) all at 65°C rise. Two 100 percent capacity sets of cooling equipment are provided.

The Transformer Deluge system is mentioned in section 9.5A.3.1.3, 9.5A.3.3 and TABLE 9.5A-3. This system is for fire suppression of the Main Transformers.

ANALYSIS OF EFFECTS ON SAFETY

The main transformers, main generator and the isophase bus, as discussed in Section 8.2.1.4 of the UFSAR, are non-safety related equipment and do not interact with any safety related structure, system, or component. The transformer fire protection deluge system is non-safety related. This engineering evaluation is therefore, classified as Not Nuclear Safety.

Disabling Main Transformer 1B does not adversely impact operability of AC power sources as described in Technical Specification 3.8.1.1. Operation of the Unit in the temporary alignment, utilizing only Main Transformer 1A, does not adversely impact operability of the AC power sources, since the startup transformers are unaffected by

this alignment. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system and the two diesel generator sets are maintained operable in the proposed alignment.

FAILURE MODES AND EFFECTS ANALYSIS

There are no new failure modes created by operation at reduced power with a single main transformer.

PLANT RESTRICTIONS:

Loading on the transformer should not exceed 475 MVA unless a basis is established from temperature data that provides reasonable assurance that the temperature specifications will not be exceeded. In order to maintain the transformer within its operating capabilities, the hotspot and top oil temperatures should be monitored and verified to be less than 120 and 90 degrees C respectively. Existing high temperature alarms are sufficient for continuously monitoring the temperatures of the transformer.

Operating limits based on transformer nameplate rating have been determined and are represented in the attached figure, Attachment 3. The Gross Megawatt output and Gross Megavar output of the main generator as displayed in the control room are the preferred controlling parameters. Accuracy of this indication is not significant since the generator nameplate ratings are conservative. An assumption of 44 megawatts at a 0.85 power factor is assumed for the load on the auxiliary transformers and the auxiliary transformer losses. The remaining generator output is power delivered to the grid through the main transformer and the main transformer losses. The Megawatt and Megavar limits for generator operation are determined at several points by adding the main transformer nameplate limits, and the assumed auxiliary transformer load. The main transformer losses are assumed to be insignificant and are neglected. The efficiency of the transformers is high, is not a significant influence, and is also neglected.

The main generator gross output limits based on transformer nameplate ratings are estimated to be:

<u>XFMR PF</u>	<u>XFMR OUTPUT</u>		<u>AUX LOAD</u>		<u>TOTAL</u>
0.95	451	MW	44	MW	495 MW
	148	MVAR	27	MVAR	175 MVAR
0.96	456	MW	44	MW	500 MW
	133	MVAR	27	MVAR	160 MVAR

0.97	461	MW	44	MW	505 MW
	116	MVAR	27	MVAR	143 MVAR
0.98	466	MW	44	MW	510 MW
	95	MVAR	27	MVAR	122 MVAR
0.99	470	MW	44	MW	514 MW
	67	MVAR	27	MVAR	94 MVAR
1.00	475	MW	44	MW	519 MW
	0	MVAR	27	MVAR	27 MVAR

The result of the above tabulation are represented in graphical form in Attachment 3. Operation within the bounds defined by this figure assume that the auxiliary transformers are available to supply plant loads. If during operation with the single main transformer plant loads are not supplied through the station auxiliary transformers, main generator output should be limited to approximately 200 MW.

Compensatory measures are required whenever the deluge system is inoperable for the 1B and/or 1A transformers.

EFFECTS ON TECHNICAL SPECIFICATIONS:

There is no impact to the ability to comply with the Technical Specifications nor has the bases of the Technical Specifications been affected by operation with a single main transformer.

UNREVIEWED SAFETY QUESTION DETERMINATION

In accordance with 10 CFR 50.59, the responses to the below listed questions serve to determine if the subject activity constitutes an unreviewed safety question:

1. *Does the proposed activity increase the probability of occurrence of an accident previously evaluated in the SAR?*

The probability of occurrence of an accident previously evaluated in the SAR has not been increased. The relevant analyzed event is a loss of external electrical load which is evaluated in FSAR section 15.2.7. Operation with a single main

transformer within the guidance provided by this evaluation provides assurance that the transformer is operated within its design capabilities. Therefore, the reliability of the operating main transformer is not adversely affected and the probability of a transformer failure is not increased.

2. *Does the proposed activity increase the consequences of an accident previously evaluated in the SAR?*

The consequences of an accident previously evaluated in the SAR have not been increased. This evaluation does not affect any safe shutdown or accident mitigating equipment. Operation with a single main transformer does not impact the ability of the plant to respond to a loss of external electrical load event.

3. *Does the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR?*

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR has not been increased. This evaluation allows power operation with only one of two main transformers in service. FSAR section 8.2.1.4 discusses system design and describes operation with a single transformer in service "if the other transformer is out of service." Operation with the single transformer will be in accordance with the requirements provided by this evaluation and will be enveloped by the condition discussed in the FSAR (operation at 632 Mva). Adherence to the requirements of this evaluation will ensure that the in-service transformer is operated within its design capabilities, thereby ensuring its reliability. No equipment important to safety is affected by this evaluation.

The transformer deluge system associated with the 1B main transformer will be removed from service in support of maintenance activities on the 1B main transformer. The deluge system will be isolated in a manner such that fire protection of plant equipment remaining in service will not be affected. The 1B main transformer will be removed from service and therefore not represent a significant fire hazard since its primary ignition source will not be available. Thus, the probability of a fire occurring at the 1B main transformer has been reduced.

- Does the proposed activity increase the consequences of a malfunction of equipment important to safety previously evaluated in the SAR?*

The proposed activity does not increase the consequences of a malfunction of equipment important to safety previously evaluated in the SAR. There is no impact to any FSAR accident analysis assumptions or to the operation of any

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- Middle left: "11/14/96" and "in line with..."
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system required for accident detection or mitigation. The main transformers and associated equipment, including the isophase bus, are classified as Not Nuclear Safety and are not considered important to safety.

5. *Does the proposed activity create the possibility of an accident of different type than any previously evaluated in the SAR?*

The proposed activity does not create the possibility of an accident of a different type than any previously evaluated in the SAR. This evaluation analyzes the potential failure modes and effects of the proposed changes and concludes that no new failure modes or system interactions are introduced. No equipment is being added and no new system interactions have been introduced.

6. *Does the proposed activity create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in the SAR?*

The proposed activity does not create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in the SAR. As stated above, there are no new failure modes or system interactions as a result of the changes provided via this evaluation.

7. *Does the proposed activity reduce the margin of safety as defined in the basis for any Technical Specification?*

The margin of safety as defined in the basis for any Technical Specification has not been reduced. This evaluation does not affect any Technical Specification Limiting Condition for Operation, Surveillance or Bases. The electrical power sources required by Technical Specifications 3.8.1.1 and 3.8.1.2 are not affected by this evaluation.

The foregoing constitutes the determination, per 10 CFR 50.59(b), that the subject activity does not involve an unreviewed safety question. Based on this determination, prior NRC approval for implementation is not required.

ACTIONS:

The temporary alignment utilizes a single transformer, Main Transformer 1A, instead of the normal configuration of two main transformers in parallel. Operation with a single main transformer is described in the Unit 1 FSAR updated to 632 MVA at 65°C rise if the other transformer is out of service and all the cooling equipment is applied to the remaining transformer. Since the cooling equipment from the 1B transformer is not available the transformer loading will be controlled based on its nominal rating of 475

MVA. Transformer loading can exceed this value if temperature data is sufficient to provide reasonable assurance that temperature alarm setpoints will not be reached.

1. Plant procedures shall be reviewed to determine necessary changes to support the temporary operation with a single main transformer.
2. Fire Detection and Deluge System

As the 1A and 1B main transformers share a common fire detection and deluge system, fire protection for the 1A transformer will be affected during the 1B transformer work activities. Normal compensatory measures shall be taken as provided for by the St. Lucie Unit 1 Fire Protection Program. The fire water supply to the 1B main transformer will be capped to allow auto initiation of the 1A main transformer deluge system. While the 1B transformer is out of service its most significant ignition source will be unavailable, minimizing the need for fire suppression system on the 1B Main Transformer. Fire suppression is still available for the 1A transformer. The fire detection system is to be rewired to prevent accidental actuation caused by repair activities on the 1B main transformer. These activities are to be performed in accordance with a Temporary System Alteration.

3. Isolated Phase Bus

The bus was designed to operate with one of the main transformers out of service as shown on EMDRAC Drawings 8770-1199, Rev. 5 and 8770-1200, Rev. 3. These ratings are, with forced cooling operable, 28,000 A for the main bus, 18,500 A (705 MVA) for the main transformer bus (with one transformer in service) and 2500 A (Self cooled rating) for the auxiliary transformer and potential transformer taps. Forced cooling air shall be verified to be available to the isophase bus duct for the operational transformer. This may require installation of devices, such as end caps, where the bus has been disconnected (See Attachment 2).

4. Main Transformer

Each of the main transformers is rated 475 MVA with a guaranteed average winding temperature rise of 65°C. The design rated operating temperature is 85 C for insulating oil. Alarms are provided for a top oil temperature (set at 90°C) and for the hot spot winding temperature (120°C). Operation of transformers at higher than design temperatures results in a loss of life of the insulation system, with a potential for a transformer failure. This loss of life is proportional to the temperature and time. Loading on the transformer should not exceed 475 MVA unless a basis is established from temperature data that provides reasonable assurance that the temperature specifications will not be exceeded. In order to maintain the transformer within its operating capabilities, the

hotspot and top oil temperatures should be monitored and verified to be less than 120 and 90 degrees C respectively. Existing high temperature alarms are sufficient for continuously monitoring the temperatures of the transformer.

5. Insulating Oil Cross Connection

Insulating oil cross tie valves between the 1A and 1B Main Transformers must be closed and danger tagged in accordance with in-plant clearance procedures during the repair activities. Standard FPL isolating and grounding procedures shall be followed.

6. Protective Relaying

Protective relaying dedicated solely to Main Transformer 1B will be disconnected for the period of repairs. Copies of the marked-up Controlled Wiring Diagrams, drawing 8770-B-327 Sheets 864, 884, 885, 878, and 899 (Attachment 1) reflect the temporary changes required.

The following temporary circuit alterations will be necessary to allow operation with only the 1A Main Transformer in service:

- 1) Isolate the 87TB/878 phase A, phase B and phase C BDD differential relays for Main Transformer 1B by removing the relay paddles.
- 2) Isolate the 51TNB/878 IAC neutral overcurrent relay by removing the relay paddle.
- 3) Install shorts for the C1, C2 and C3 current transformers for differential "s1" in Main Transformer 1B. Install isolation strips in the BC isolation device points 1-12 (six isolation strips).
- 4) Turn off all annunciator points in Main Transformer 1B. These may be turned on for testing purposes if required.

No relay setting changes are necessary. The rationale for this conclusion is based on a review of the existing relay settings as described in Attachment 4.

7. Prepare a PMAI to Engineering to evaluate the need to revise TM/LP or LPD setpoints as a result of operation at less than 100% power by 9/20/96.

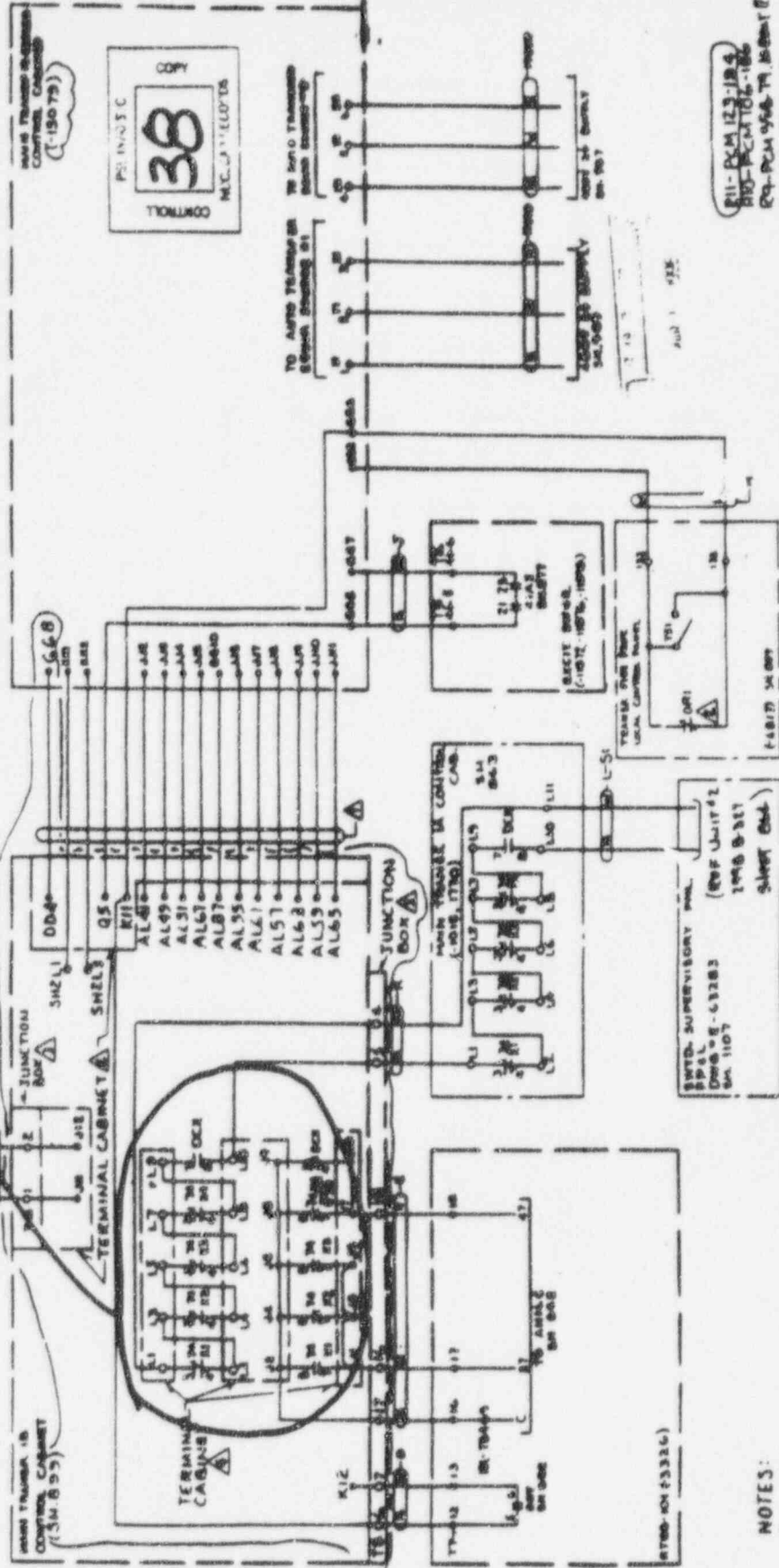
ATTACHMENTS:

1. Protective Relaying Changes (5 pages).
2. Isophase Enclosure Duct Plug Detail (2 pages).
3. Unit Gross Output Limitations Based on 475 MVA Rating (1 page).
4. Substation Materials & Design and Protection & Control Departments Memoranda (4 pages).
5. Minimum Exciter Limiter Settings (1 page).

REFERENCES:

1. Condition Report 96-2136
2. St. Lucie Unit 1 FSAR, Amendment 14.
3. St. Lucie Unit 1 Technical Specifications, through Amendment 145.
4. St. Lucie Plant Drawing 8770-1199, Rev. 5
5. St. Lucie Plant Drawing 8770-1200, Rev. 3
6. St. Lucie Plant Drawing 8770-1015, Rev. 8
7. St. Lucie Plant Drawing 8770-B-327, Sheet 864, Rev. 11
8. St. Lucie Plant Drawing 8770-B-327, Sheet 884, Rev. 08
9. St. Lucie Plant Drawing 8770-B-327, Sheet 885, Rev. 22
10. St. Lucie Plant Drawing 8770-B-327, Sheet 878, Rev. 8
11. St. Lucie Plant Drawing 8770-B-327, Sheet 899, Rev. 1
12. ANSI Standard C57.12.00-1987 IEEE Standard General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers.
13. JPN-PSL-SEEP-94-023, Evaluation of Temporary Operating Configuration As a Result of Main Transformer Electrical Fault Event, Rev. 0.

TURN OFF ALL ANNUNCIATOR SWITCHES
 (May be turned on for testing purposes)



NOTES:

- △ OF MANUFACTURER
- △ - PLB TO CORRECT NO CONTACT TO MC
- △ - SH 860 818 899 (-13084)
- △ - SH 860 818 899

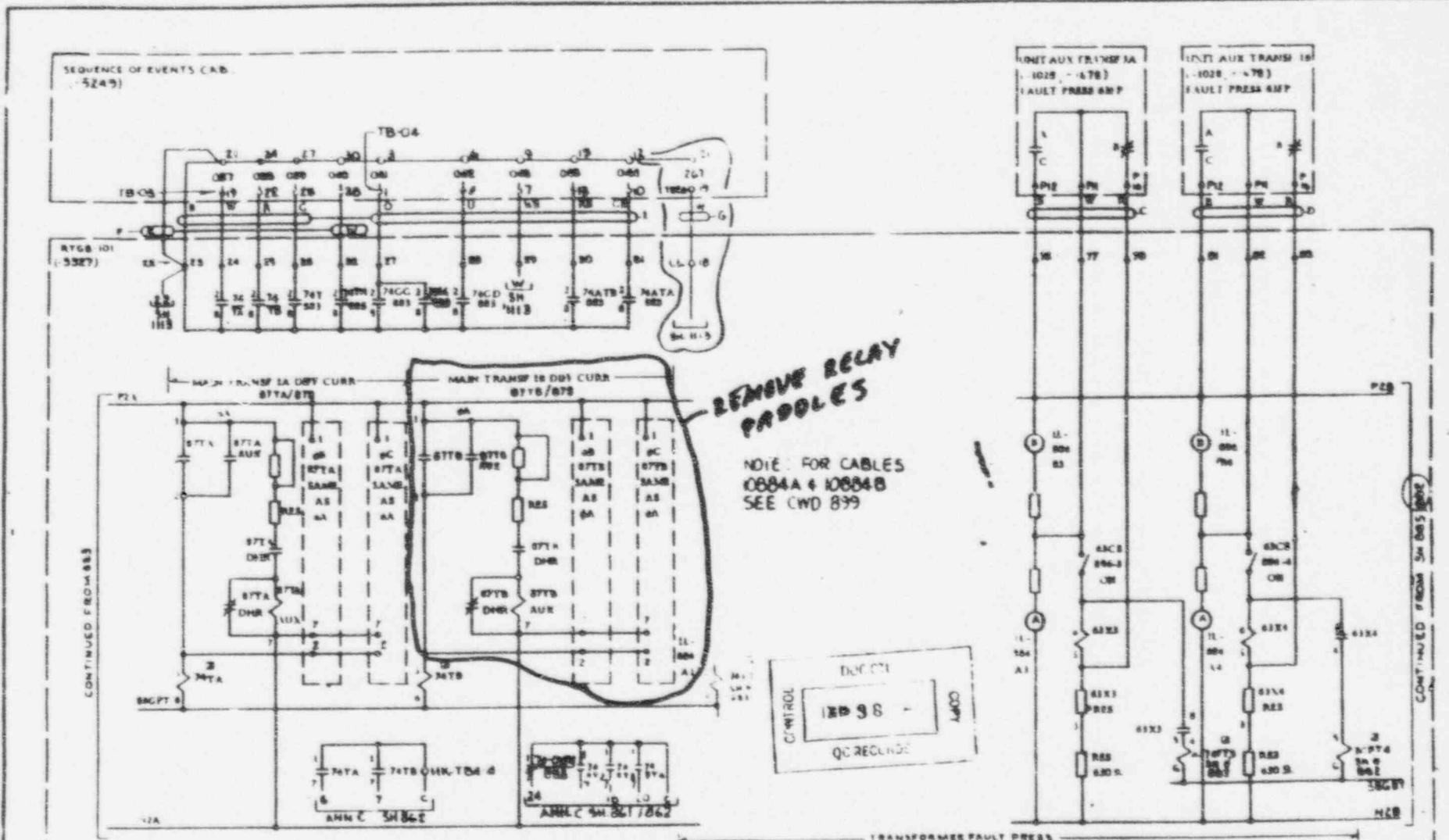
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3	11/15/54	W. J. S.	[Signature]	3	11/15/54	W. J. S.	[Signature]
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FLORIDA POWER & LIGHT CO.
 HUTCHINSON ISLAND PLANT-UNIT NO. 1
 CONTROL WIRING DIAGRAM
 MARCH TRANSFORMER 1B
 SHEET 384



RS PCM 5: 10/21
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 RB - CM 22-5-96

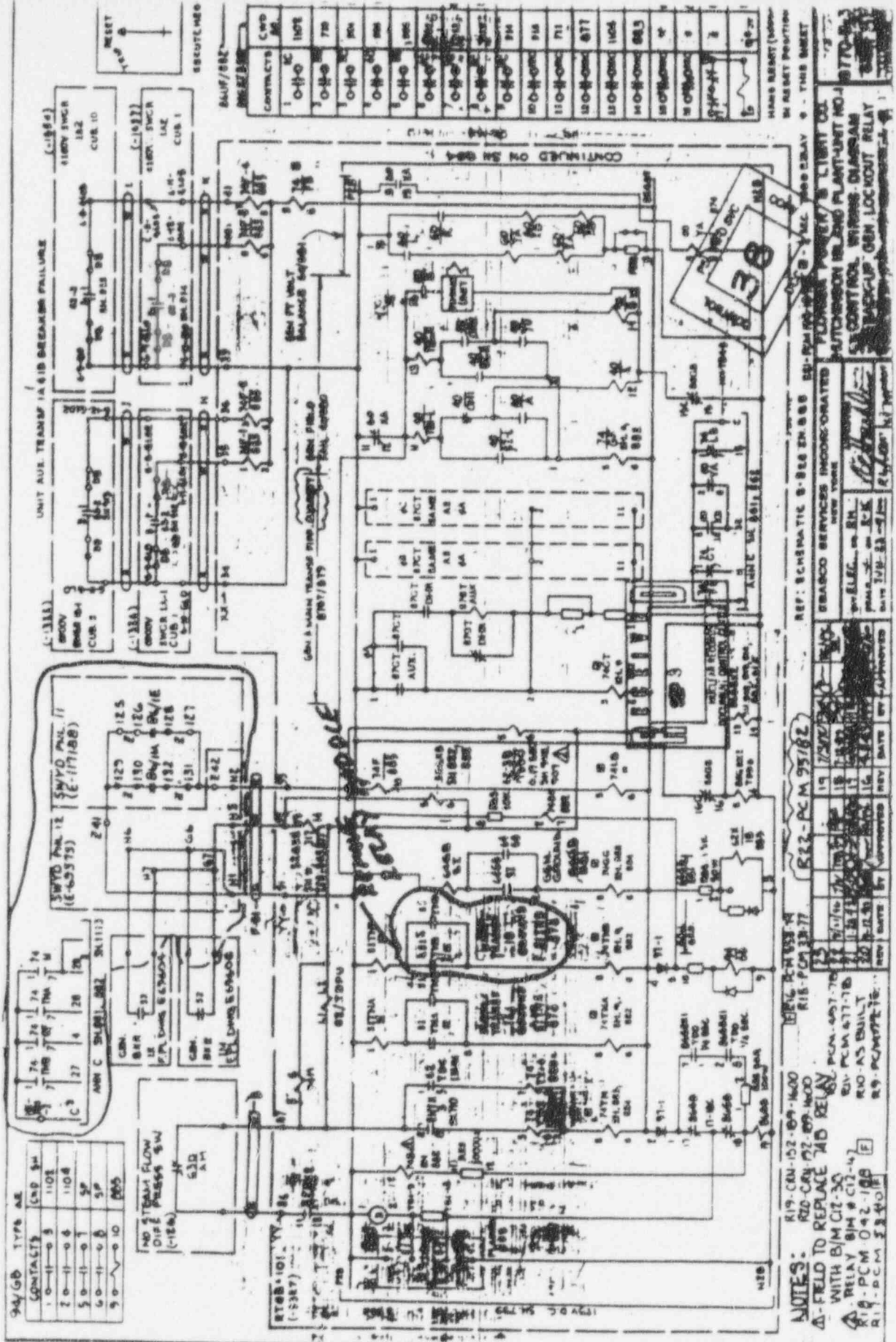
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3	4/11/96	3	4/11/96
4	10/18/96	4	10/18/96

EBASCO SERVICES INCORPORATED
 NEW YORK
 DIV. 01 RC 24
 SCALE: 1/2" = 1'

FLORIDA POWER & LIGHT CO.
 HUTCHINSON ISLAND PLANT-UNIT NO. 1
 CONTROL WIRING DIAGRAM
 PRIMARY BACKUP JOH
 LOCKOUT RELAYS

8770-B-32
 6-007 DC4



94/G0	TYPE	AE
CONTACTS	CND	SM
1-0-11-0-3	110E	
2-0-11-0-6	110B	
5-0-11-0-1	5P	
6-0-11-0-8	5P	
9-0-11-0-10	005	

IND STEAM FLOW
 DISC PRESS SW
 (-18A)
 53D
 AM

STEAM 101 W-81
 (-2387)

UNIT AUX. TRAMP PNL 818

UNIT AUX. TRAMP PNL 818

UNIT AUX. TRAMP PNL 818

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UNIT AUX. TRAMP PNL 818

UNIT AUX. TRAMP PNL 818

NOTES:
 R19-CAN-102-09-1400
 R20-CAN-02-09-1400
 Δ-FIELD TO REPLACE 7AD RELAY
 WITH BIM C12-50
 RELAY BIM # C12-4
 R18-PCM 042-108
 R1-D.C.M 3340

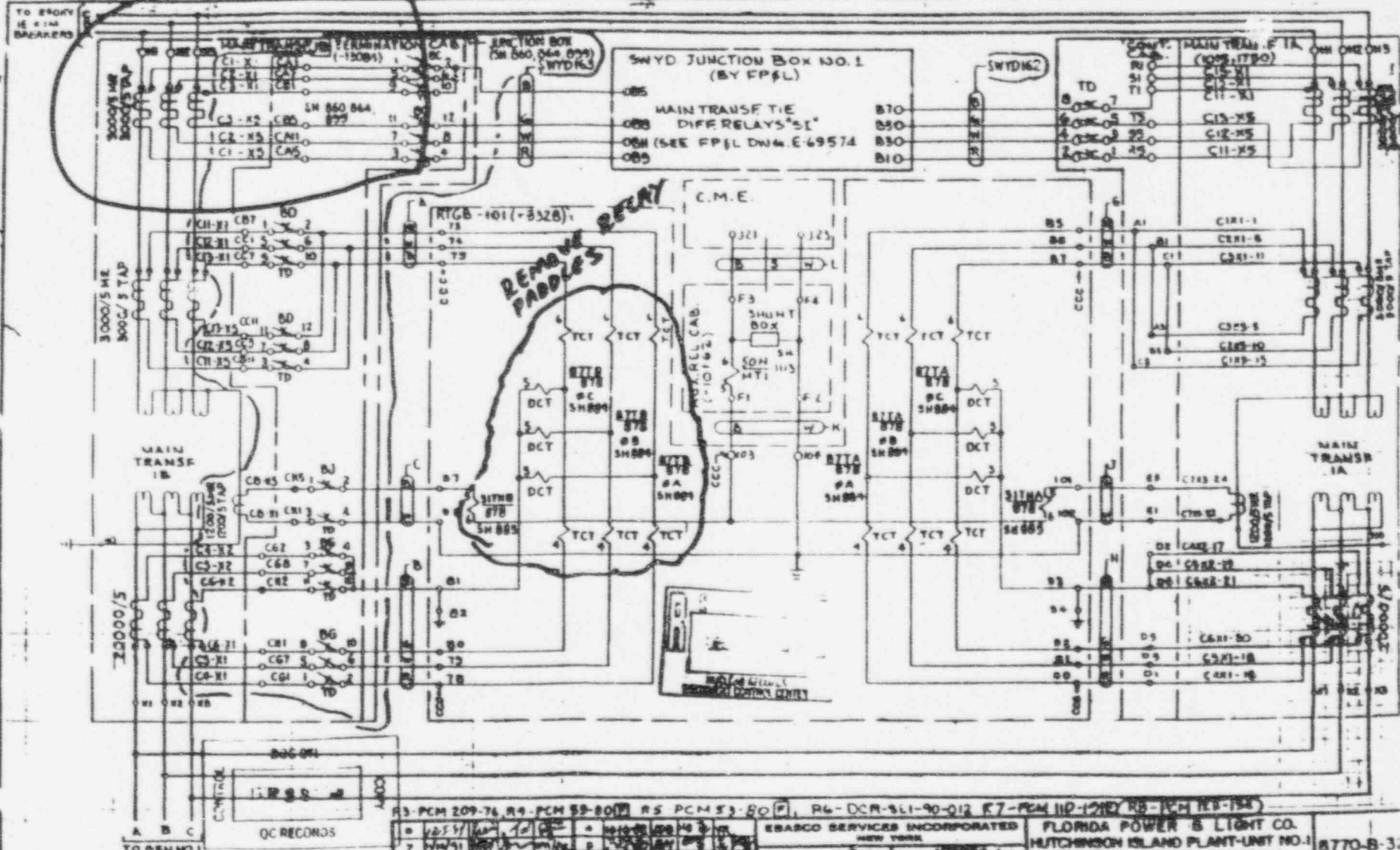
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 NEW YORK
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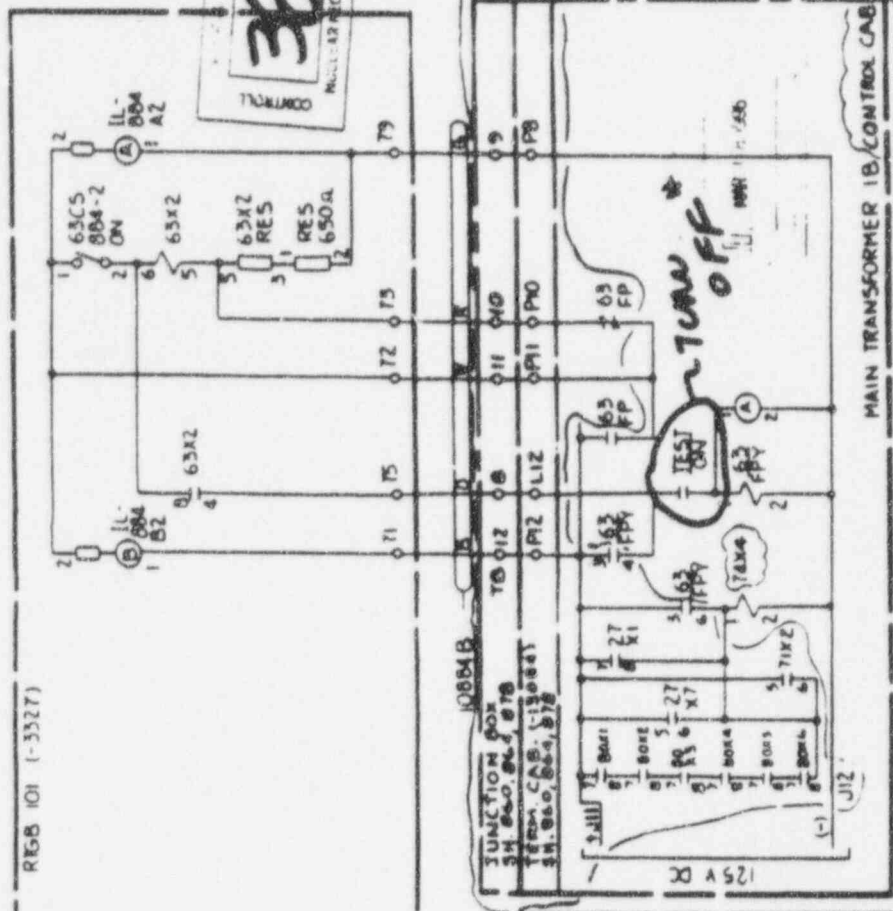
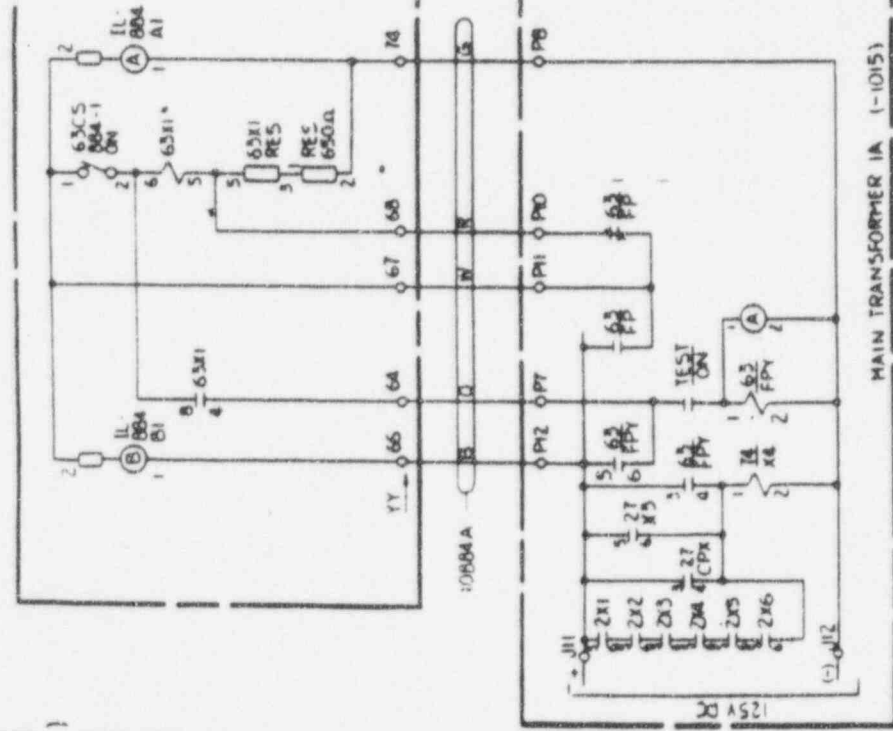
UNIT AUX. TRAMP PNL 818
 BREAKER FAILURE
 UNIT AUX. TRAMP PNL 818
 BREAKER FAILURE

SHORT CT'S AND INSERT ISOLATION STEPS ON BC TEST SOURCE



R3-PCM 209-76 R4-PCM 59-80 R5-PCM 53-80 R6-DCR-311-90-012 R7-PCM 110-121EY R8-PCM 118-154				ESBARCO SERVICES INCORPORATED NEW YORK		FLORIDA POWER & LIGHT CO. HUTCHINSON ISLAND PLANT-UNIT NO. 1		8770-B-32 SHEET 87
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REG-101 (-3327)



* May be turned on for testing purposes

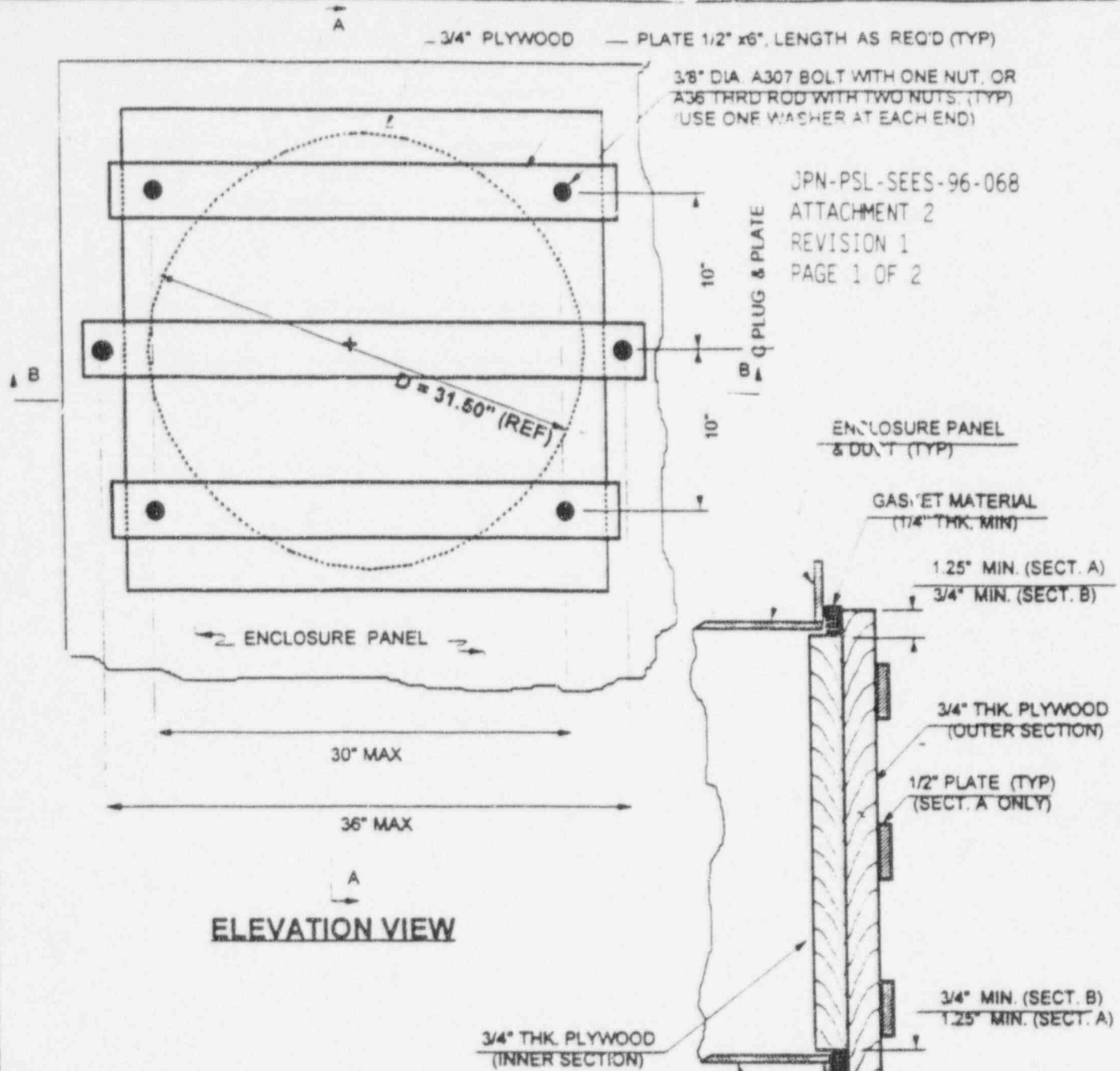


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APPROVED: *R. Chellappa*
 DATE: 11/15/85
 BY: RJC

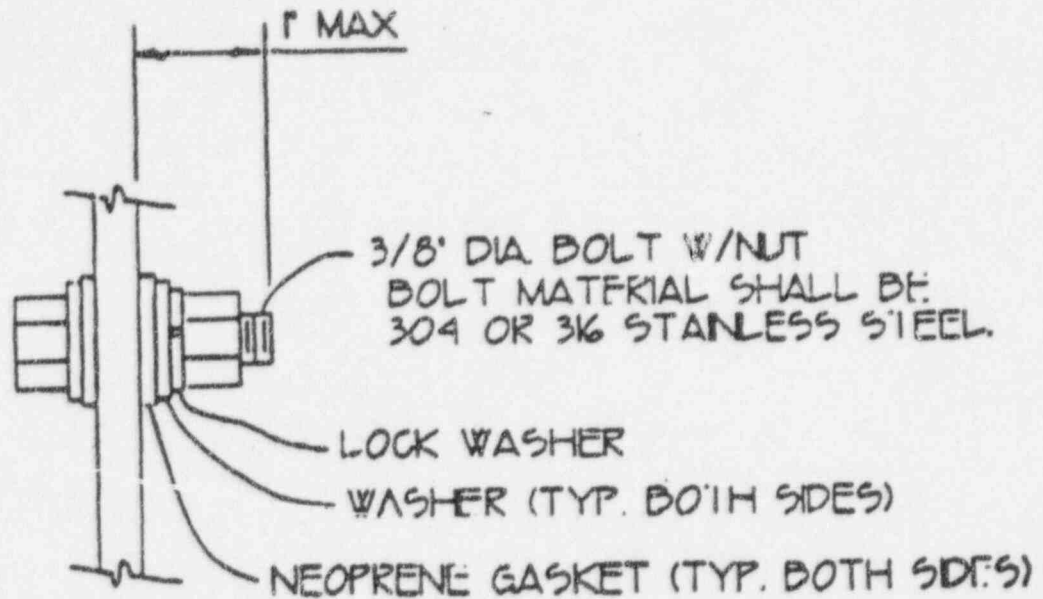
RO-PCM 087-18A (E) R1-PCM 123-194
 EBASCO SERVICES INCORPORATED
 FLORIDA POWER & LIGHT CO.
 MUTCATION BLAND PLANT UNIT NO. 1
 CONTROL WIRING DIAGRAM
 PRIMARY GEN LOCKOUT RELAY - 3
 8770-B-327
 SHEET 099



NOTES:

1. -TOLERANCE FOR ALL DIMENSIONS IS +/-1/2" U.N.O.
2. -CARBON STEEL MEMBERS SHALL BE ASTM-A36.
3. -PLYWOOD SHALL BE COATED WITH FIRE RETARDANT COATING.
4. -INNER AND OUTER SECTIONS OF PLUG SHALL BE SCREWED TOGETHER USING A MINIMUM OF 4 SCREWS 1" OR 1.25" LONG.
5. -GASKET SHALL BE TIGHTLY FIT AGAINST THE EDGE OF THE INNER SECTION OF THE PLUG AND GLUED TO THE SURFACE OF THE OUTER SECTION. CAULK SHALL BE PLACED AROUND THE EDGE OF THE INNER SECTION PRIOR TO INSTALLATION OF PLUG.
6. -DRILL 7/16" DIA. HOLES ON THE ENCLOSURE PANELS, PLYWOOD & PLATES FOR THE 3/8" DIA. BOLTS (SEE DETAILS FOR LOCATION).
7. -BOLTS SHALL BE ASTM A307 AND THREADED RODS SHALL BE ASTM A36 3/4"x4" x4" (CUT AS REQUIRED) WOODEN BLOCK, WITH A 7/16" DIA. HOLE IN THE CENTER, SHALL BE PLACED BETWEEN THE EXTERIOR SURFACE OF THE ENCLOSURE PANEL AND THE FLAT WASHER/NUT OF THE BOLT
8. -BOLTS SHALL BE SNUG TIGHT.
9. -AFTER REMOVAL OF TEMPORARY PLUGS, HOLES DRILLED IN ENCLOSURE PANELS SHALL BE REPAIRED IN ACCORDANCE WITH DRWG Page 2 of this attachment.
10. -ALL MATERIAL SHALL BE PROCURED PC-4 MINIMUM.

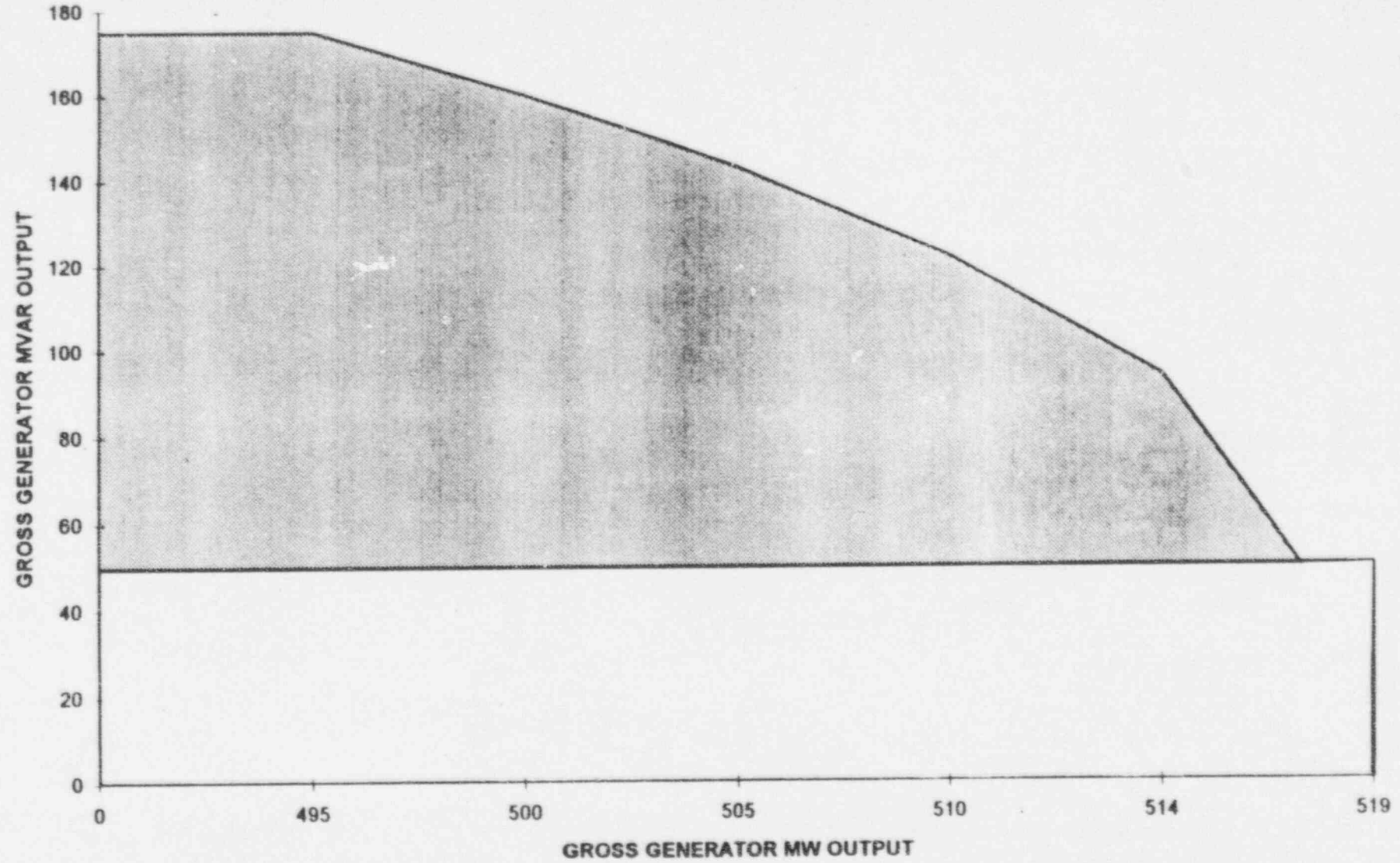
SECT. A (AS SHOWN)
SECT. B (AS NOTED)



BOLT HOLE REPAIR DETAIL

1. WASHER AND GASKET TO COVER EXISTING BOLT HOLE.
2. SNUG TIGHT BOLTS WITHOUT CRUSHING GASKET MATL.
3. BOLT HEAD SHALL BE ON INSIDE OF PLENUM
4. ALL MATERIAL SHALL BE PC-4, OR BETTER.

UNIT GENERATOR GROSS OUTPUT LIMITATIONS BASED ON 475 MVA XFMR RATING



Note: this assumes that the auxiliary transformers are in service; if not, limit output to 200 MW.



Inter-Office Correspondence

JPN-PSL-SEES-96-068
 ATTACHMENT 4
 REVISION 1
 PAGE 1 OF 4

To: D. J. Denver **Date:** September 4, 1996
From: B. A. Jaundl **Location:** SB/JB
Subject: ST. LUCIE PLANT UNIT #1

The Substation Materials & Design and Protection & Control Departments Engineering and Settings Sections, under my direction, have evaluated the temporary configuration of operating PSL 1 on only the 1A main transformer.

Protection & Control has determined that the temporary protection realignment provides the necessary protection.

Substation Materials and Design have determined that the 1A transformer and it's system of pumps and coolers can be operated separately while the 1B main transformer is out of service for repair and testing.

References:

- 1-letter dated 09/04/96 from R. Shaheen to D. J. Denver
- 2-letter dated 09/04/96 from Tony Figueroa to D. J. Denver
- 3-JPN-PSL-SEES-96-068 REVISION 0

A handwritten signature in black ink, appearing to read 'B. A. Jaundl', is written over the typed name below.

B. A. Jaundl, Director Substation and P&C

Copies:

Jim Scarola	L. D. Leon
C. M. Mennes	Tony Figueroa
Richard Shaheen	Pedro Modia
M. R. Smith	John Fischer
R. L. Hahn	C. E. Seitz



Inter-Office Correspondence

To: Dan Denver Date: September 4, 1996
From: Tony Figueroa Department: SB/JB
Subject: Operation of PSL Unit #1
With 1B Main Transformer Out of Service

St. Lucie Main Transformer 1B has developed air intrusion problems. Unit #1 can operate in a temporary configuration using only Main Transformer 1A until transformer 1B is repaired and tested satisfactorily.

Unit #1 can be operated at a reduced level with only one main power transformer. With transformer 1B out of service, transformer 1A has a nominal rating of 475 MVA. Loading on the transformer should not exceed 475 MVA unless a basis is established from the temperature data that provides reasonable assurance that the temperature specifications will not be exceeded. Existing high temperature alarms are sufficient for continuous monitoring of the temperatures of the transformer. In order to maintain the transformer within its operating capabilities, the hotspot and top oil temperatures should be monitored and verified to be less than 120° and 90° C, respectively.

If you have any questions, please feel free to call me at 694-4572.

A handwritten signature in cursive script, appearing to read 'Tony Figueroa'.

Tony Figueroa
Manager, Substation Operations & Planning

Copies: B. A. Jandl
Dave Wolf
John Fischer
Ken Veronee
Oscar Bello
M. R. Smith
Pedro Modia
Marty Mennes

Received Time: Sep. 4. 6:00PM

Inter-Office Correspondence



JPN-PSL-SEES-96-068
 ATTACHMENT 4
 REVISION 1
 PAGE 3 OF 4

To: Dan Denver
 ENG/PSL
 Location: SPE/JB


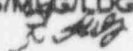
From: R. L. Shaheen
 Date: September 4, 1996

Subject: PROTECTIVE RELAY MODIFICATIONS FOR
 PSL1 OPERATION WITHOUT MAIN TX 1B

Protection & Control has completed their review of the proposed temporary system alteration as mentioned in the above subject. The following conclusions were made:

- I. The following temporary circuit alterations will be necessary to allow operation with only the 1A Main Transformer in service:
 - 1) Isolate the 87TB/878 phase A, phase B and phase C BDD differential relays for Main Transformer 1B by removing the relay paddles.
 - 2) Isolate the 51TNB/878 IAC neutral overcurrent relay by removing the relay paddle.
 - 3) Install shorts for the C1, C2 and C3 current transformers for differential "s1" in Main Transformer 1B. Install isolation strips in the BC isolation device points 1-12 (six isolation strips).
 - 4) Turn off all annunciator points in Main Transformer 1B.
- II. No relay setting changes are necessary. The rationale for this conclusion is based on a review of the existing relay settings as described in Attachment A.

If there are any questions or concerns, please call me at 694-3745.


 R. L. Shaheen, Supervisor
 P & C Engineering
 RLS/MLG/LDG


Copies To:

Warren Busch	JPN/JB
L. D. Leon	SP/LFO
Pedro Modia	SPE/JB
M. R. Smith	SPG/PSL
B. A. Jaindl	SBE/JB
C. E. Seitz	WBP/LPS

ATTACHMENT A

(OPERATION OF PSL1 WITH MAIN TX 1B OUT OF SERVICE)

Relay settings for the following pertinent relays were reviewed:

Generator Out-Of-Step (21M/21ST/50N) Relays:

GSY: The setting criteria takes into account an outage of one of the two transformers. No need to make any changes.

CEX: Its setting is based on the same parameters as in GSY. Therefore, no change needed.

PJC: The relay already has a very sensitive setting and does not require any change.

Main Transformer 1A Neutral O/C (51TNA) Relay:

The re-calculated setting for the IAC53 relay is the same as the existing one.

Generator Leads Backup Distance (21) Relay :

The criteria used for the KD-11 setting is very conservative. No need to make any changes.

Generator Loss-Of-Field (40) Protection:

No change required in the CEH52 setting since this setting is independent of the transformer impedance.

Main Transformer Differential (87TA) Protection:

No change required in the BDD15 setting since this setting is independent of the transformer impedance.

Unit Differential (87GT) Protection:

No change required in the BDD18 setting since this setting is independent of the transformer impedance.

Negative Sequence (46B) Protection:

No change required in the SGC12 setting since this setting is independent of the transformer impedance.

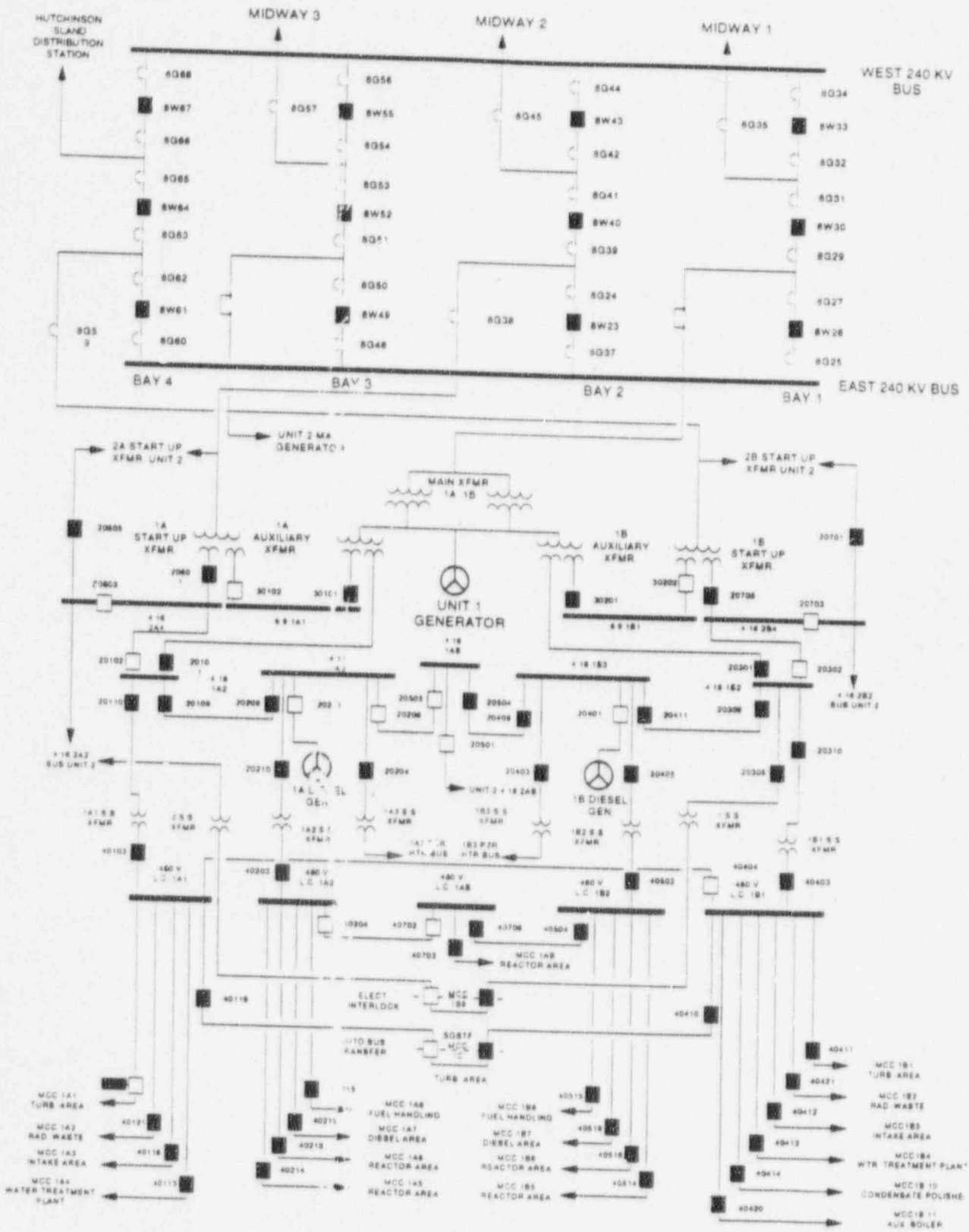
Reverse Power (32) Relay:

No change required in the GGP53 setting since this setting is independent of the transformer impedance.

Overexcitation (59-1 & 59-2) Protection:

No change required in the STV11A's settings since these settings are independent of the transformer impedance.

UNIT 1 - MAIN POWER DISTRIBUTION SYSTEM BREAKER POSITIONS - NORMAL OPERATION



(T/RCO/071502-F6-RB)

Figure 6
071502, Rev. 8
FOR TRAINING USE ONLY

Operations Department

St. Lucie Nuclear Power Plant

Night Order

DISTRIBUTION: Unit 1 Control Room Unit 2 Control Room
 OPS Support Work Control Group
 System Specialists Training
 Simulator

From: Operations Supervisor's Office
To: All Operations Personnel

Date: September 20, 1996

1. *NPS's please review with your crew the attached Self Assessment of the Mis-aligned ESFAS bistable. The following interim actions have been taken:*
 - a. *Unit 1 EFAS Bypass key switches have labeled to match the ESFAS trip unit. For example the S/G 1B Pressure MSIS Bistable trip unit fails to trip. The trip unit is labeled BA410 and the bypass key switch has been labeled BA410.*
 - b. *The tags for the key switches have been labeled.*

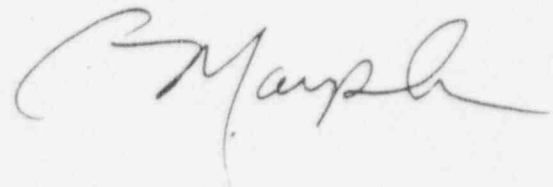
There are many more traps left our there. Please use a questioning attitude, have someone double check what you are about to perform(Peer Check), and take nothing for granted when performing any task. Time should not be a factor. Always take the time to ensure the task is performed correctly.
2. *Find attached the following memo's:*
 - a. *1B MG set Flywheel Vibration alarm*
 - b. *Hurricane Crew Coverage.*
 - c. *ASI control for Unit 2 Down Power on 9/23/96*
3. *E/M believes the 1B DC ground that keeps coming in intermittently is not the ground test switch. Also the*

EE/54

ground is so small the ground buster can not pick it up. Therefore if the ground comes into alarm and stays in, implement the DC ground ONOP.

4. We are doing a very good job in our pre-job briefings. Please ensure that job debriefs are being preformed and any issues are sent to me if required to resolve.

5. Find attached the game plan for PCV-1100F on Unit 2. The plan is to begin next Tuesday. See the POD.

A handwritten signature in cursive script, appearing to read "R. Mayph". The signature is written in dark ink and is located in the lower right quadrant of the page.

Operating Crew Self Assessment

Description: Misaligned ESFAS bistable bypass

Unit: 2

Date: 9/18/96

Shift: Peak

EVENT:

At 1945 while restoring the instrumentation from the performance of the Area Radiation Monitoring System Periodic Test it was noted that the ATI fault light would not reset. From the indicator lights that were lit on the ATI panel it appeared to be a B MSIS problem. All other indications on the ESFAS and RTGBs associated with S/G pressure appeared to be normal. The NPS, RMM and I&C were notified.

At approximately 2030 while the ANPS was speaking of the problem with the I&C system supervisor at home on the telephone, it was observed that the D Channel B S/G pressure indicator failed high confirming a fault with the D Channel B S/G MSIS.

At 2045 in accordance with Tech Spec 3.3.2.1, which states that the inoperable channel be placed in bypassed or tripped condition within 1 hour and that all functional units receiving an input from the inoperable channel also be placed in the same condition, the D Channel B S/G MSIS, RPS D channel TM/LP and LO S/G Pressure, and D channel AFAS 1 and 2 were placed in bypass.

At approximately 0705 on 9/19/96 it was noted that the D Channel A S/G MSIS bistable had been mistakenly bypassed instead of the D Channel B S/G MSIS bistable. Subsequently the A S/G MSIS was restored to normal configuration and the B S/G MSIS bistable was placed in the bypassed condition.

STRENGTHS:

The crew determined that the ATI fault was associated with the one of the B S/G MSIS trip paths.

The problem was promptly reported to Plant Management, the RMM and I&C.

The entire control room crew including the STA was involved in the review and discussion of the Tech Specs as they pertained to this situation.

The administrative control of the paperwork to document the event including entries in

the controlled key locker log, the equipment OOS log, the switch deviation log and the chronological log was handled correctly.

WEAKNESSES:

The wrong bistable on D Channel ESFAS was incorrectly bypassed and incorrectly independently verified.

The RCO made the assumption that the proper bistable was being bypassed since the bypass key switch lined up with the isolation module that was labeled as the B S/G MSIS.

The key number was not compared to the key index located in the key locker, although this comparison is not normally made.

CONTRIBUTING FACTORS:

The first six bypass key switches line up with the corresponding isolation modules, the last three do not. Earlier that evening when performing the Area Radiation Monitor Periodic Test, the RCO successfully bypassed the Containment Hi Pressure bistables one at a time without incident. That bistable was one of the first six.

The bistable bypass key switches in the ESFAS cabinets are not clearly labeled.

The key switch tags are labeled with numbers and are not clearly labeled with the component description.

A condition report was submitted several months ago to address and upgrade the controlled key labeling deficiencies on both units, this problem has not has not yet been resolved.

There is not an off-normal procedure, other than the annunciator summery, that addresses situations concerning ESFAS cabinets failures or failures of their related instrumentation.

LESSONS LEARNED:

Avoid making assumptions. Even though something may appear to be straightforward and correct, such as the bistable key switch being in line with the corresponding isolation module, always maintain a questioning attitude.

If time permits, compare the key tag with the key locker index.

SUGGESTIONS FOR IMPROVEMENT:

Clarify the labeling deficiencies of the ESFAS bypass switches.

Relabel all of the keys in the controlled key lockers ensuring the key tags have the number and component description on them and are also color coded where appropriate.

Develop an off-normal procedure that deals with ESFAS cabinet components and instrumentation problems.

Reinforce the critical differences in the ESFAS component layout between units 1 and 2 during Licenced Operator requal.

Operations Department Chronological Log Unit 1

04-Sep-96

NUMBER:	818	NUC POWER:	0
DATE:	9/1/96	DELTA T POWER:	0
SHIFT:	MID	MWE:	0
BOARD RCO:	SCOTT	CEA GROUP #:	7
DESK RCO:	CONE/KIMPEL	POSITION:	0
NWE:	TAYLOR	T AVG:	532
ANPS:	DAUGHTRY	BORON:	1126
NPS:	SANDY	Xe WORTH:	-3401
		MODE:	3
		CALCULATED SD MARGIN:	>3600

MAJOR MILESTONES OR ACTIVITIES TO BE PERFORMED DURING THE SHIFT:

COMPLETE ALL PREPERATIONS FOR A RX START UP

TIME LOG ENTRIES

23:00 REVEIUED LOGS, COMPLETED BOARD WALKDOWN AND ASSUMED THE SHIFT

23:01 ANN J-11 CLEARED, EXITED ONOP 1-0120034 (RCP OF? NORMAL)

23:03 CHEM. REPORTS DEQ SAMPLE RESULTS ARE NORMAL

0:15 START THE WIDE RANGE INSTRUMENTATION CHANNELS FUNCTIONAL TEST IAW OP 1-1210051

0:20 DECLARED THE SJAE RAD MONITOR OOS FOR NPO TO OBTAIN AIR IN LEAKAGE READING

0:23 DECLARED THE SJAE RAD MONITOR B.I.S., AIR IN LEAKAGE READING IS 3.8

0:24 UNABLE TO OBTAIN GENERATOR MW METER READING AT 0000 DUE TO TURBINE OFF LINE. THE PREV READING WAS 4575460 ON 9/1/96 AT 0000. THE READING WILL BE OBTAINED WHEN THE TURBINE IS PLACED ON LINE.

0:30 DECLARED "A" CHANNEL WR NI'S OOS DUE TO FUNCTIONAL TEST.

0:59 DECLARED "A" CHANNEL WR NI'S BIS

1:00 DECLARED "B" CHANNEL WR NI'S OOS DUE TO FUNCTIONAL TEST. REMOVED THE BYPASS KEY FROM CHANNEL "A" VAR HIGH POWER BISTABLE, WHICH IS OOS. THE VAR HIGH BISTABLE IS NOT REQUIRED IN MODE 3 AND THE BYPASS KEY IS REQUIRED FOR THE WR FUNCTIONAL TEST. ANPS NOTIFIED.

1:10 DECLARED "B" CHANNEL WR NI'S BIS.

1:11 DECLARED "C" CHANNEL WR NI'S OOS DUE TO FUNCTIONAL TEST.

1:20. DECLARED "C" CHANNEL WR NI'S BIS.

1:21 DECLARED "D" CHANNEL WR NI'S OOS DUE TO FUNCTIONAL TEST.

1:25 T&D REPORTED OIL SAMPLE ON THE 1B MAIN XFRMR SAT.

1:33 DECLARED "D" CHANNEL WR NI'S BIS AND COMPLETED WR FUNCTIONAL TEST SAT. PLACED BYPASS KEY BACK INTO "A" CHANNEL VAR HIGH POWER. ANPS NOTIFIED

EE/SS

Operations Department Chronological Log Unit 1

04-Sep-96

1:35 I&C ENTERED CONTAINMENT AND TEST OF THE CONTAINMENT EVAC ALARM SAT. NOTIFIED ANPS AND STA. FILLED OUT A DS#30 FOR THE UNSCHEDULED SURV.

1:55 COMMENCED RPS LOGIC MATRIX TEST PER OP 1-1400059.

14:00 INCREASED "A" AND "B" STEAM GENERATOR BLOWDOWN TO 80 GPM. NOTIFIED CHEMISTRY AND UNIT#2. (CORRECT TIME IS 0200)

1:45 (LATE ENTRY) RCS INVENTORY BALANCE COMPLETED PER DS#1, WITH RCS LEAKAGE AT -.26 GPM. CHARGING PUMP LEAKAGE (1A) AT 1.6 "/HR, (1B) AT .8 "/HR, (1C) AT .4 "/HR.

2:15 LOGIC MATRIX TEST PLACED ON "HOLD" DUE TO THE BD1 MATRIX HOLD LIGHT NOT EXTINGUISHING IMMEDIATELY LIKE THE OTHER MATRIX HOLD LIGHTS. I&C NOTIFIED TO INVESTIGATE

2:30 ENG REPORTED THAT THE 1B CONTAINMENT FAN COOLER CCW LEAK IS 2 LITERS/HOUR AND STEADY.

2:31 COMMENCED LOSS OF LOAD TEST PER OP 1-1400054.

2:45 UNABLE TO LATCH THE TURBINE FROM THE CONTROL ROOM. WHEN THE LATCH BUTTON IS RELEASED THE TURBINE TRIPS. THE TURBINE WOULD LATCH FROM THE FRONT STANDARD.

3:05 TRIPPED THE TURBINE AND OPENED ALL TCB'S. LOSS OF LOAD AND LOGIC MATRIX TESTING ARE TERMINATED AT THIS TIME WHILE CONTROL ROOM CREW DISCUSSES THE IMPACT OF THE BD1 MATRIX HOLD LIGHT.

3:15 CHEM. REPORTS RCS Cb 1053ppm VIA SAMPLE TAKEN AT 0305

3:30 AFTER DISCUSSIONS WITH LICENSING IT HAS BEEN DECIDED TO KEEP THE REACTOR TRIP CIRCUIT BREAKERS OPEN UNTIL THE BD-1 MATRIX HOLD RELAY IS REPAIRED.

4:50 DECLARED BD LOGIC MATRIX PANEL OOS DUE TO I&C REPLACING BD1 MATRIX RELAY.

6:45 NO FURTHER ENTRIES THIS SHIFT

TIME REVIEWER'S COMMENTS

2:33 NPS Review. CDL.

Operations Department Chronological Log Unit 1

04-Sep-96

NUMBER:	817	NUC POWER:	100
DATE:	8/31/96	DELTA T POWER:	100
SHIFT:	PEAK	MWE:	880
BOARD RCO:	HOLZMACHER	CEA GROUP #:	7
DESK RCO	de la Guardia	POSITION:	136
NWE:	KLAUCK	T AVG:	575
ANPS:	SCALES	BORON:	1000
NPS:	STORKE	Xe WORTH:	-2419 PC
		MODE:	1
		CALCULATED SD MARGIN:	>3600

MAJOR MILESTONES OR ACTIVITIES TO BE PERFORMED DURING THE SHIFT:

MAINTAIN 100% POWER

TIME LOG ENTRIES

15:00 COMPLETED BOARD WALKDOWN, ASSUMED SHIFT

15:35 1B BAM TANK BORON SAMPLE RESULT IS 5622 PPM SAMPLE TIME WAS 1525

15:56 SJAE RAD MONITOR OOS WHILE NPO TAKES AIR IN LEAKAGE READING

15:59 SJAE RAD MONITOR BIS

16:30 25

17:20 RECEIVED ANN J-11 RCP 1B1 OIL PRESS/FLOW/LVL HIGH/LOW, LIA 1177 READING 2.0 INCHES, ENTERED ONOP 1-0120034, NOTIFIED I&C AND OPS MANAGEMENT

17:20 NOTIFIED I&C SUPERVISION OF ANN J-11. I&C SUPERVISOR COMING OUT TO INVESTIGATE AND CORRECT PROBLEM. NOTIFIED HP ON SHIFT AND SECURITY SHIFT SUPERVISOR OF UP COMING CONTAINMENT ENTRY. TIME SHOULD READ 1725.

17:55 ATTEMPTING TO NOTIFY JPN ENGINEERING OF IMPENDING CONTAINMENT ENTRY TO COORDINATE CCW LEAK INSPECTION ON 1B CONTAINMENT COOLER

18:17 CONTAINMENT PIG OOS FOR HP REMOTE AIR SAMPLE IN PREPERATION FOR CONTAINMENT ENTRY.

18:48 ANN C-37 1B MAIN XFMR ALARM PNL LOCKED IN DISPATCHED ANPO AND NWE. ENTERED ONOP 1-0030125

18:51 ANPO REPORTS GAS DETECTOR ALARM LIGHT LIT. AS PER ONOP WE ARE TO COMMENCE A UNIT SHUT DOWN.

19:03 COMMENCED UNIT #1 SHUTDOWN. IAW OP 1-0030125

19:20 RPS CHANNEL A VAR HI POWER, PRE-TRIP ALARMS/RESETS

19:40 QRP ALARM, NOTIFIED CHEMISRTY

19:45 RECIEVED ANN D-15, TURBINE VIBRATION ABNORMAL, #1 BRG ALERT

19:50 DECLARED CHANNEL A RPS VARIABLE -HI-POWER, OUT OF SERVICE, DUE TO SPURIOUS PRE-TRIPS /PLACED CHANNEL IN BYPASSED

Operations Department Chronological Log Unit 1

04-Sep-96

20:05	SECURED 1A/B HTR DRAIN PUMPS
20:07	PLACED 1B MAIN FEED WATER PUMP ON RECIRC
20:18	MANUALLY TRIPPED REACTOR AND TURBINE DUE TO DETERIORATING CONDITIONS ON 1B MAIN TRANSFORMER
20:45	EXITED EOP-2
20:49	STARTED HVE-1 AND HVE-2 FOR CONTAINMENT ENTRY
21:30	KADON SYSTEM ALARM, SYSTEM SHUTDOWN ON LOW FLOW CONDITIONS
21:50	TURBINE ON TURNING GEAR
22:10	KADON SYSTEM BIS ALIGNED TO THE BOTTOM OF RESERVOIR
22:50	COMPLETED NOTIFICATION TO THE NRC
22:55	NO FURTHER ENTRIES THIS SHIFT
TIME	REVIEWER'S COMMENTS
22:00	Reviewed log
22:00	Reviewed log R.A. Storke



To: D. A. Brown
St. Lucie Plant

Date: 9/3/96

From: D. J. Denver *DJD*
Nuclear Engineering

Department: JPN/PSL

Subject: ST. LUCIE PLANT UNIT 1
TITLE: EVALUATION OF TEMPORARY OPERATING CONFIGURATION WITH 1B
MAIN TRANSFORMER OUT OF SERVICE
PROJECT #:
FILE:

This evaluation provides for the temporary operating configuration using only Main Transformer 1A until repair and testing of the Main Transformer 1B cooling system is satisfactorily completed and the transformer can be returned to service.

If you have any questions, please contact Kino Vélez at 467-7489.

DJD/WAB/JNV

Copies:

EE/56