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Michael J. Colomb
Site Vice President - JAF

JAFP-12-0032
March 30, 2012

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

SUBJECT: Response to Request for Additional Information Re: Application for Change to the Current Licensing Basis, Authorizing use of On Load Tap Changers with the Reserve Station Service Transformers (TAC No. ME6887)
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

References:

1. Entergy Letter, JAFP-11-0102, Application for Change to the Current Licensing Basis, Authorizing use of On Load Tap Changers with the Reserve Station Service Transformers (TAC No. ME6887), dated August 16, 2011

2. NRC Request For Additional Information Regarding James A. FitzPatrick Nuclear Power Plant Application for Change to the Current Licensing Basis, Authorizing use of On Load Tap Changers with the Reserve Station Service Transformers (TAC No. ME6887), dated February 27, 2012

3. Teleconference with NRC to clarify Request for Additional Information, dated February 27, 2012

Dear Sir or Madam:

On August 16, 2011 Entergy Nuclear Operations, Inc. (ENO), submitted an application for amendment to the Current Licensing Basis for the James A. FitzPatrick Nuclear Power Plant (JAF) that would approve the use of On Load TAP Changers with the Reserve Station Service Transformers [Reference 1]. On February 27, 2012, JAF received a Request for Additional Information (RAI) from the Nuclear Regulatory Commission (NRC) staff [Reference 2]. That request was clarified in a conference call with the staff on February 27, 2012 [Reference 3].

Based on the clarifying discussions with the staff, ENO is supplementing the amendment application with enclosed RAI responses.

There are no new commitments made in this letter.

Questions concerning this submittal may be addressed to Mr. Joseph Pechacek, Licensing Manager, at (315) 349-6766.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on the 27th day of March 2012.

Sincerely,

Michael J. Colomb
Site Vice President - JAF

MC/JP/jo

Enclosures:
1. Responses to Request for Additional Information Questions
2. Draft UFSAR Changes (Figures and Text)
3. Draft UFSAR Text, Figure and Table Changes
4. Modification Drawings for Replacement RSSTs
5. Replacement RSST's Non-Safety Related / ECCS Load Sequencing Voltage Profile
6. Replacement RSST's Non-Safety Related Load Voltage Profile on Transfer From NSST

cc: next page

cc:

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JAFP-12-0032

Enclosure 1

Responses to Request for Additional Information Questions

(6 Pages)

Responses to Request for Additional Information Questions

1. Question:

"Provide revised Figures 8.2-1 and 8.5-1 of Updated Final Safety Analysis Report and any others, in which the new ratings of RSSTs are shown."

1. Response:

Draft copies of Updated Final Safety Analysis Report Figures 8.2-1, 8.3-4, 8.5-1, 8.5-3 and 8.5-4 are provided in Enclosure 2. Drafts are provided since the figures can not be finalized until the new Reserve Station Service Transformers (RSST's) are installed. Included in Enclosure 3 are copies of the UFSAR changes related to the existing Reserve Station Service Transformers (RSST's) that are currently being processed as a result of a revision to an electrical calculation. This change affects Figure 8.6-1, section 8.6.6 and Table 8.6-1.

2. Question:

"In the LAR, Attachment 1, Page Nos. 5 and 6, the following is stated: "The normal power source for the primary and backup digital OLTC Beckwith microcontrollers is from a potential transformer that is located between the RSST secondary windings and the 4kV [kilo-Volt] RSST bus supply breakers."

Provide a copy of the diagram which shows the connection of the potential transformer that is located between the RSST secondary windings and the 4kV RSST bus supply breakers. Also, identify which 4kV buses are monitored and controlled by the OLTC, and which 4kV buses are shown in Figures 1 and 2 of the LAR."

2. Response:

Modification drawing FE-1F (Enclosure 4) shows the connection of the potential transformer that is located between Reserve Station Service Transformer 71T-3 low voltage "Y" winding and non-safety related bus 10300 (71H03). Modification drawing FE-1G (Enclosure 4) shows the connection of the potential transformer that is located between Reserve Station Service Transformer 71T-2 low voltage "Y" winding and non-safety related bus 10400 (71H04). (Note: The JAF RSST's are normally energized and unloaded.) The OLTC's monitor and control voltage to 4.16kV switchgear buses 10300 (71H03) and 10400 (71H04) that supply power to downstream safety related buses 10500 (71H05) and 10600 (71H06). Also included in Enclosure 4, are modification drawings FE-1B, which provides an electrical one line diagram of Station Service Transformers, and 1.22-106 which details the Reserve Station Service Transformer connections to the OLTC. The "Typical Pre Transfer Voltage Control and Limit Bands" shown in Figure 1 of the LAR and the "Typical Post Transfer Control and Limit Bands" shown in Figure 2 of the LAR are applicable to the 10300 (71H03) and 10400 (71H04) buses.

Responses to Request for Additional Information Questions

3. Question:

"In the LAR, Attachment 1, Page No. 6, the following is stated: "The primary microcontroller is set with a time delay during operation; this setting is needed to inhibit the tap changer from unnecessary operations on temporary voltage excursions."

Provide the above time delay setting associated with the primary microcontroller, and confirm whether the above time delay is bypassed in case of a design basis accident signal. "

3. Response:

The primary microcontroller is set for a two (2) second inverse time delay. The primary controller intertap time delay setting is set to zero (0) seconds in order to allow immediate adjustment if the voltage remains outside the established primary microcontroller control band. These settings are not bypassed in the event of a Design Basis Accident (DBA).

The backup microcontroller time delay is set to the minimum setting of one (1) second to enable a quick response to possible overvoltage conditions. The backup microcontroller is bypassed / blocked during unloaded conditions; however its function is enabled after closing of the 4.16kV bus feeder breakers coupled with a ten (10) second time delay. This action enables the starting of the electrical safety-related loads, while eliminating the potential of lowering bus voltages lower than the degraded voltage relay reset setting.

4. Question:

"In the LAR, Attachment 1, Page Nos. 6 and 7, the following is stated: "By providing automatic adjustment of the voltage to the auxiliary power system from the offsite 115kV system, the RSST OLTC's will compensate for a wide range of 115kV (110kV – 121kV) system operating voltages." "To prevent unnecessary disconnection of the safety-related buses from offsite power, analyses have determined the minimum permissible pre LOCA [loss-of-coolant accident] contingency voltage that can occur following generator trip without actuating the DVR [degraded voltage relay] scheme."

Provide the basis for considering the above voltage range for the 115kV system. What is the current minimum permissible pre LOCA 115kV contingency voltage that can occur following a generator trip without actuating the DVR scheme, prior to the proposed amendment?"

4. Response:

Since the RSST's are normally unloaded, the Transmission Owner utilizes a post LOCA contingency analysis in lieu of a pre LOCA contingency voltage range. JAF's basis for considering the voltage range of the 115kV system is based on the fact that the Transmission Owner (National Grid) maintains the 115kV system operating voltages between 109.25kV and 120.75kV (115kV ±5%). The current permissible post LOCA 115kV contingency voltage that can occur following a generator trip without actuating the DVR scheme with the existing RSST's installed is 112.5kV.

Responses to Request for Additional Information Questions

The minimum post LOCA contingency voltage with the replacement RSST's installed that can occur following a generator trip without actuating the DVR scheme and the OLTC in automatic operation is 106.8kV.

The Transmission Owner has procedural controls in place that monitor the minimum 115kV system post LOCA contingency voltage for JAF. In the event the minimum post LOCA voltage alarm occurs, notification is made to the JAF Control Room, at which time the 115kV would be declared inoperable, and the Transmission Owner takes actions to raise the 115kV system voltage to JAF. After actions have been taken by the Transmission Owner to raise 115kV system voltage, another load flow will be performed to determine if the post LOCA voltage alarm has cleared. If the alarm is still present the Transmission Owner will take additional actions to raise the 115kV system voltage and if the alarm has cleared, the JAF Control Room will be notified. Within 30 minutes from the initial alarm another load flow will be performed by the Transmission Owner and the JAF Control Room will be notified if the minimum post LOCA contingency voltage alarm has cleared or if the Transmission Owner was not successful in raising the raising the 115kV system voltage above the minimum post LOCA contingency voltage. If the post LOCA contingency alarm has cleared, the 115kV system would be declared operable; otherwise the 115kV system would remain inoperable.

5. Question:

"In order to find the voltage improvements due to the OLTC, please provide the voltage profiles for the 4kV major load buses in the following scenarios:

a. Accident load sequencing with the 115kV switchyard voltage at the minimum voltage level, without OLTC (prior to proposed amendment).

b. Same as (a) but with new RSST and OLTC in normal operation.

c. Non-Accident load sequencing due to spurious sudden trip of the main generator, with the 115kV switchyard voltage at the minimum voltage level, loads fast transfer to RSST (prior to proposed amendment).

d. Same as (c) but with new RSST and OLTC in normal operation."

5. Response:

The JAF analysis for the replacement RSST's with the OLTC in service has been analyzed to a 115kV grid voltage of 106.8kV. This analyzed voltage is lower than the Transmission Owner lower voltage of 109.25kV (115±5%) and as such the OLTC will maintain the bus voltage at the OLTC microcontroller setting provided the 115kV bus voltage is above the analyzed voltage.

a. The transient voltage bus profiles for this scenario are not available.

Responses to Request for Additional Information Questions

b. The transient voltage profile of the 4kV buses resulting from a transfer of non-safety related loads from the Normal Station Service Transformer to the replacement Reserve Station Service Transformer and the sequencing of ECCS loads with the OLTC is in an automatic mode of operation. It is provided on the attached Transient Stability Analysis plot labeled "JAF-CALC-11-00002 Attachment 6 Page 103" in Enclosure 5.

c. The transient voltage bus profiles for this scenario are not available.

d. The transient voltage profile of the 4kV buses resulting from a transfer of non-safety related loads from the Normal Station Service Transformer to the replacement Reserve Station Service Transformer due to a turbine trip or generator trip, while the OLTC is in an automatic mode of operation is provided on the attached Transient Stability Analysis plot labeled "JAF-CALC-11-00002 Attachment 6 Page 1" in Enclosure 6.

6. Question:

"Provide a discussion of the power and control voltage sources for operation of the OLTC, and primary and backup microcontrollers. Also, confirm the location of primary and backup microcontrollers, and the locations where an Operator can locally and remotely control the OLTC's, if needed."

6. Response:

The primary microcontroller and backup microcontroller are fed from the potential transformers which are connected to the RSST transformers "Y" low voltage winding (Reference: Drawings supplied in response to Question 2). The power for RSST 71T-2 OLTC is fed from non-safety related motor control center 71MCC-341 compartment BF2 and the power for RSST 71T-3 OLTC is fed from non-safety related motor control center 71MCC-331 compartment CF2. The motor control centers which feed the RSST's OLTC's are normally fed from the Normal Station Service Transformer (NSST) 71T-4. Upon transfer of plant loads to the RSST's these motor control centers will be supplied power from the RSST's. (Note: The selection of the RSST automatic microcontroller settings does not require operation during the time interval of a transfer of loads from the NSST to the RSST's.)

The primary microcontroller and backup microcontroller are located at the RSST's. The Operator has the ability to place the OLTC in manual / automatic control and manually raise / lower the tap setting at the RSST's or in the Control Room from the 09-8 panel.

7. Question:

In the LAR, Attachment 1, Page No. 9, the following is stated: "The 4400V used in Figure 1 is 110% of the voltage rating of the safety-related motors fed from the bus, consistent with ANSI/NEMA Standard MG-1-2009, Revision 1-2010, "Motors and Generators."

Responses to Request for Additional Information Questions

The staff finds that in Figure 1, the nominal voltage shown in Figure 1 is 4441.5V instead of 4400V. Please provide an explanation for this discrepancy.

7. **Response:**

The Reserve Station Service Transformers are normally in the energized unloaded condition. In this configuration the electrical buses and loads are not fed from the Reserve Station Service Transformers; however, the transformers and electrical non-segregated phase buses are energized and controlled between 4259.5V and 4476.5V (see revised Figure 1 and 2 below), with the microcontroller OLTC Pre Transfer nominal setting of 4368V. The Reserve Station Service Transformers are rated for 4,800V and the electrical non-segregated phase bus is rated for 5,000V; as such the electrical equipment is designed for the applied voltage.

The following changes are provided to the submittal:

- JAF-11-0102 Attachment 1 page 4 of 20, replace "Figure 1 Typical Pre Transfer Voltage Control and Limit Bands" with the following:

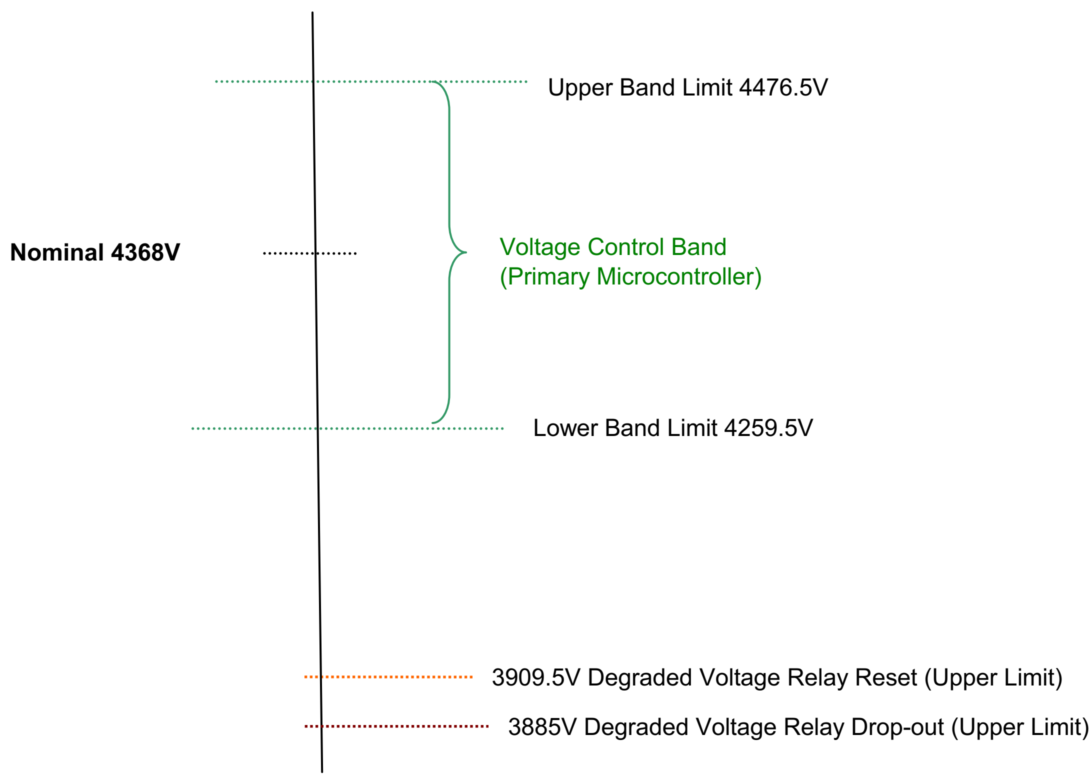

Figure 1 Typical Pre Transfer Voltage Control and Limit Bands

Responses to Request for Additional Information Questions

- JAF-11-0102 Attachment 1 page 5 of 20, replace "Figure 1 Typical Voltage Control and Limit Bands" with the following:

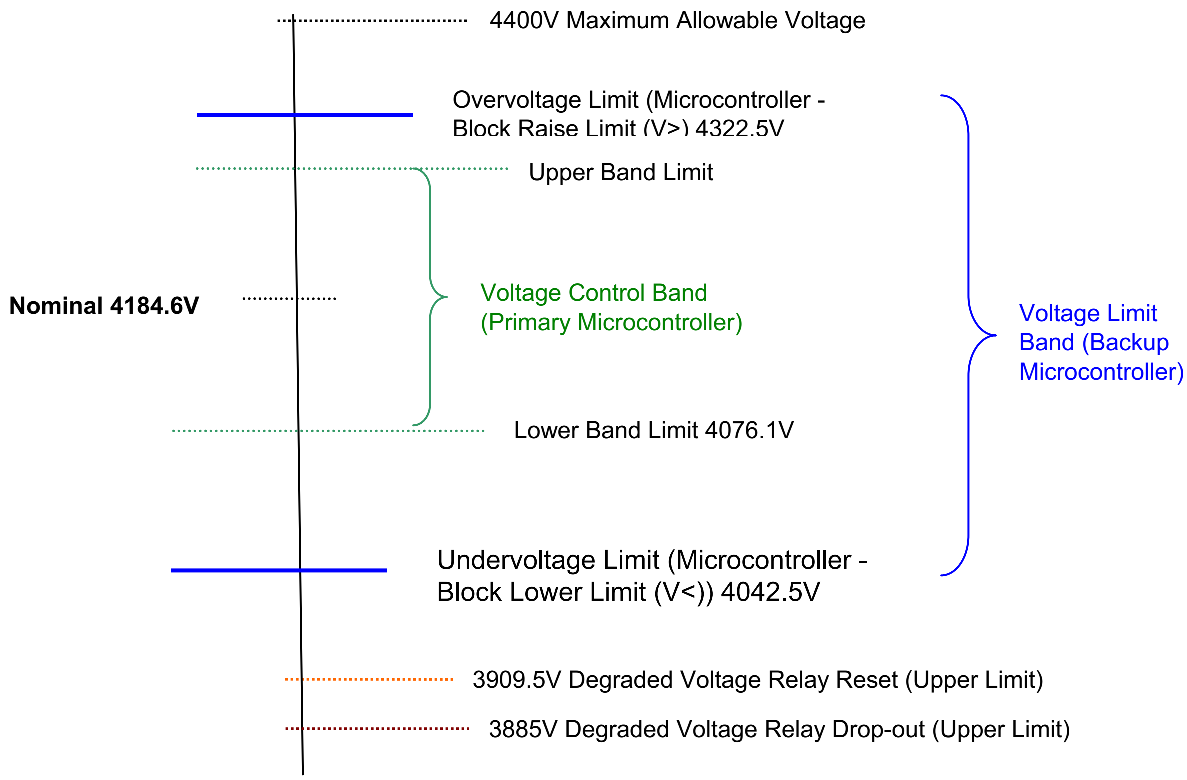

Figure 2 Typical Post Transfer Control and Limit Bands

- JAF-11-0102 Attachment 1 Page 6 of 20 change:

  From: "The OLTC will provide a range of -10% to +10% of the rated secondary voltage in 16 step increments, each step being 1.25% of rated secondary voltage. By providing automatic adjustment of the voltage to the auxiliary power system from the offsite 115kV system, the RSST OLTC's will compensate for a wide range of 115kV (110kV – 121kV) system operating voltages."

  To: "The OLTC will provide a range of -10% to +10% of the rated secondary voltage in 16 step increments, each step being 1.25% of rated secondary voltage. By providing automatic adjustment of the voltage to the auxiliary power system from the offsite 115kV system, the RSST OLTC's will compensate for a wide range of 115kV (109.25kV – 120.75V) system operating voltages.

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Enclosure 2

Draft UFSAR Changes
(Figures and Text)
(7 Pages)

T2 & T3 -15/20/25 MVA (65 C), 115-4.16-4.16 kV, 3 PH, 60 CY, ONAN/ONAF1/ONAF2, 65 C Rise
H Winding - 15/20/25 MVA
X Winding - 5/6.66/8.33 MVA
Y Winding - 10/13.33/16.66 MVA

EC 12703

DELETE

GENERATORS

G1-981.4 MVA, 0.9 PF, 0.58 SCR 24 KV, 1800 RPM, 3 PH, 60 CY, 60 PSI H.
EDGA, EDGB, EDGC, EDGD DIESEL DRIVEN

TRANSFORMERS

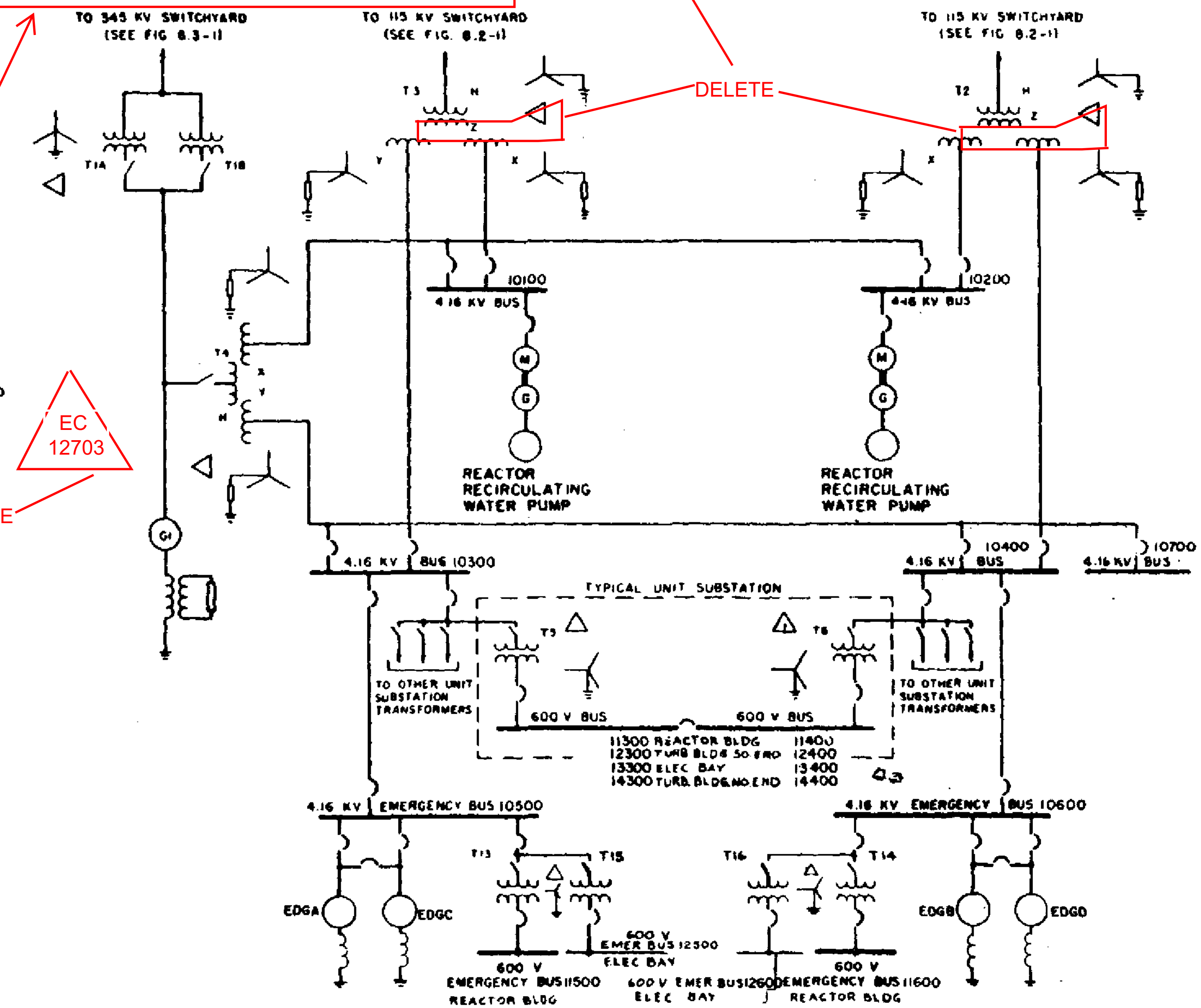
T1A & T1B - 445 MVA (55C), 22.8 - 345 KV, 3 PH, 60 CY, FOA, 55/65 C RISE
T4 - 24/32/40 MVA (55C), 22.8 - 4.16 - 4.16 KV, 3 PH, 60 CY, OA/FA/FOA, 55/65C RISE, LTC
H WINDING - 24/32/40 MVA
X WINDING - 8/10.7/13.3 MVA
Y WINDING - 16/21.3/26.7 MVA
T2 & T3 - 12/16/20 MVA (55 C), 115 - 4.16 - 4.16 KV, 3 PH, 60 CY, OA/FA/FOA, 55/65 C RISE
H WINDING - 12/16/20 MVA
X WINDING - 4/5.3/6.7 MVA
Y WINDING - 8/10.7/13.3 MVA
Z WINDING - UNLOADED TERTIARY
T-5 & T-13 - 1000KVA, 4160 - 600V, 3PH, 60CY
T-6 THRU T-12, T-14, T-15, T-16 - 1000/1333 KVA, 4160-600Y, 3PH, 60CY

BUS

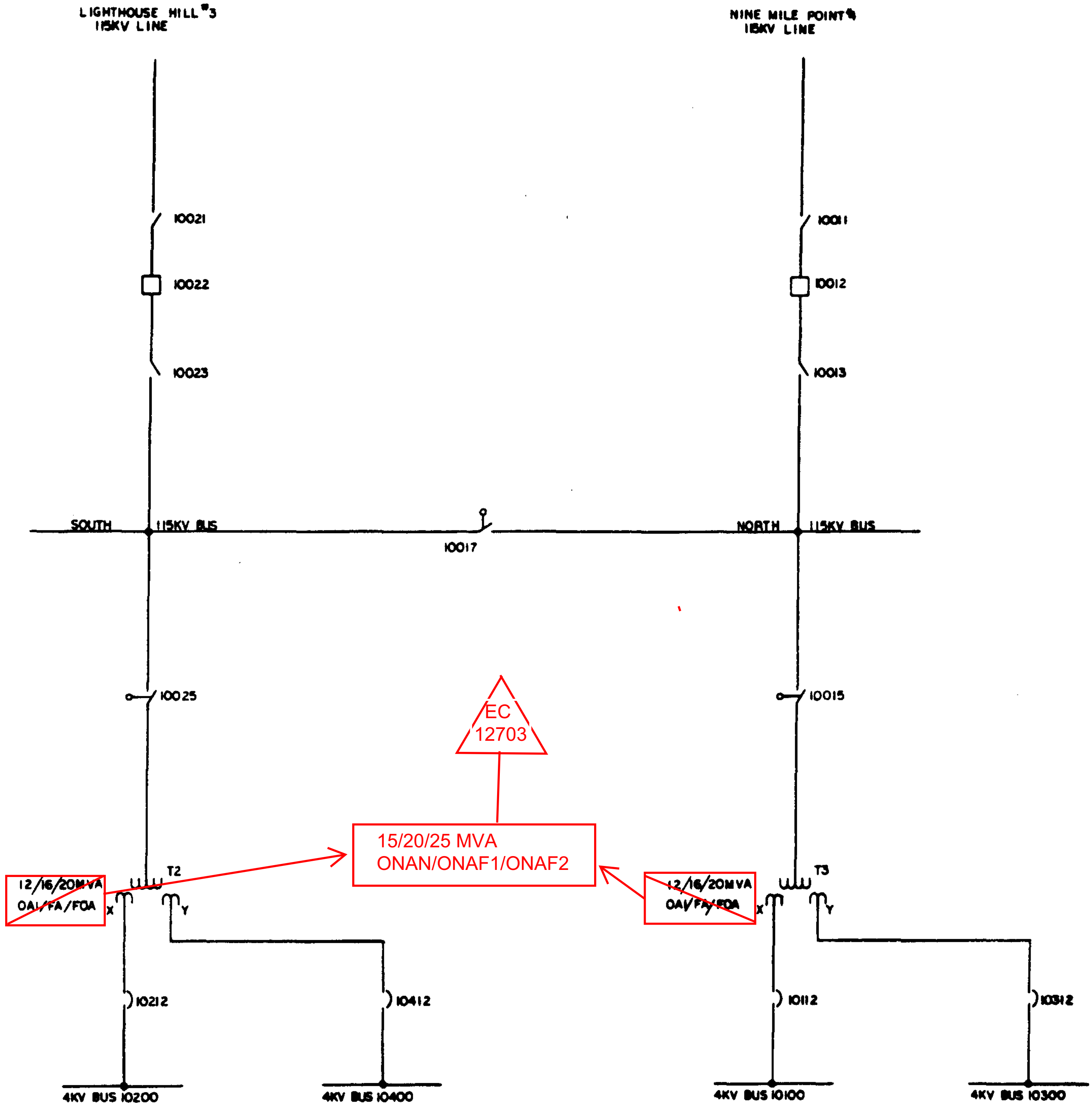
GENERATOR LEADS - ISOLATED PHASE 24000 AMP FORCED COOLED
STATION SERVICE TRANSFORMERS SECONDARY LEADS NON-SEGREGATED PHASE, 5 KV, 1200, 2000 & 4000 AMP.

AUXILIARIES

4.16 KV BUS 10100
1 REACTOR CIRCULATION PUMP A
4.16 KV BUS 10200
1 REACTOR CIRCULATION PUMP B
4.16 KV BUS 10300
1 CIRCULATING WATER PUMP A
1 CONDENSATE PUMP A
1 CONDENSATE BOOSTER PUMP A
1 SERVICE WATER PUMP A
1 TURBINE CLOSED LOOP COOL WATER PUMP A
4 600 V UNIT SUBSTATIONS
1 AIR REMOVAL VAC PUMP A
4.16 KV BUS 10400
1 CIRCULATING WATER PUMP B
1 CONDENSATE PUMP B
1 CONDENSATE BOOSTER PUMP B
1 SERVICE WATER PUMP B
1 TURBINE CLOSED LOOP COOL WATER PUMP B
4-600V UNIT SUBSTATIONS
1 AIR REMOVAL VAC PUMP B
4.16 KV BUS 10500
1 CORE SPRAY PUMP A
2 RHR SERVICE WATER PUMPS A & C
2 RHR PUMPS A & C
2 600 V UNIT SUBSTATIONS
4.16 KV BUS 10600
1 CORE SPRAY PUMP B
2 RHR SERVICE WATER PUMPS B/D
2 RHR PUMPS B & D
2 600 V UNIT SUBSTATIONS
4.16 KV BUS 10700
1 CONDENSATE PUMP C
1 CONDENSATE BOOSTER PUMP C
1 SERVICE WATER PUMP C
1 CIRCULATING WATER PUMP C
1 TURBINE CLOSED LOOP COOL WATER PUMP C



JAMES A. FITZPATRICK	FSAR UPDATE
PLANT ELECTRICAL DIAGRAM	
REV. 3 MAY 1997	FIGURE NO 8.2-1



JAMES A. FITZPATRICK	FSAR UPDATE
ONE LINE DIAGRAM 115 Kv SWITCHYARD	
REV. 0 JULY, 1982	FIGURE NO. 8.3-4

Reserve station service transformer T2 high voltage winding is connected to the 115 kV bus through an underground low pressure oil filled cable; reserve station service transformer T3 high voltage winding is connected to the 115 kV bus through an overhead transmission line.

[oil natural air natural/oil natural air forced/oil natural air forced cooled]

Each of the ~~self-cooled/forced air cooled/forced oil-forced air cooled~~ reserve station service transformers is rated at ~~12/16/20 MVA, 55 C temperature rise, 22.4 MVA 65 C~~ temperature rise. The high voltage windings are rated ~~116 kV,~~ 450 kV BIL and are wye connected with solidly grounded neutrals; the two low voltage windings, X or Y, are each rated 4160 V ~~75 kV~~ BIL and are wye connected with resistance grounded neutrals~~,~~ ~~the tertiary winding is Z and is unloaded.~~

[115 kV] [110 kV] [15/20/25 MVA, 65 C]

The low voltage windings of the reserve transformers supply 4160 V reserve power through an enclosed nonsegregated bus duct to the plant service AC distribution buses as follows:

TransformerT2	AC Distribution Bus
"X"winding	10200
"Y"winding	10400

TransformerT3	AC Distribution Bus
"X"winding	10100
"Y"winding	10300

[EC 12703]

[The low voltage Y winding is equipped with a load tap changer.]

8.4.2.5 Safety Evaluation

The lines connecting the reserve station service transformers to the 115 kV bus are arranged so that a failure of either line does not result in the loss of the other line. The overhead line to reserve station service transformer T3 is designed to equal or exceed the requirements of the 115 kV incoming transmission lines. The line to reserve station service transformer T2 is underground. The underground line is not subjected to the surface conditions which affect the overhead line.

The overhead and underground lines are each capable of continuously carrying full capacity of their respective reserve station service transformers.

The transformers are located approximately 153 ft apart and are further protected by fire walls.

The secondary leads from each transformer consist of a non-segregated phase bus duct.

Each transformer and its high and low voltage connections are capable of starting and supplying all loads on its associated emergency service bus of the Plant Service AC Power Distribution System.

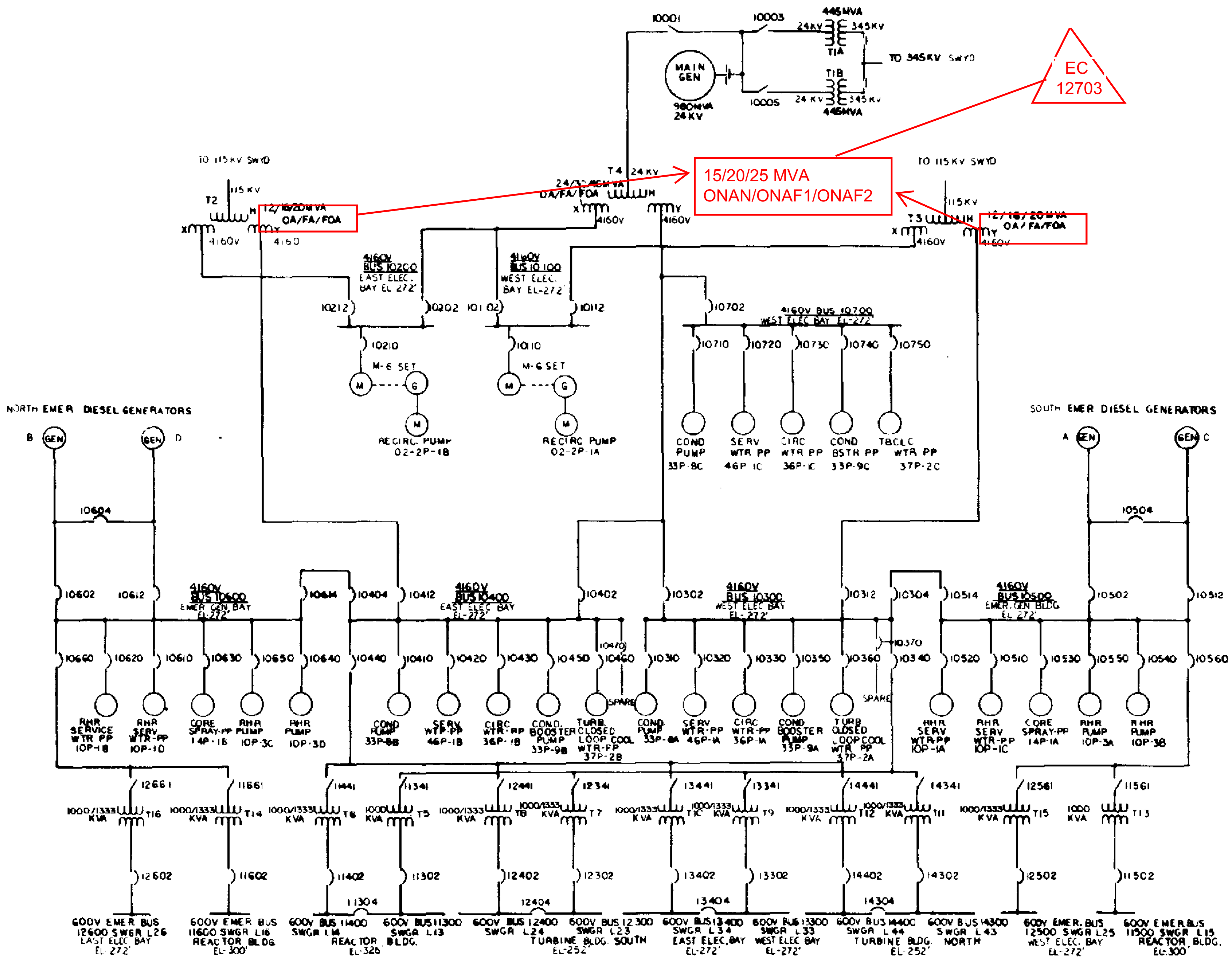
In the event that the normal AC power source is lost, the reserve AC power sources are automatically connected to the Plant Service AC Power Distribution System as described in Section 8.5.

Monitoring and indicating devices are provided in the Control Room to permit supervision of the operational status of the reserve AC power source.

8.4.2.6 Inspection and Testing

Inspection and testing at vendor facilities and initial system tests were conducted to ensure that all components are operational within their design ratings.

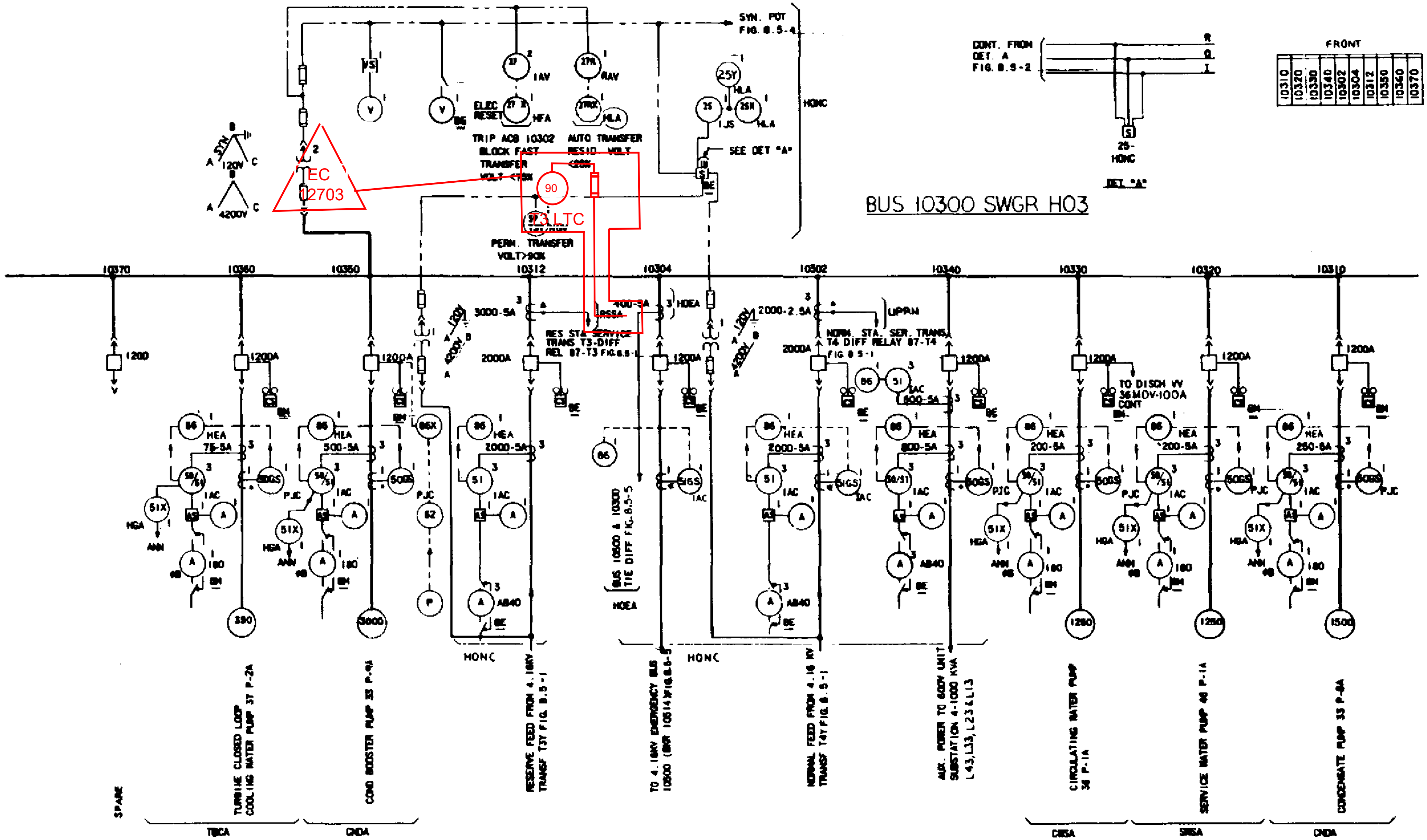
The system and its components are tested throughout plant life in accordance with plant operating procedures.



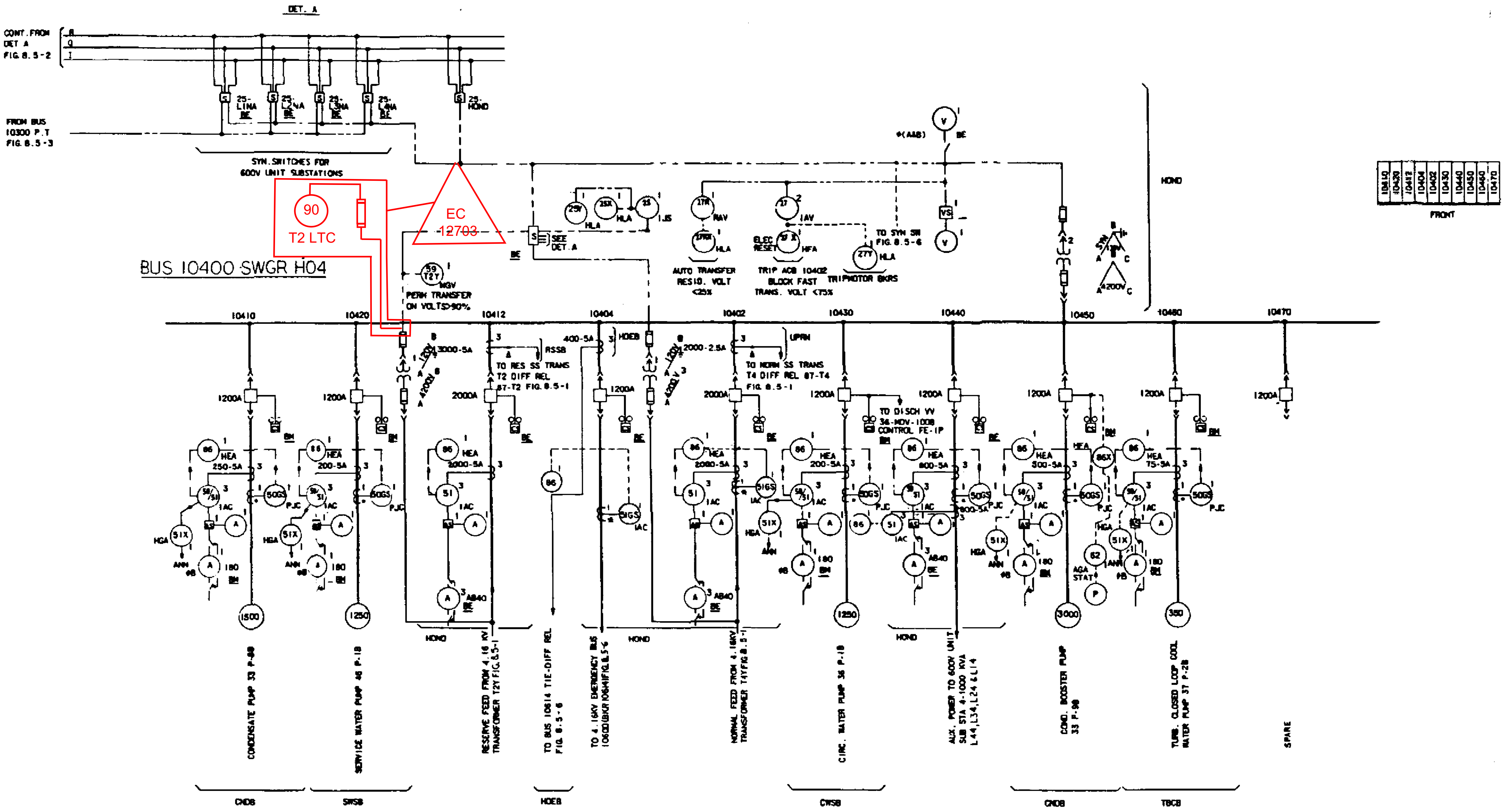
JAMES A. FITZPATRICK **FSAR UPDATE**

ONE LINE DIAGRAM PLANT SERVICE A-C POWER DISTRIBUTION

REV. 2	JULY, 1995	FIGURE NO. 8.5-1



JAMES A. FITZPATRICK	FSAR UPDATE
4160 V ONE LINE DIAGRAM, BUS 10300	
REV 0 JULY, 1982	FIGURE NO. 8.5-3



JAMES A. FITZPATRICK FSAR UPDATE

4160 V ONE LINE DIAGRAM, BUS 10400

REV. 0 | JULY, 1982 | FIGURE NO. 8.5-4

b. EHV Grid System Voltages

The normal operating range of the 345 kV grid system is between a minimum of 345 kV and a maximum of 370 kV. If the 345 kV system voltage should decay to a minimum of 323 kV, undervoltage tripping and system load shedding are initiated by the system dispatcher to maintain the system voltage above this minimum. If the 345 kV system voltage should operate above 370 kV, Control Room operators will notify the appropriate power grid control dispatchers to reduce the grid voltage below 370 kV.

The normal operating range of the 115 kV system at the JAF switchyard bus is between a minimum of 117 kV and a maximum of 122 kV. The minimum voltage on the 115 kV bus that is expected at anytime is 116 kV, however, for conservatism a condition of 115 kV minimum voltage on the 115 kV bus was considered.

With a 115 kV system bus voltage of 117 kV, the voltage on the 4160 V emergency buses is 4143 V and 577 V at the 600 V emergency load center buses at normal load. A system voltage of 122 kV produces 4333 V at the 4160 V emergency buses and 605 V at the 600 V emergency load center buses at normal load.

c. Emergency Bus Voltages When Operating From the Reserve Source

Computer studies have been performed to calculate the voltages at the 4160 V and 600 V emergency buses for the full range of the 115 kV switchyard bus voltages taken in conjunction with the existing transformer tap settings and normal load, no load, and full load emergency bus and normal conditions. The voltage profiles at the emergency buses are shown in Figure 8.6-1 and are bounding for application of the load tap changer. A summary of results for the significant conditions is shown below:

EC 12703

1. Normal operating range maximum on the 115 kV switchyard bus of 122 kV and no load on the reserve station service transformer and load center transformers.

   a. 4160 V emergency bus voltage is 4472 V (107.5 percent of nominal)

   b. 600 V emergency bus voltage is 634.5 V (105.75 percent of nominal)

2. Normal operating range minimum on the 115 kV switchyard bus of 117 kV and full load on the reserve station service transformers and load center transformers.

   a. 4160 V emergency bus voltage is 4067 V (97.76 percent of nominal)

   b. 600 V emergency bus voltage is 553 V (92.17 percent of nominal)

The reserve station service transformers are provided with a load tap changer on the low voltage Y winding with 8 steps above and 8 steps below 4.16 kV for a range of ±10 percent.

A no load tap changer is provided on the high voltage H winding with 2 steps above and 2 steps below 115 kV for a range of ±5%. The taps will remain at a fixed position.

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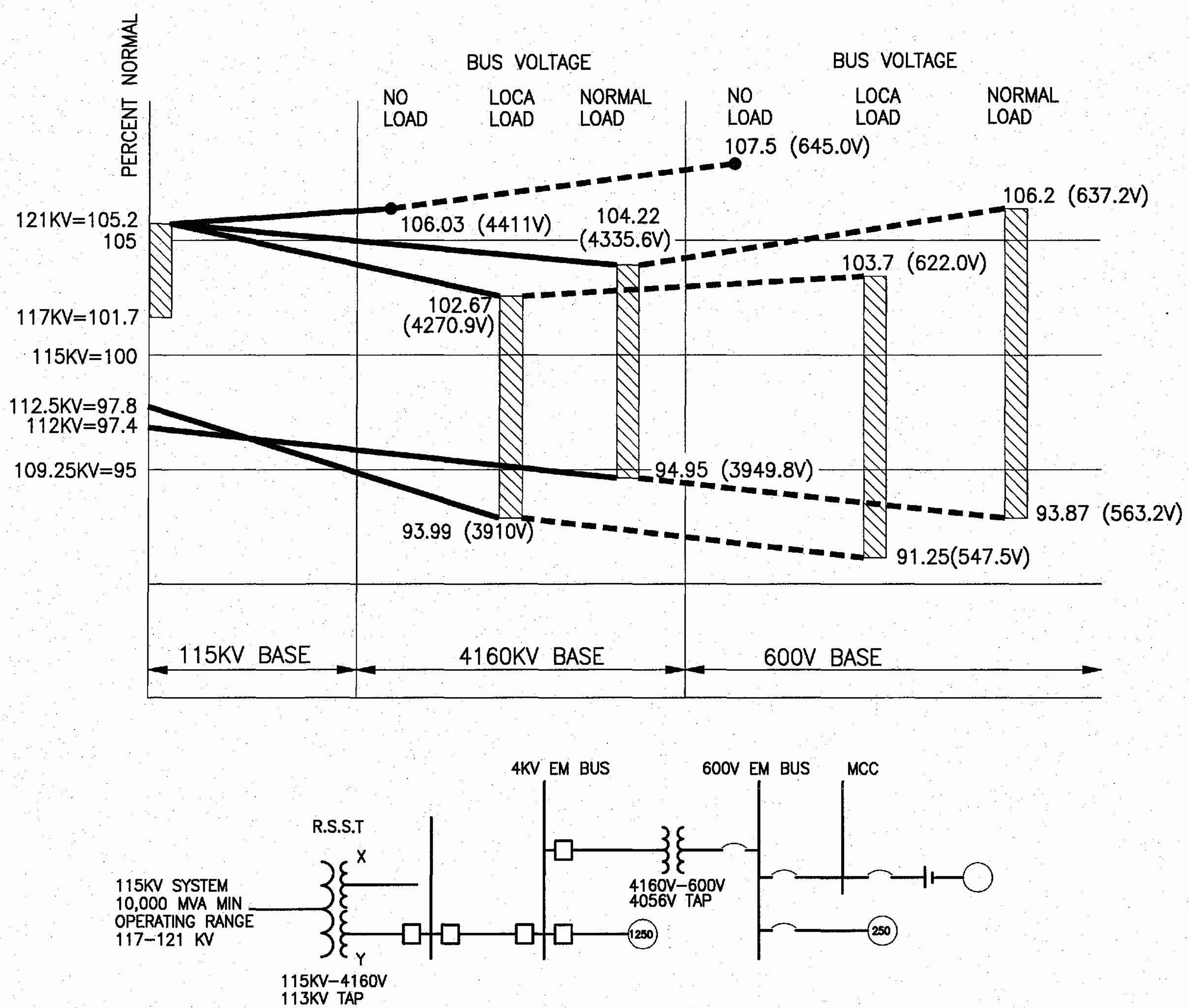
Enclosure 3

Draft UFSAR Text, Figure and Table Changes
(6 Pages)

VOLTAGE PROFILE – ESSENTIAL BUSES – EXISTING TRANSFORMER TAP SETTINGS



JAMES A. FITZPATRICK	FSAR UPDATE
VOLTAGE PROFILE - ESSENTIAL BUSES	
REV. 4 DEC, 2011	FIGURE NO. 8.6-1

b. EHV Grid System Voltages

The normal operating range of the 345 kV grid system is between a minimum of 345 kV and a maximum of 370 kV. If the 345 kV system voltage should decay to a minimum of 323 kV, undervoltage tripping and system load shedding are initiated by the system dispatcher to maintain the system voltage above this minimum. If the 345 kV system voltage should operate above 370 kV, Control Room operators will notify the appropriate power grid control dispatchers to reduce the grid voltage below 370 kV.

The normal operating range of the 115 kV system at the JAF switchyard bus is between a minimum of 117 kV and a maximum of 122 kV. The minimum voltage on the 115 kV bus that is expected at anytime is 116 kV, however, for conservatism a condition of 115 kV minimum voltage on the 115 kV bus was considered.

With a 115 kV system bus voltage of 117 kV, the voltage on the 4160 V emergency buses is 4143 V and 577 V at the 600 V emergency load center buses at normal load. A system voltage of 122 kV produces 4333 V at the 4160 V emergency buses and 605 V at the 600 V emergency load center buses at normal load.

c. Emergency Bus Voltages When Operating From the Reserve Source

Computer studies have been performed to calculate the voltages at the 4160 V and 600 V emergency buses for the full range of the 115 kV switchyard bus voltages taken in conjunction with the existing transformer tap settings and normal load, no load, and full load emergency bus and normal conditions. The voltage profiles at the emergency buses are shown in Figure 8.6-1. A summary of results for the significant conditions is shown below:

1. Normal operating range maximum on the 115 kV switchyard bus of 122 kV and no load on the reserve station service transformer and load center transformers.
   a. 4160 V emergency bus voltage is 4472 V (107.5 percent of nominal)
   b. 600 V emergency bus voltage is 634.5 V (105.75 percent of nominal)
2. Normal operating range minimum on the 115 kV switchyard bus of 117 kV and full load on the reserve station service transformers and load center transformers.
   a. 4160 V emergency bus voltage is 4067 V (97.76 percent of nominal)
   b. 600 V emergency bus voltage is 553 V (92.17 percent of nominal)

3. Minimum voltage on the 115 kV bus of ~~125~~ 112 kV and ~~full load~~ normal load (winter) on the reserve station service transformers and load center transformers.

   a. 4160 V emergency bus is ~~3987~~ 3949.8 V (~~95.84~~ 94.95 percent of nominal).

   b. 600 V emergency bus voltage is ~~642~~ 563.2 V (~~90.17~~ 93.87 percent of nominal).

4. Maximum voltage on the 115KV bus of 121 KV and normal load (summer) on the reserve station service transformers and load center transformers.

   a. 4160 V emergency bus is 4335.6 V (104.22 percent of nominal)

   b. 600 V emergency bus is 637.2V (106.2 percent of nominal)

Calculations were performed to establish the worst case voltage level at the safety related load terminals, when starting the non-safety related load producing the largest voltage drops throughout the plant electrical distribution system. The calculations assumed full load on the plant electrical buses with the offsite power supply grid at its lowest voltage of 115 kV. It was found that the worst case occurred while starting one 3000 hp condensate booster pump at the 4000 V level. The starting of one of the 7000 hp Recirculation Pump M-G sets results in a lesser disturbance since these loads are fed from separate windings in the reserve transformers.

The resulting values of load terminal voltages found as described above, are shown in Figure 8.6-2.

d. Emergency Bus Voltages When Operating From the Normal Source

The normal station service transformer is provided with a load tap changer with 16 steps above and 16 steps below 22.8 kV for a range of ± 10 percent. The taps are changed by use of remote manual control in the Control Room. As the main generator voltage changes in response to changes in grid voltage and generator loading, the operator changes transformer taps to maintain a voltage of 4160 V, and as a result voltages at the 600 V emergency buses will also be satisfactory.

For any voltage in the normal operating range (370 to 345 kV) of the 345 kV grid system, or with the voltage at the degraded condition of 323 kV where load shedding begins to occur (rather than generator trip), the voltage at the normal station service transformer primary will remain within the range of the load tap changer.

e. Set Point and Location of Loss of Voltage Trip Sensors

The loss of offsite power (loss of voltage trip) relays sense the voltage at the 4160 V emergency buses. The devices which are used to detect and alarm an undervoltage condition, initiate starting of the emergency diesel generators, isolate the bus from the normal and reserve supply, initiate bus load shedding, permit closure of the emergency diesel generator breakers, and initiate the program restart circuit, are located in the instrument and breaker control compartments of the 4160 V emergency bus

Setting of the degraded grid relay is very critical to the protection scheme. Analyses show that the 600 V bus must be maintained at 90 percent of nominal at 600 V load center bus to ensure proper operation of 600 V loads, 600 V MCC control circuits and control circuits fed from 120 V AC emergency buses. To maintain this voltage at the 600 V level, a minimum voltage of 92 percent of nominal is required on 4160 V emergency buses. Adding instrument inaccuracies to this value, the drop-out setting of the relay is determined to be 93 percent of nominal. The pick-up setting of the relay was selected to be 93.64 percent of the nominal, which is 0.64 percent over the drop-out setting.

The maximum allowable time delay setting for degraded voltage protection, coincident with a LOCA condition is approximately 9 seconds. The maximum allowable time delay setting for extended degraded voltage protection during a non-LOCA condition is approximately 45 seconds. Time delay settings do not exceed the maximum time delay that is assumed in the FSAR accident analysis and will provide protection of the safety related loads from thermal damage or tripping of protective devices due to degraded voltage. These time delays will allow for recovery of bus voltage from voltage drops caused by the starting of large motors during normal operation, from the transfer of house loads during start-up and by the sequence starting of ECCS pump motors during an accident condition.

g. Degraded Grid Voltage at Loss-of-Voltage Trip Setting

~~The maximum voltage on the 115 kV system is 122 kV. At no load, this corresponds to a voltage of 4472 V and 634.5 V at the 4160 V and 600 V emergency buses.~~ The undervoltage trip set point of 71.5 percent on the 4160 V emergency bus and the corresponding voltage on the 115 kV system would be approximately 88 kV.

h. Voltage Ranges of Electrical Equipment

The 4000 V RHR and core spray pump motors will start and accelerate at 75 percent and 70 percent voltage respectively. Other 4000 V and 600 V load center motors will start and accelerate at 70 percent to 80 percent rated voltage. The breaker control circuits for the 4160 V bus and 600 V load center bus loads are supplied by the station batteries and are independent of grid voltage.

TABLE 8.6-1
(Sheet 1 of 2)

AUTOMATIC STARTING AND SEQUENTIAL LOADING OF EMERGENCY AC POWER SOURCE LOSS OF VOLTAGE DEGRADED VOLTAGE COINCIDENT WITH POSTULATED ACCIDENT OR EXTENDED DEGRADED VOLTAGE OF BOTH NORMAL AND RESERVE POWER SOURCES TYPICAL FOR EACH OF TWO REDUNDANT AC POWER SOURCES

Event	Elapsed Time (Sec.)	Load, KW	Remarks
Coincident undervoltage condition of normal and reserve power supplies to 4160 V emergency bus and postulated accident or extended undervoltage condition of normal and reserve power supplies to 4160V Emergency Bus.			
Initiate starting diesel generators	0	----	
Emergency bus undervoltage condition is still present Emergency diesel generators up to speed and voltage. Normal/reserve source tie breakers and all feeder except supply to 600 V emergency busses tripped open.	----	----	
Generator breakers closed	11 (14 [3])	1775[7]	Worst case load centers load assumed, including load center transformers' losses
Start first RHR pump (1060) hp	12 (15 [3])	961 [4]	Approximately one second after restoration of bus voltage
First RHR pump at speed Start second RHR pump (1060 hp)[1]	17 (20 [3])	961 [4]	
Second RHR pump at speed Start core spray pump (1250 hp)[1&2]	22	1017 [4]	
Core spray pump at speed	27 (30 [3])		This completes automatic start sequence
Total Automatic Loading	***@60 Hz, 4.16 kV***	***4714***	
	@61.2 Hz, 4.4 kV[5, 6]	***5026***	
Begin manual sequence	600		
Manually stop one RHR pump		961 [4]	

TABLE 8.6-1
(Sheet 2 of 2)

Event	Elapsed Time (Sec.)	Load, KW	Remarks
Manually start 2 RHR service+ water pumps (2 at 350 hp)		582	
Manual Loading Total @ 60 Hz, 4.16 kV		***4335***	
@ 61.2 and 4.4 kV (5, 6)		***4683***	
Additional loads may be added manually within capacity of the emergency AC power source.			

(1) This RHR pump will not be started should one machine of the emergency AC power source experience a malfunction.

(2) If only one EDG is automatically sequenced onto an emergency bus, the single EDG may be overloaded beyond its capability to supply load.

(3) If only a single EDG is automatically sequenced onto an emergency bus, a 3-second time delay is added to the sequence time. However, no analytical credit for accident mitigation is taken for loads on a bus in this scenario.

(4) The pump load values are worst case loading under run-out condition.

(5) If EDG is running with the maximum Technical Specification value of 61.2 Hz, then the rotating equipment, such as pump, loads will increase loading on the EDG approximately up to 6%.

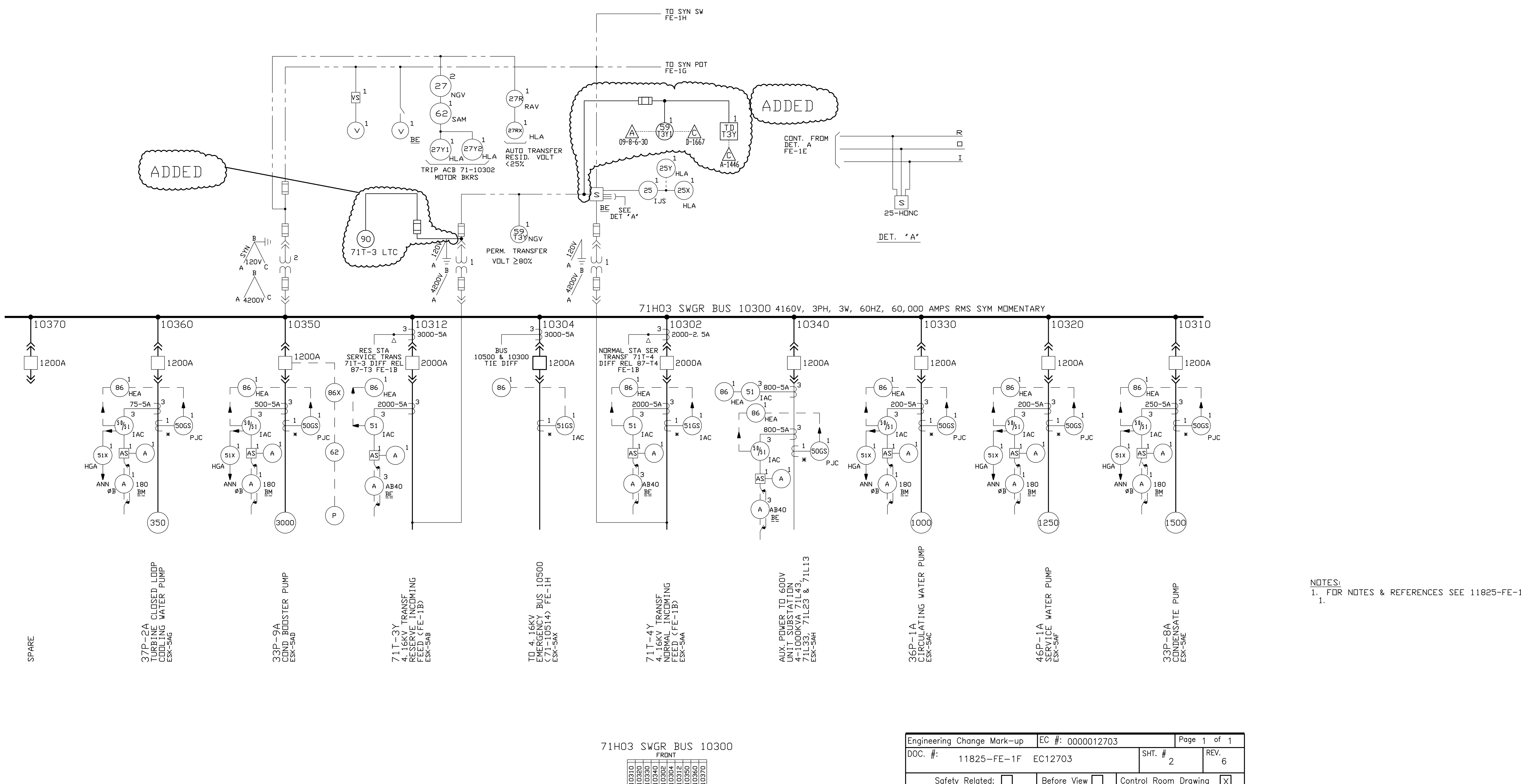
(6) If EDG is running with the maximum Technical Specification value at 4400 volts, then the static loads, such as heaters will increase loading on the EDG approximately up to 11.9%.

(7) For additional margin, 2% loading is added.

JAFP-12-0032

Enclosure 4

Modification Drawings for Replacement RSST's
(4 Pages)



NOTES:
1. FOR NOTES & REFERENCES SEE 11825-FE-1E

Engineering Change Mark-up	EC #: 0000012703	Page 1 of 1
DOC. #: 11825-FE-1F EC12703	SHT. # 2	REV. 6
Safety Related: ☐	Before View ☐	Control Room Drawing ☒
Supersedes Mark-up from EC #: N/A		Issued per ECN #: N/A
VG (S&L) Prepared By:	12/15/09 Date	N OBRADOVIC 12/15/09 (S&L) Reviewer Name (Optional)

Engineering Change Mark-up	EC #: 12703, REV.01	Page 1 of 1
DOC. #: 11825-FE-1F EC12703	SHT. # 2	REV. 6
Safety Related: ☐	Before View ☐	Control Room Drawing ☒
Supersedes Mark-up from EC #: 12703, REV.00		Issued per ECN #: N/A
Prepared By:	Date	Reviewer Name (Optional)

Q. A. CAT. II/III

REV	DESCRIPTION	DATE	BY	CHK'D	APP.
7	INCORPORATED EC 26116	1/26/11	RVB	KB	SK

REVISIONS

REV NO	DATE	DESCRIPTION	DWN / CHK	DS	DE / DM	PROJ APP
6	08-13-91	THIS DRAWING IS REDRAWN & INCORPORATES INFORMATION SHOWN ON OP 46A-1	VS / BP	–	– / AE	–
5	5/24/90	DOCUMENT ELECTRONICALLY CONVERTED	SP / JG	–	– / AE	–

REVISIONS

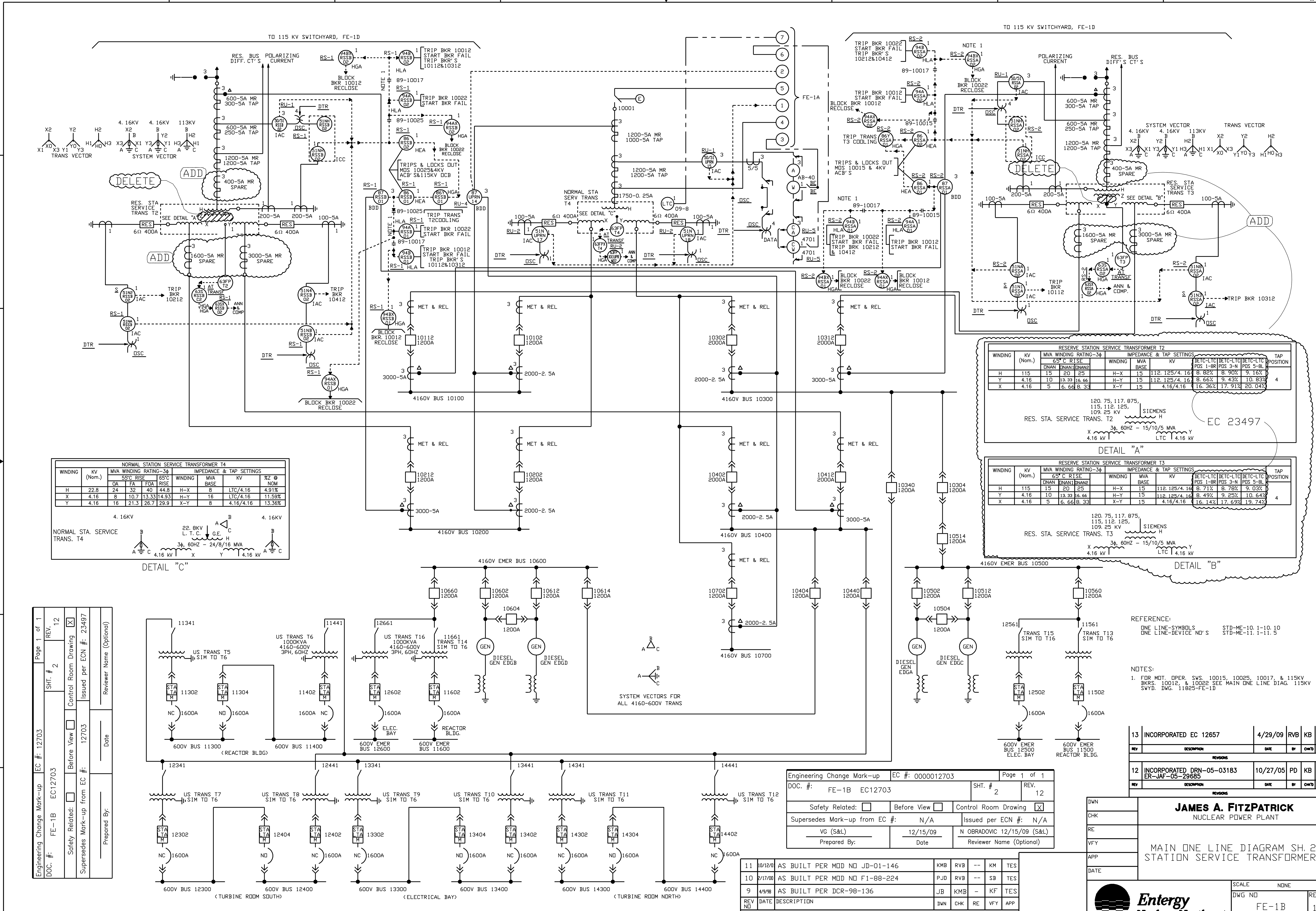
DWN | CHK'D
DES SUPV
DISCIPLINE ENG
DISCIPLINE MGR
PROJ APPROVAL
DATE

James A. Fitzpatrick
NUCLEAR POWER PLANT

4160V ONE LINE DIAGRAM
SH. 2 BUS 10300

Entergy Nuclear Northeast

SCALE NONE
DWG NO FE-1F
REV 7
SHEET OF
FIG. OP-46A-1



RESERVE STATION SERVICE TRANSFORMER T2											
WINDING	KV (Nom.)	MVA WINDING RATING-3φ 65° C RISE ONAN	ONAN1	ONAN2	IMPEDANCE & TAP SETTINGS WINDING	MVA BASE	KV	DETC-LTC POS 1-8R	DETC-LTC POS 3-N	DETC-LTC POS 5-8L	TAP POSITION
H	115	15	20	25	H-X	15	112.125/4.16	8.82%	8.90%	9.16%	
Y	4.16	10	13.33	16.66	H-Y	15	112.125/4.16	8.66%	9.43%	10.83%	4
X	4.16	5	6.66	8.33	X-Y	15	4.16/4.16	16.36%	17.91%	20.04%	

120.75, 117.875, 115, 112.125, 109.25 KV SIEMENS H
RES. STA. SERVICE TRANS. T2
3φ, 60HZ – 15/10/5 MVA
X 4.16 kV — LTC Y 4.16 kV

EC 23497

DETAIL "A"

RESERVE STATION SERVICE TRANSFORMER T3											
WINDING	KV (Nom.)	MVA WINDING RATING-3φ 65° C RISE ONAN	ONAN1	ONAN2	IMPEDANCE & TAP SETTINGS WINDING	MVA BASE	KV	DETC-LTC POS 1-8R	DETC-LTC POS 3-N	DETC-LTC POS 5-8L	TAP POSITION
H	115	15	20	25	H-X	15	112.125/4.16	8.71%	8.78%	9.03%	
Y	4.16	10	13.33	16.66	H-Y	15	112.125/4.16	8.49%	9.25%	10.64%	4
X	4.16	5	6.66	8.33	X-Y	15	4.16/4.16	16.14%	17.69%	19.74%	

120.75, 117.875, 115, 112.125, 109.25 KV SIEMENS H
RES. STA. SERVICE TRANS. T3
3φ, 60HZ – 15/10/5 MVA
X 4.16 kV — LTC Y 4.16 kV

DETAIL "B"

NORMAL STATION SERVICE TRANSFORMER T4									
WINDING	KV (Nom.)	MVA WINDING RATING-3φ 55°C RISE OA	FA	FOA	65°C RISE	IMPEDANCE & TAP SETTINGS WINDING	MVA BASE	KV	%Z @ NOM
H	22.8	24	32	40	44.8	H-X	8	LTC/4.16	4.91%
X	4.16	8	10.7	13.33	14.93	H-Y	16	LTC/4.16	11.59%
Y	4.16	16	21.3	26.7	29.9	X-Y	8	4.16/4.16	13.36%

NORMAL STA. SERVICE TRANS. T4
4.16KV 22.8KV L.T.C. G.E. H 4.16KV
3φ, 60HZ – 24/8/16 MVA
4.16 kV X Y 4.16 kV

DETAIL "C"

REFERENCE:
ONE LINE-SYMBOLS STD-ME-10.1-10.10
ONE LINE-DEVICE NO'S STD-ME-11.1-11.5

NOTES:
1. FOR MOT. OPER. SWS. 10015, 10025, 10017, & 115KV BKRS. 10012, & 10022 SEE MAIN ONE LINE DIAG. 115KV SWYD. DWG. 11825-FE-1D

Engineering Change Mark-up	EC #: 0000012703	Page 1 of 1	
DOC. #: FE-1B EC12703		SHT. #: 2	REV. 12
Safety Related: ☐	Before View ☐	Control Room Drawing ☒	
Supersedes Mark-up from EC #: N/A		Issued per ECN #: N/A	
VG (S&L) Prepared By:	12/15/09 Date	N OBRADOVIC 12/15/09 (S&L) Reviewer Name (Optional)	

Engineering Change Mark-up	EC #: 12703	Page 1 of 1
DOC. #: FE-1B EC12703	SHT. #: 2	REV. 12
Safety Related: ☐	Before View ☐	Control Room Drawing ☒
Supersedes Mark-up from EC #: 12703	Issued per ECN #: 23497	
Prepared By:	Date	Reviewer Name (Optional)

REV	DESCRIPTION	DATE	BY	CHK'D	APP.
13	INCORPORATED EC 12657	4/29/09	RVB	KB	SWG
12	INCORPORATED DRN-05-03183 ER-JAF-05-29685	10/27/05	PD	KB	SL

REVISIONS

REV NO	DATE	DESCRIPTION	DWN	CHK	RE	VFY	APP
11	10/12/01	AS BUILT PER MOD NO JD-01-146	KMB	RVB	--	KM	TES
10	2/17/00	AS BUILT PER MOD NO F1-88-224	PJD	RVB	--	SB	TES
9	4/9/98	AS BUILT PER DCR-98-136	JB	KMB	--	KF	TES

REVISIONS

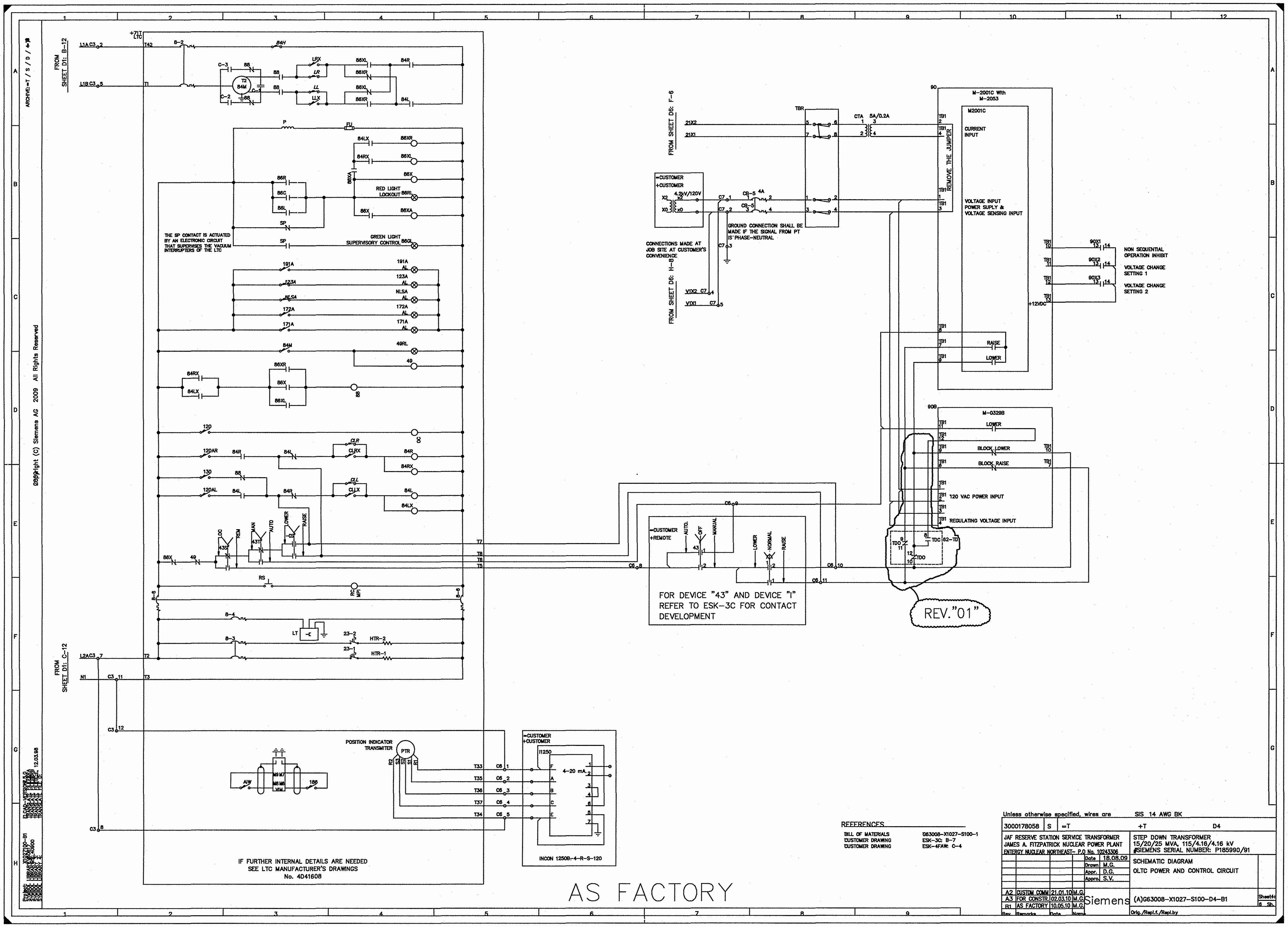
DWN
CHK
RE
VFY
APP
DATE

JAMES A. FITZPATRICK
NUCLEAR POWER PLANT

MAIN ONE LINE DIAGRAM SH. 2
STATION SERVICE TRANSFORMERS

Entergy Nuclear Northeast

SCALE NONE
DWG NO FE-1B
REV 13
SHEET OF



REFERENCE DRAWINGS

1.22-103

EC 23497

Engineering Change Mark-up	EC #: 12703, REV.01	Page 1 of 1
DOC. #: 1.22-106 EC12703	SHT. # 1	REV. 1
Safety Related: ☐	Before View ☐	Control Room Drawing ☐
Supersedes Mark-up from EC #: 12703, REV.00		Issued per ECN #: N/A
Niko Obradovic (signature)	1/30/12	(signature)
Prepared By:	Date	Reviewer Name (Optional)

for Patrick J. Finnerty (S&L) per telecom 1/30/12

EC 23497 REPLACES THE VENDOR DRAWING IN ITS ENTIRETY WITH THE VENDOR AS-BUILT DRAWING

Engineering Change Mark-up	EC #: 12703	Page 1 of 1
DOC. #: 1.22-106 EC12703	SHT. # N/A	REV. 0
Safety Related: ☐	Before View ☐	Control Room Drawing ☐
Supersedes Mark-up from EC #: 12703		Issued per ECN #: 23497
VG (S&L)	8/06/10	NIKO OBRADOVIC
Prepared By:	Date	Reviewer Name (Optional)

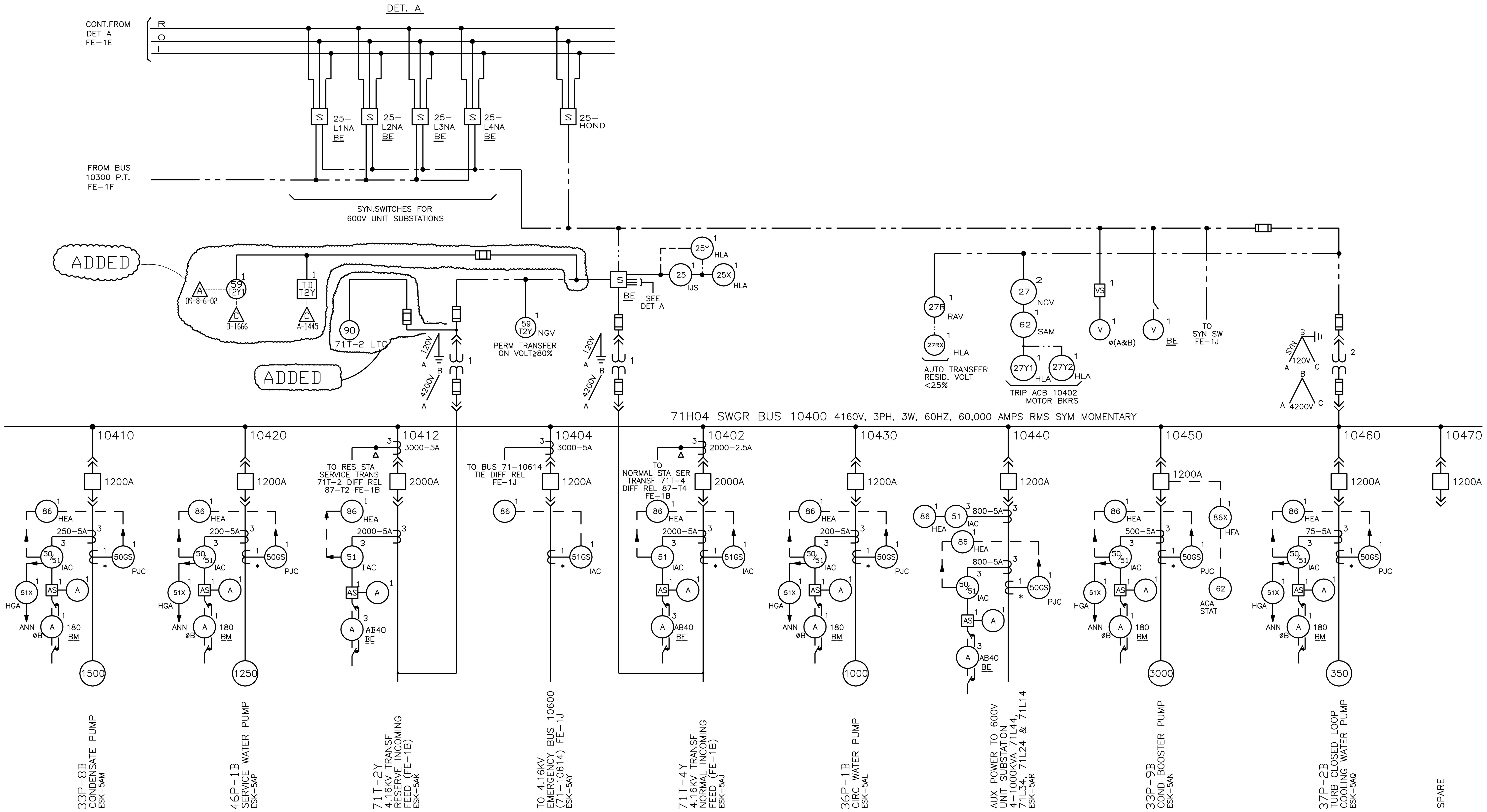
Engineering Change Mark-up	EC #: 0000012703	Page 1 of 1
DOC. #: 1.22-106 EC12703	SHT. # _	REV. 0
Safety Related: ☐	Before View ☐	Control Room Drawing ☐
Supersedes Mark-up from EC #: N/A		Issued per ECN #: N/A
VG (S&L)	12/15/09	N OBRADOVIC 12/15/09 (S&L)
Prepared By:	Date	Reviewer Name (Optional)

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

RESERVE STATION SERVICE TRANSFORMER–SCHEMATIC OUTPUT SIGNALS

Entergy Nuclear Northeast

DWG NO.	REV
1.22-106	1
SCALE NONE	SHEET 1 OF 1



NOTES:
1. FOR NOTES & REFERENCES SEE 11825-FE-1E

71H04 SWGR BUS 10400

10410	10420	10412	10404	10402	10430	10440	10450	10460	10470

FRONT

Engineering Change Mark-up	EC #: 12703, REV.01		Page 1 of 1
DOC. #: 11825-FE-1G EC12703		SHT. # 3	REV. 7
Safety Related: ☐	Before View ☐	Control Room Drawing ☒	
Supersedes Mark-up from EC #: 12703, REV.00		Issued per ECN #: N/A	
Prepared By:	Date	Reviewer Name (Optional)	

Engineering Change Mark-up	EC #: 0000012703		Page 1 of 1
DOC. #: FE-1G EC12703		SHT. # 3	REV. 7
Safety Related: ☐	Before View ☐	Control Room Drawing ☒	
Supersedes Mark-up from EC #: N/A		Issued per ECN #: N/A	
VG (S&L) Prepared By:	12/15/09 Date	N OBRADOVIC 12/15/09 (S&L) Reviewer Name (Optional)	

REVISIONS

REV	DESCRIPTION	DATE	BY	CHK'D	APP.
8	INCORPORATED EC 26116	1/26/11	RVB	KB	SK

REV	DATE	DESCRIPTION	DWN	CHK	RE	VFY	APP
7	7/10/02	AS-BUILT PER DCR-02-094	PJD	JB	–	KM	TJA

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6	08-13-91	THIS DRAWING IS REDRAWN & INCORPORATES INFORMATION SHOWN ON OP 46A-1	VS BP	–	AE	–	
5	5/24/90	DOCUMENT ELECTRONICALLY CONVERTED	SP JG	–	AE	–	
4	3/26/74	REV. CIRC WTR PP HP, REV BUS UNDERVOLT RELAYS & MINOR CHANGES					

DWN	CHK'D
DES SUPV	
DISCIPLINE ENG	
DISCIPLINE DIR	
PROJ APPROVAL	
DATE	

JAMES A. FITZPATRICK
NUCLEAR POWER PLANT

4160V ONE LINE DIAGRAM SH. 3
BUS 10400

Entergy Nuclear Northeast

SCALE NONE
DWG NO FE-1G
REV 8
SHEET OF
FIG.OP-46A-1

JAFP-12-0032

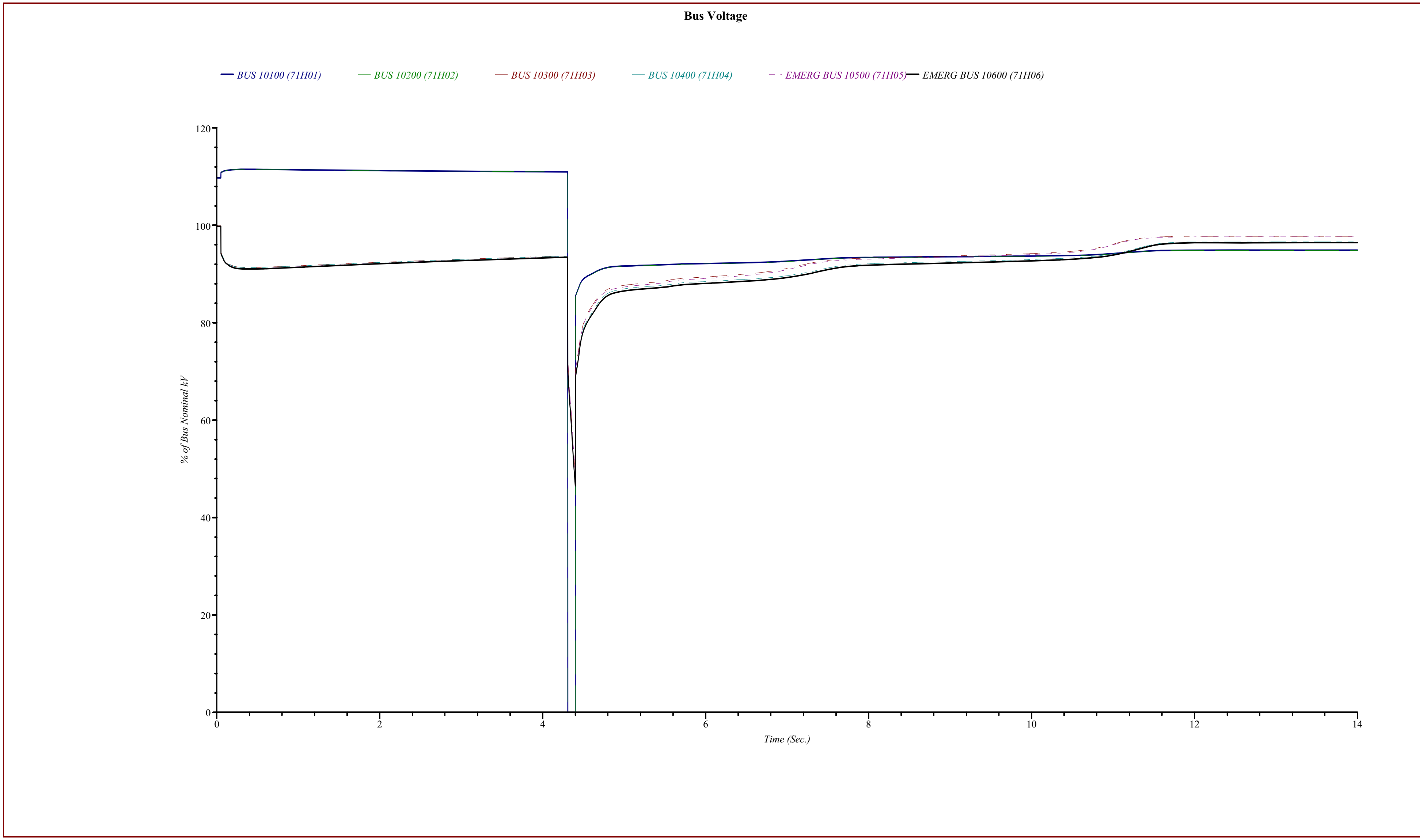
Enclosure 5

Replacement RSST's Non-Safety Related / ECCS Load Sequencing Voltage Profile (1 Page)

Project: JAF AC Auxiliary System	ETAP		Date:	08-03-2011
Location: Oswego, NY	7.1.0N		SN:	SARGENTLDY
Contract: 11021-023			Revision:	Revision 2
Engineer: Sargent & Lundy, LLC	Study Case: Case 4		Config.:	LOCA_D2T_GEN

Project File: C:\Documents and Settings\0r6702\Desktop\Fitzpatrick\new\JAF_ETAP_MODEL
Output Report: Case 4

TRANSIENT STABILITY ANALYSIS



JAFP-12-0032

Enclosure 6

Replacement RSST's Non-Safety Related Load Voltage Profile on Transfer from NSST (1 Page)

Project:	JAF AC Auxiliary System	ETAP 7.1.0N	Date:	08-03-2011
Location:	Oswego, NY		SN:	SARGENTLDY
Contract:	11021-023		Revision:	Revision 2
Engineer:	Sargent & Lundy, LLC	Study Case: Case 1	Config.:	FLSUM_D2_GEN

Project File: C:\Documents and Settings\0r6702\Desktop\Fitzpatrick\new\JAF_ETAP_MODEL
Output Report: Case 1

TRANSIENT STABILITY ANALYSIS