January 31, 1996

NOTE TO: File

FROM: Louis L. Wheeler 1/31/96
Vogtle Project Manager
NRR, DRPE, PD II-2

SUBJECT: ENGINEERING CALCULATION X3CA34/95615PG

The purpose of this note is to docket a licensee engineering calculation that will be part of the basis for an NRC safety evaluation.

Georgia Power Company, the licensee for the Vogtle Electric Generating Plant (Vogtle), submitted an application dated May 1, 1995, to the NRC for conversion of the current Vogtle technical specifications to the improved standard technical specifications. An engineering calculation performed by the licensee (X3CA34/95615PG) was referenced during a telephone conference call being conducted for the purpose of ensuring the staff accurately understood the licensee's technical basis for the proposed technical specifications related to the emergency diesel generators. A copy of the calculation was provided to the staff informally. The staff has determined that the calculation is relevant to the proposed licensing action and the staff's safety evaluation. Therefore, it is, by attachment to this note, being placed into the dockets for Vogtle Units 1 and 2.

Attachment: Design Calculation X3CA34/95615PG

cc: Docket File (50-424/425)
PUBLIC
PD II-2 Reading

DF01

Calculation Cover Sheet

Southern Company Services

Project Vogtle Electric Generating Plant Units 1 and 2	Calculation Number X3CA34
Objective determine thje impact of diesel load rejection on 4.16kV bus voltage	Discipline Electrical (041)
Subject/Title Diesel Generator -- Load Rejection Test	REA Number 95-VAA075

Originator's Signature NA	Date NA	Last Page Number 5

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Safety Related	X	Yes	Nonsafety-Related That Could Impact Safety-Related		Yes
		No			No

Record of Revisions

Rev. No	Description	Originator/ Date	Reviewer/ Date	Approval/ Date
0	Approved for use on Vogtle Project.	NA	9-12-95	9/14/95

Notes: This cover sheet approves CATS calculation 95615PG for use on the Vogtle Project.

Design Calculations | Southern Company Services

Project	Prepared By	Date
Plant Vogtle Unit 1 & 2	T.R. Sims	9/11/95
Subject/Title	Reviewed By	Date
Diesel Generator / load rejection test	- L.A. Wall	9/11/95
	Calculation Number	Sheet
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Purpose :

The purpose of this calculation is to determine the expected 4.16kV supply bus voltage change experienced by equipment connected to a class 1E bus following opening of the diesel generator supply breaker during a full load rejection test. In the full load rejection test, the diesel is being operated in parallel with the utility grid with an output of 7000kW at approximately 94% power factor.

The primary purpose for the test is to demonstrate the ability of the diesel to return to stable no-load operation after the load rejection. In this study the question of concern does not involve the diesels operation, Therefore this study does not address diesel dynamic operation.

Criteria :

Acceptability will be based on a comparison of this step voltage change on the 4.16kV bus to another switching event that has already been performed without problems. In this case the voltage change associated with the diesel full load rejection will be compared to the change associated with a hot parallel bus transfer of loads from the UAT to RAT during unit shutdown.

Conclusions :

The worst case 4.16kV bus voltage change associated with the diesel full load rejection is 4.2%. The 4.16kV bus voltage change associated with a hot parallel bus transfer is 2.6%. Therefore these events are similar and no adverse impact to 4.16kV equipment would be expected. In addition, a dynamic computer simulation was run to illustrate that the bus voltage change associated with the full load rejection is a smooth transition.

Major Equations :

n/a

Assumptions :

1. A unit 2 model was used in this generic review. The bus loading on unit 1 and 2 are the same per X3CA29.

2. The 'A' train model was assumed for this evaluation. 'B' train results would be similar.

3. Two bus loading scenarios were used in this study. These represent normal operating conditions of the plant with maximum expected loading of the buses for the respective condition. The first was 'Normal 1E' where all class 1E buses are fed from the RAT and are the only loads on the RAT. The second was 'Normal sparing of the UAT' where all of the station auxiliary loads are fed from the RATs.

Body of Calculation :

The STAUX computer program was used to determine the voltage change on the 4.16kV bus for two different switching operations on the 4.16kV bus.

- Case 1 was run without the diesel generator but with the 230kV bus voltage at 100% and 105% assuming normal 1E station auxiliary loading. The 4.16kV bus voltage was 98.13% and 103.22% respectively.

- Case 2 was run with the diesel connected to the bus with the diesel's terminal voltage allowed to increase to 104% of 4.16kV or until the diesel generator's var limit of 5250 vars was reached , a 230kV bus voltage of 100% and 105% assuming normal 1E station loading. The output of the diesel generator was 8750kVA @ 80% power factor and 7020kVA @ 99.7% power factor respectively. The 4.16kV bus voltage was 102% and 103.8% respectively.

- Case 3 was run with the 230kV bus voltage at 100% and 105% assuming normal sparing of the UAT station auxiliary loading. The 4.16kV bus voltage was 95.51% and 100.58% respectively.

- Case 4 was run with the diesel connected to the bus with the diesel's terminal voltage allowed to increase to 104% of 4.16kV or until the diesel generator's var limit of 5250 vars was reached, a 230kV bus voltage of 100% and 105% assuming normal sparing of the UAT loading. The output of the diesel generator was 8750kVA @ 80% power factor and 7966kVA @ 87.8% power factor. The 4.16kV bus voltage was 99.72% and 103.0% respectively.

The START computer program was run with a model of the normal sparing case with a 230kV bus voltage of 100% and a diesel generator output of 8750kVA @ 80% power factor. This will provide a dynamic simulation of a very conservative worst case voltage change of approximately 4.2%. This is labeled case 5 in this study. The case was designed to illustrate the dynamic transition between the two steady state results from STAUX cases 4 and 3. As shown in the figure the transition is essentially a smooth step change in voltage.

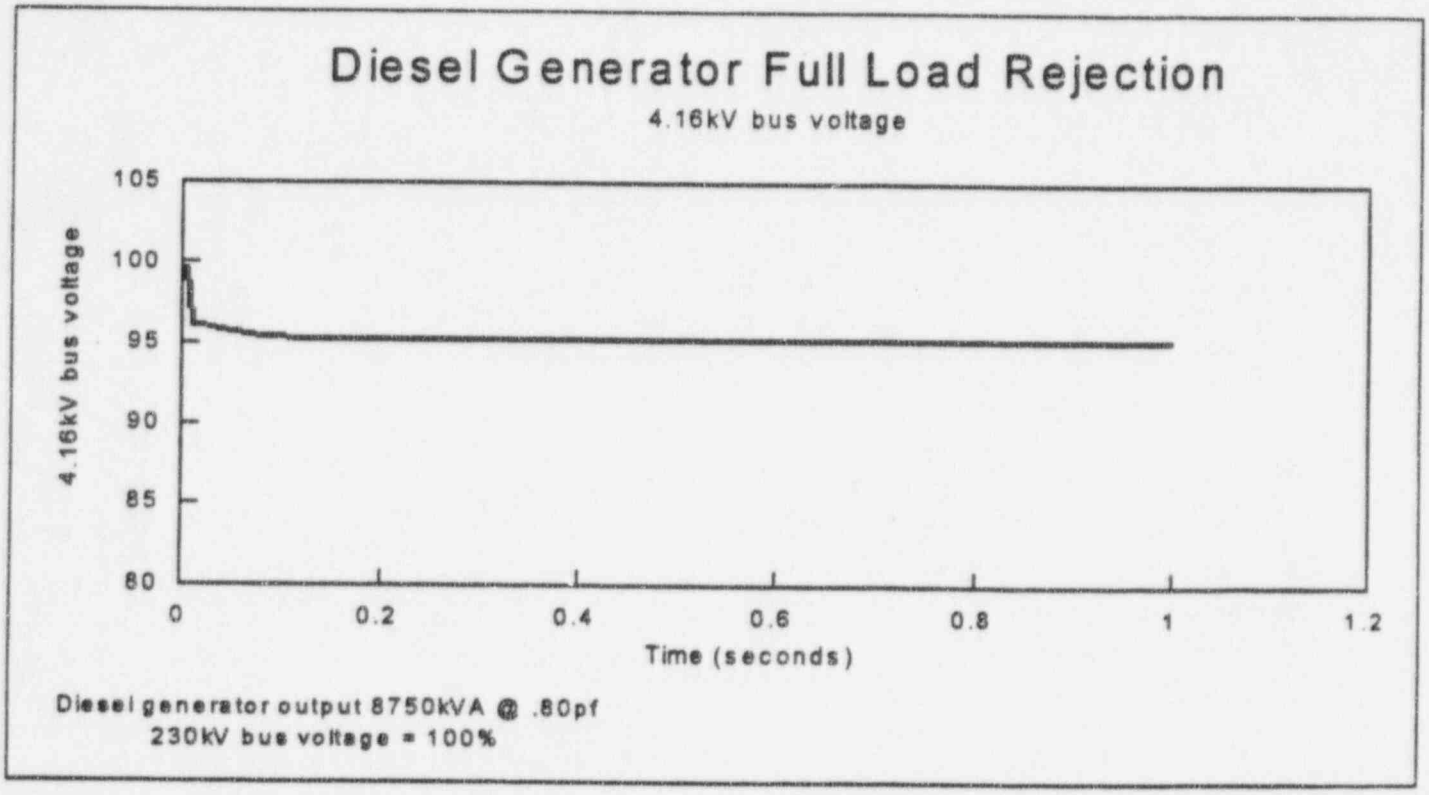
Results :

1. The parallel transfer voltage change is approximately 2.6% (case 1 - case 3).

2. The full load rejection result for normal 1E loading is 3.87% for a system voltage of 100% and .58% for a system voltage of 105% (case 2 - case 1).

3. The full load rejection result for normal sparing of the UAT is 4.21% for a system voltage of 100% and 3.02% for a system voltage of 105% (case 4 - case 3).

4. The dynamic waveform for the full load rejection case for the normal sparing loading case assuming a 230kV bus voltage of 100% and a diesel generator output of 8750kVA @80% power factor is shown below. (from case 5)



Project	Prepared By	Date
Plant Vogtle Unit 1 & 2	T.R. Sims	9/11/95
Subject/Title	Reviewed By	Date
Diesel Generator / load rejection test	L. A. Wall	9/11/95
	Calculation Number	Sheet
	95615PG	5 of 5

References :

1. Request letter - NRC Questions from Amy Streeman 9/1/95.(4 pages attached)
2. X3CA25 rev.0 - Offsite Dynamic Calculation.
3. Vogtle Operating Procedures 14325-1 and 14325-2.
4. X3CA29 rev.0 - Plant Vogtle bus loading study.

NRC Questions
24 Hour EDG full load run while at power

1. Demonstrate that the EDGs are equipped with a design feature that will automatically switch them from the test mode to the standby mode on the receipt of an accident signal. For example, if the EDG receives an accident signal while in the test mode (paralleled to the grid) the EDG has the capability to automatically disconnect from the offsite power system, return to the standby mode, and supply power to the necessary accident loads within the required time.

   While an EDG is paralleled to the grid for testing, a safety injection (SI) signal will open the EDG circuit breaker, the EDG will continue to run in standby, and the automatic load sequencer will load the emergency safety loads to the bus energized by offsite power. Also, a surveillance test is performed every 18 months to verify this feature. (Reference FSAR 8.3.1.1.3 (H)(3-l).

   When an EDG is intentionally shut down such as during periodic surveillance testing, there is a 90 second time delay to prevent starting the EDG. If during the 90 second time delay period a LOSP signal is received or a manual start attempt is initiated, the engine will not start because fuel to the engine is blocked. If an operator depresses the manual start pushbutton during the 90 second time delay period, the starting air valves will open for 5 seconds and then automatically close. This built in 5 second time limit on the opening of the starting air valves is to prevent the depletion of the starting air. This 5 second limit also applies to LOSP start signals received at the engine control panel.

   However, if a EDG is manually stopped during a surveillance test and an emergency start signal (LOCA with or with out an LOSP) is received at the control panel during the 90 second time delay period, the engine control system will automatically bypass the 90 second time delay and will allow fuel oil and starting air to be admitted to the engine. The 5 second starting air intake time limit is also automatically bypassed.

   An LOSP signal by itself does not override the 90 second time delay on fuel supply. If one EDG is being tested and then is manually stopped at the time of the LOSP, the other EDG automatically starts without delay to provide the emergency power. If, in addition, it is assumed that the EDG that is not being tested fails, there is a 90 second time delay before the other EDG automatically starts.

2. Demonstrate that during the 24 test of the EDG that no other EDG will be connected in parallel with the grid and the remaining redundant division(s) are supplied from a separate offsite source.

Administrative controls will prohibit any other EDG from being connected to the remaining redundant division safety bus and simultaneously being paralleled to the grid with any other EDG. While one EDG is being tested by operating it in parallel to an offsite power source (a RAT), the other division/train of safety loads is supplied from a completely separate and independent offsite source. Administrative controls prohibit interconnections between divisions/trains while any EDG is connected to a safety bus.

3. Assuming a LOOP and a single Failure of the EDG being tested, demonstrate adequate capacity is available in the remaining EDG(s) to power the remaining division(s), and that the remaining divisions have the required equipment operable to mitigate the consequences of a DBA or LOOP condition.

The standby power supply for each unit consists of two EDGs. Each EDG supplies a separate safety-related load group and one train is capable of satisfying minimum engineered safety features demand caused by a LOCA and a simultaneous LOSP. Each EDG is complete with its own accessories, fuel storage and transfer systems, and are electrically isolated from each other.

Each EDG is rated at 7000 kW for continuous operation and 7700 kW for a short-term (2-hr) period every 24 hours. The maximum accident loading of one 4160 volt Class 1E bus is less than 6.4 MVA, within the capability of one EDG.

4. Demonstrate how the EDGs will be prevented from paralleling the grid during severe weather or unstable grid conditions.

Administrative controls will prevent paralleling an EDG to the grid during severe weather or unstable conditions.

EDG Full Load Rejection Test - QUESTION

T-3.8-01 (Ref. 82 - EELB - Pratt)
DOC 38a
JD 21

Removal of restriction against performance of the following DG tests during Modes 1 and 2:

4.8.1.1.2.h.2 single load rejection (improved TS SR 3.8.1.8);
4.8.1.1.2.h.3 full load rejection (improved TS SR 3.8.1.9);
4.8.1.1.2.h.7 24 hour DG full load run (improved TS SR 3.8.1.13).

Performing EDG load rejection tests at power. No licensee has been allowed to perform single or full load rejections tests while at power due to safety concerns related to the transient conditions caused by a load rejection. EELB feels that it is good engineering judgment to continue to perform all load rejections tests while in a shutdown condition. Allowing this test to be performed at power is a deviation from the standard and has generic implications.

GENERAL COMMENT

What is the specific safety concern associated with each individual test referenced? Is there an exact transient of greatest concern, or analysis on the effects of specific equipment or systems in question? Such as: the EDG being tested? the safety bus and loads? or the main generator and grid?

RESPONSES

Single Load rejection test: 4.8.1.1.2.h.2 (Improved TS SR 3.8.1.8)

VEGP will revise their ITS Change Request submittal to remove the requirement to perform a single load rejection test at power. The single load rejection test is not necessary since it is enveloped by the full load rejection test.

Full Load rejection test: 4.8.1.1.2.h.3 (Improved TS SR 3.8.1.9)

During the current monthly surveillance test each EDG is run at full load for approximately an hour and is at risk of a potenetial full load rejection. Although a full load rejection is not performed during the test, this is already bounded by existing analysis. Therefore a new safety concern should not be raised by performing a full load rejection at power.

(SCS transient analysis needed) - Tom Sims please provide comments and supporting info.

24 hour EDG Full Load Operability Test 4.8.1.1.2.h.7 (Improved TS SR 3.8..1.13)

This is only an extension of the current monthly TS surveillance test.

Route through Tom Sims and Fray for their input.

ATTACHMENT 1

CALCULATION NO. 95615PG SHEET 1 OF 1

COMPUTER PROGRAM PRINTOUT SUMMARY

CASE NO	DESCRIPTION	OUTPUT PAGES	DATAFILE	DATAFILE PAGES	230KV SUPPLY VOLT %	LP	MS	DF	PROGRAM
1	NORMAL 1E W/O DIESEL RUNNING	9 ON 5	V2.93.1	(1)	100.00 105.00	X			STAUX
2	NORMAL 1E WITH DIESEL	11 ON 6	V2.93.1	(1)	100.00 105.00 104.00 - DIESEL VOLTAGE	X			STAUX
3	NORMAL SPARING OF UAT W/O DIESEL	12 ON 6	V2.93.1	(1)	100.00 105.00	X			STAUX
4	NORMAL SPARING OF UAT WITH DIESEL	14 ON 7	V2.93.1	(1)	100.00 105.00 104.00 - DIESEL VOLTAGE	X			STAUX
5	DYNAMIC LOAD REJECTION CASE (NORMAL SPARING LOADING)	11 ON 6	DIESEL_LOAD_REJECT	4 ON 2	100.00 8750@80%PF - DIESEL GEN OUTPUT	X		X	START

NOTES:
(1) DATA FILE V2.93.1 IS TAKEN WITHOUT CHANGES FROM CALCULATION X3CA20.

COMPUTER/PROGRAM INFORMATION

COMPUTER TYPE: APOLLO
PROGRAM TITLE: SOUTHERN COMPANY SERVICES STATION AUXILIARY DESIGN PROGRAM
PROGRAM STATUS: REVISION 4.1, JULY 1994
INPUTS/OUTPUTS: REFER TO SUMMARY ABOVE
VERIFICATION: DOCUMENTED AND VERIFIED AS QC DOCUMENT #P1239300101
APPLICATION BASIS: PROGRAM IS SPECIFICALLY WRITTEN FOR THE GENERATING PLANT STATION AUXILIARY ANALYSIS AS EVALUATED HEREIN.

COMPUTER TYPE: APOLLO
PROGRAM TITLE: STARTR3.2
PROGRAM STATUS: VERSION OF APRIL 1992
INPUTS/OUTPUTS: REFER TO SUMMARY ABOVE
VERIFICATION: DOCUMENTED AND VERIFIED AS QC DOCUMENT #P1239108702
APPLICATION BASIS: PROGRAM IS SPECIFICALLY WRITTEN FOR STUDYING DYNAMICS OF MOTORS AND GENERATORS AS USED IN THIS STUDY.

SOUTHERN COMPANY SERVICES STATION AUXILIARY DESIGN PROGRAM

DATE : 9/ 5/95 TIME :13:15:10

****
* CONSULTING AND TESTING SERVICES - ELECTRICAL *
****

PROGRAM STAUXR4.1

VERSION OF JULY 1994

CALCULATION NUMBER

X3CA20

Case#1

DATA FILE

V2.93.1

PREPARED BY: TOM SIMS DATE 9/ 5/95

REVIEWED BY: Larry Wall DATE 9,11,95

PROGRAM VALIDATED ON --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	109EB	9.7	2
DN3000	FAF4	9.7	2
DN3000	13056	9.7	1
DN330	707A	9.7	1
DN330	704E	9.7	2
DN3000	39EBB	9.7	1

MACHINE USED FOR THIS RUN --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	39EBB	9.7	1

NOTE: PROGRAM DOCUMENTED AND VERIFIED IN ACCORDANCE WITH APPLICABLE STANDARDS AND PROCEDURES AND MAINTAINED AS QC DOCUMENT #P1239300101.

THE FOLLOWING IS A LIST OF SYSTEM BUSSES

NUMBER	NAME	VOLTAGE	NUMBER	NAME	VOLTAGE
1	230 KV SYSTEM	230000.	56	(S1A) ELEC MCC RM CLR #1	480.
2		0.	57	(S1A) CHRG PMP RM CLR	480.
3		0.	58	(S1A) CTMT SPRAY RM CLR	480.
4		0.	59	(S1A) RHR RM CLR	480.
5		0.	60	(S1A) ELEC SWGR & MCC RM	480.
6		0.	61	LS.120V 2AYD1 DIST PNL X	120.
7		0.	62	HS.480V SWGR 2AB05	4160.
8		0.	63	LS.480V SWGR 2AB05	480.
9		0.	64	(S8A) DGB VENT FAN #1	480.
10		0.	65	(S8A) DGB VENT FAN #3	480.
11	INNER BUS RAT 2NXRA	230000.	66	480V MCC 2ABA	480.
12	X-W RAT 2NXRA	13800.	67	(S8A) CB ESF CHILL WTR P	480.
13	Y-W RAT 2NXRA	4160.	68	(S1A) CB NORM AC #5	480.
14	INNER BUS RAT 2NXRB	230000.	69	(S1A) CB CR CHLR RM VENT	480.
15	X-W RAT 2NXRB	13800.	70	(S4A) CB ESS CHLR PKG	480.
16	Y-W RAT 2NXRB	4160.	71	BAT CHGR 2AD1CA	480.
17		0.	72	BAT CHGR 2CD1CB	480.
18		0.	73	LS.120V 2AYA1 DIST PNL	120.
19		0.	74	480V MCC 2ABC	480.
20	CONDUCTOR BUS 20	4160.	75	(S1A) CBSF BATT RM EXH F	[illegible]
21	CONDUCTOR BUS 21	4160.	76	(S1A) CBSF BATT RM EXH F	[illegible]
22		0.	77	(S1A) CBSF ELEC EQUIP RM	[illegible]
23	CONDUCTOR BUS 23	4160.	78	(S1A) CB AUX RELAY RM AC	480.
24	CONDUCTOR BUS 24	4160.	79	LS.120V 2AYC1 DIST PNL X	120.
25		0.	80	480V MCC 2ABF	480.
26		0.	81	(S1A) AFWP HSE FAN #1	480.
27		0.	82	(S1A) DSL TUNNEL 2T4A VE	480.
28	4.16KV SWGR 2AA02 2-18	4160.	83	(S1A) DSL OIL STORAGE TK	480.
29	4.16KV SWGR 2BA03	4160.	84	(S1A) DSL OIL STORAGE TK	480.
30	(S5A) CCW PMP MTR #3	4160.	85	LS.120V 2AYF1 DIST PNL X	120.
31	(S5A) CCW PMP MTR #1	4160.	86	HS.480V SWGR 2AB04	4160.
72	(S6A) NSCW PMP #3	4160.	87	LS.480V SWGR 2AB04	480.
33	(S7A) NSCW PMP #5 SPARE	4160.	88	(A) CTMT CCU #1 (HS)	480.
34	(S8A) CB ESF CHLR #1	4160.	89	(A) CTMT CCU #2 (HS)	480.
35	(S1X) CVCS CCP #2	4160.	90	(A) CTMT CCU #5 (HS)	480.
36	(A) ACCW PMP #T	4160.	91	(A) CTMT CCU #6 (HS)	480.
37	(S5A) AUX FDWTR PMP #3	4160.	92	480V MCC 2ABE	480.
38	HS.480V SWGR 2AB15	4160.	93	(S1A) CTB POST LOCA CAV	480.
39	LS.480V SWGR 2AB15	480.	94	BAT CHGR 2CD1CA	480.
40	(S8A) NSCW CTWR FAN #1	480.	95	BAT CHGR 2AD1CB	480.
41	(S8A) NSCW CTWR FAN #2	480.	96	HS.480V SWGR 2NB01	4160.
42	(S8A) NSCW CTWR FAN #3	480.	97	LS.480V SWGR 2NB01	480.
43	(S8A) NSCW CTWR FAN #4	480.	98	BAT CHGR 2ND3ACA	480.
44	(A) SPT FUEL PIT PMP #2	480.	99	BAT CHGR 2ND1CA	480.
45	480V MCC 2ABB	480.	100	480V MCC 2NBS	480.
46	(A) NSCW CTWR XFER PMP #	480.	101	CTB RX SUPP COOL MTR #1	480.
47	(S1A) SFP PMP RM CLR #17	480.	102	LS.120V PNL 2NYS1	120.
48	(S1A) TB TUNNEL FAN #5	480.	103	480V MCC 2NBI	480.
49	(S1A) NSCW TWR TUNNEL FA	480.	104	LUBE OIL CIRC PMP	480.
50	(S1A) ELEC MCC RM CLR	480.	105	LS.120V PNL 2NYI1	120.
51	(S1A) CCW PMP RM CLR	480.	106	(S5B) CCW PMP MTR #4	4160.
52	LS.120V 2AYB1 DIST PNL X	120.	107	(S6B) CCW PMP MTR #6 (SP	4160.
53	480V MCC 2ABD	480.	108	(S6B) NSCW PMP #2	4160.
54	(S1A) SIS PMP RM CLR #15	480.	109	(S7B) NSCW PMP #6 (SPARE	4160.
55	(S1A) BORIC ACID XFER PM	480.	110	(S8B) CB ESF CHLR #2	4160.

NUMBER	NAME	VOLTAGE
111	(S1Y) CVCS CCP #3	4160.
112	(B) ACCW PMP #2 (SPARE)	4160.
113	(S5B) AUX FDWTR PMP #2	4160.
114	HS.480V SWGR 2BB06	4160.
115	LS.480V SWGR 2BB06	480.
116	(B) CTMT CCU #3 (HS)	480.
117	(B) CTMT CCU #4 (HS)	480.
118	(B) CTMT CCU #7 (HS)	480.
119	(B) CTMT CCU #8 (HS)	480.
120	480V MCC 2BBE	480.
121	(S1B) CTB POST LOCA CAV	480.
122	BATT CHRGR 2DD1CB	480.
123	BATT CHRGR 2BD1CB	480.
124	LS.120V 2BTE1 DIST PNL X	120.
125	HS.480V SWGR 2BB07	4160.
126	LS.480V SWGR 2BB07	480.
127	(S8B) DGB VENT FAN #2	480.
128	(S8B) DGB VENT FAN #4	480.
129	480V MCC 2BBA	480.
130	(S1B) CB CR CHLR RM VENT	480.
131	(S8B) CB ESF CHLD WTR PM	480.
132	(S1B) CB AUX RLY RM AC U	480.
133	(S8B) CB ESS CHLR PKG	480.
134	BATT CHRGR 2BD1CA	480.
135	BATT CHRGR 2DD1CA	480.
136	LS.120V 2BYA1 DIST PNL X	120.
137	480V MCC 2BBC	480.
138	(S1B) CB SF BATT RM EXB	480.
139	(S1B) CB SF BATT RM EXB	480.
140	(S1B) CB SF ELEC EQ RM A	480.
141	480V MCC 2BBF	480.
142	(S1B) AFW PP SEE FAN #2	480.
143	(S1B) DSL TNL 2T4B VENT	480.
144	LS.120V 2BTF1 DIST PNL X	120.
145	HS.480V SWGR 2BB16	4160.
146	LS.480V SWGR 2BB16	480.
147	(S8B) NSCW CTWR FAN #1	480.
148	(S8B) NSCW CTWR FAN #2	480.
149	(S8B) NSCW CTWR FAN #3	480.
150	(S8B) NSCW CTWR FAN #4	480.
151	(B) SPT FUEL PIT PMP	480.
152	480V MCC 2BB8	480.
153	(S1B) ELEC MCC RM CLR #6	480.
154	(S1B) CCW PMP RM CLR #12	480.
155	(S1B) SFP PMP RM CLR #18	480.
156	(B) NSCW XFR PMP #7	480.
157	(S1B) NSCW TWR TUNNEL FA	480.
158	LS.120V 2BYB1 DIST PNL X	120.
159	480V MCC 2BBD	480.
160	(S1B) BORIC ACID XFER PM	480.
161	(S1B) ELEC MCC RM CLR #2	480.
162	(S1B) CS PMP RM CLR #10	480.
163	(S1B) RHR PMP RM CLR #8	480.
164	(S1B) CHRG PMP RM CLR	480.
165	(S1B) SIS PMP RM CLR	480.
166	(S1B) ELEC SWGR & MCC RM	480.
167	LS.120V 2BYD1 DIST PNL X	120.
168	HS.480V SWGR 2NB10	4160.
169	LS.480V SWGR 2NB10	480.
170	BATT CHRGR 2ND3BCA	480.
171	BATT CHRGR ANDCCB	480.
172	TURNING GEAR XFR SW.	480.
173	480V MCC 2NBO	480.
174	JKT WTR CIRC PMP	480.
175	LS.120V 2NT06 DIST PNL X	120.
176	480V MCC 2NBB	480.
177	RESTRAINT VENT FAN #9	480.
178	LS.120V 2NTR1 DIST PNL X	120.
179	TAP BUS 1 —	0.
180	TAP BUS 2	0.

STUDY ASSUMPTIONS

1. AUXILIARY SYSTEM CONNECTION TO BE STUDIED - NORM-1E
2. SYSTEM TO BE STUDIED - 'AS-BUILT'
3. CABLE RESISTANCE CALCULATED AT 90.0 DEGREES C
4. MVSG OR DUMBUS LOADING

BUS NO.	BUS NAME		LOADING
28	4.16KV SWGR 2AA02	2-18	MAXIMUM
29	4.16KV SWGR 2BA03		MAXIMUM

****
* *
* LOAD FLOW STUDY ASSUMPTIONS *
* *
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1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) - 100.00% ON A 230000. VOLT BASE
2. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
3. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.0050000

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.
28	4.16KV SWGR 2AA02 2-1B MINIMUM VOLTAGE LIMIT	98.13 93.10	-1.8	4160.	0.	0.	1162.	560.

LINE FLOWS TO BUS NUMBER	BUS NAME	CURRENT(AMPS) MAG.	ANGLE
21	CONDUCTOR BUS 21	720.4	150.9
30	(S5A) CCW PMP MTR #3	39.2	-29.7
31	(S5A) CCW PMP MTR #1	39.2	-29.7
32	(S6A) NSCW PMP #3	91.5	-29.0
33	(E7A) NSCW PMP #5 ESF	91.5	-29.0
34	(S8A) CB ESF CHLR #1	50.2	-26.7
35	(S1X) CVCS CCP #2	84.7	-26.0
36	(A) ACCW PMP #I	73.6	-23.9
37	(S5A) AUX FDWTR PMP	115.9	-23.7
38	BS.480V SWGR 2AB15	49.8	-36.6
62	BS.480V SWGR 2AB05	46.9	-42.6
86	BS.480V SWGR 2AB04	88.3	-41.9
96	BS.480V SWGR 2NB01	137.2	-23.6

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* *
* LOAD FLOW STUDY ASSUMPTIONS *
* *
****

1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) - 105.00% ON A 230000. VOLT BASE
2. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
3. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.0050000

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.
28	4.16KV SWGR 2AA02 2-18	103.22	-1.7	4160.	0.	0.	1162.	560.
	MINIMUM VOLTAGE LIMIT	93.10						

LINE FLOWS TO BUS NUMBER	BUS NAME	CURRENT(AMPS) MAG.	ANGLE
21	CONDUCTOR BUS 21	693.8	151.3
30	(85A) CCW PMP MTR #3	37.3	-29.5
31	(83A) CCW PMP MTR #1	37.3	-29.5
32	(86A) NSCW PMP #3	86.9	-28.8
33	(87A) NSCW PMP #5 SP	86.9	-28.8
34	(88A) CB ESF CHLR #1	47.7	-26.6
35	(81X) CVCS CCP #2	80.5	-23.9
36	(A) ACCW PMP #1	70.8	-23.7
37	(85A) AUX FDWTR PMP	110.2	-23.6
38	BS.480V SWGR 2AB15	47.4	-36.4
62	BS.480V SWGR 2AB05	45.8	-42.3
86	BS.480V SWGR 2AB04	83.9	-41.7
96	BS.480V SWGR 2NB01	139.6	-22.5

	CURRENT VALUE	PROGRAM LIMIT
NUMBER OF BUSES	180	700
NUMBER OF LOAD FLOW LINES	162	1425
NUMBER OF HELD MOTORS	103	400
NUMBER OF MVSGs + DUMBUSes	2	20
NUMBER OF SWITCHGEAR	40	300

SOUTHERN COMPANY SERVICES STATION AUXILIARY DESIGN PROGRAM

DATE : 9/ 5/95 TIME :13:20: 1

****
* CONSULTING AND TESTING SERVICES - ELECTRICAL *
****

PROGRAM STAUXR4.1

VERSION OF JULY 1994

CALCULATION NUMBER

X3CA20

DATA FILE

V2.93.1

Case #2

PREPARED BY: TOM SIMS DATE 9/ 5/95

REVIEWED BY: Larry Wall DATE 9 / 11 / 95

PROGRAM VALIDATED ON --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	109EB	9.7	2
DN3000	FAF4	9.7	2
DN3000	13056	9.7	1
DN330	707A	9.7	2
DN330	704E	9.7	1
DN3000	39EBB	9.7	1

MACHINE USED FOR THIS RUN --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	39EBB	9.7	1

NOTE: PROGRAM DOCUMENTED AND VERIFIED IN ACCORDANCE WITH APPLICABLE STANDARDS AND PROCEDURES AND MAINTAINED AS QC DOCUMENT #P1239300101.

THE FOLLOWING IS A LIST OF SYSTEM BUSSES

NUMBER	NAME	VOLTAGE
1	230 KV SYSTEM	230000.
2		0.
3		0.
4		0.
5		0.
6		0.
7		0.
8		0.
9		0.
10		0.
11	INNER BUS RAT 2NXRA	230000.
12	X-W RAT 2NXRA	13800.
13	Y-W RAT 2NXRA	4160.
14	INNER BUS RAT 2NXRB	230000.
15	X-W RAT 2NXRB	13800.
16	Y-W RAT 2NXRB	4160.
17		0.
18		0.
19		0.
20	CONDUCTOR BUS 20	4160.
21	CONDUCTOR BUS 21	4160.
22		0.
23	CONDUCTOR BUS 23	4160.
24	CONDUCTOR BUS 24	4160.
25		0.
26		0.
27		0.
28	4.16KV SWGR 2AA02 2-18	4160.
29	4.16KV SWGR 2BA03	4160.
30	DIESEL GEN 2A	4160.
31	(S5A) CCW PMP MTR #3	4160.
32	(S5A) CCW PMP MTR #1	4160.
33	(S6A) NSCW PMP #3	4160.
34	(S7A) NSCW PMP #5 SPARE	4160.
35	(S8A) CB ESF CHLR #1	4160.
36	(S1E) CVCS CCP #2	4160.
37	(A) ACCW PMP #T	4160.
38	(S5A) AUX FDWTR PMP #3	4160.
39	HS.480V SWGR 2AB15	4160.
40	LS.480V SWGR 2AB15	480.
41	(S8A) NSCW CTWR FAN #1	480.
42	(S8A) NSCW CTWR FAN #2	480.
43	(S8A) NSCW CTWR FAN #3	480.
44	(S8A) NSCW CTWR FAN #4	480.
45	(A) SPT FUEL PIT PMP #2	480.
46	480V MCC 2ABB	480.
47	(A) NSCW CTWR XFER PMP #	480.
48	(S1A) SFP PMP RM CLR #17	480.
49	(S1A) TB TUNNEL FAN #5	480.
50	(S1A) NSCW TWR TUNNEL FA	480.
51	(S1A) ELEC MCC RM CLR	480.
52	(S1A) CCW PMP RM CLR	480.
53	LS.120V 2AYB1 DIST PNL X	120.
54	480V MCC 2ABD	480.
55	(S1A) SIS PMP RM CLR #15	480.
56	(S1A) BORIC ACID XFER PM	480.
57	(S1A) ELEC MCC RM CLR #1	480.
58	(S1A) CHRG PMP RM CLR	480.
59	(S1A) CTMT SPRAY RM CLR	480.
60	(S1A) RHR RM CLR	480.
61	(S1A) ELEC SWGR & MCC RM	480.
62	LS.120V 2AYD1 DIST PNL X	120.
63	HS.480V SWGR 2AB05	4160.
64	LS.480V SWGR 2AB05	480.
65	(S8A) DGB VENT FAN #1	480.
66	(S8A) DGB VENT FAN #3	480.
67	480V MCC 2ABA	480.
68	(S8A) CB ESF CHILL WTR P	480.
69	(S1A) CB NORM AC #5	480.
70	(S1A) CB CR CHLR RM VENT	480.
71	(S8A) CB ESS CHLR PKG	480.
72	BAT CHGR 2AD1CA	480.
73	BAT CHGR 2CD1CB	480.
74	LS.120V 2AYA1 DIST PNL	120.
75	480V MCC 2ABC	480.
76	(S1A) CBSF BATT RM EXH F	480.
77	(S1A) CBSF BATT RM EXH F	480.
78	(S1A) CBSF ELEC EQUIP RM	480.
79	(S1A) CB AUX RELAY RM AC	480.
80	LS.120V 2AYC1 DIST PNL X	120.
81	480V MCC 2ABF	480.
82	(S1A) AFWP NSE FAN #1	480.
83	(S1A) DSL TUNNEL 2T4A VE	480.
84	(S1A) DSL OIL STORAGE TK	480.
85	(S1A) DSL OIL STORAGE TK	480.
86	LS.120V 2AYF1 DIST PNL X	120.
87	HS.480V SWGR 2AB04	4160.
88	LS.480V SWGR 2AB04	480.
89	(A) CTMT CCU #1 (HS)	480.
90	(A) CTMT CCU #2 (HS)	480.
91	(A) CTMT CCU #5 (HS)	480.
92	(A) CTMT CCU #6 (HS)	480.
93	480V MCC 2ABE	480.
94	(S1A) CTB POST LOCA CAV	480.
95	BAT CHGR 2CD1CA	480.
96	BAT CHGR 2AD1CB	480.
97	HS.480V SWGR 2NB01	4160.
98	LS.480V SWGR 2NB01	480.
99	BAT CHGR 2ND3ACA	480.
100	BAT CHGR 2ND1CA	480.
101	480V MCC 2NBS	480.
102	CTB RX SUPP COOL MTR #1	480.
103	LS.120V PNL 2NYS1	120.
104	480V MCC 2NBI	480.
105	LUBE OIL CIRC PMP	480.
106	LS.120V PNL 2NYI1	120.
107	(S5B) CCW PMP MTR #4	4160.
108	(S6B) CCW PMP MTR #6 (SP	4160.
109	(S6B) NSCW PMP #2	4160.
110	(S7B) NSCW PMP #6 (SPARE	4160.

NUMBER	NAME	VOLTAGE
111	(S8B) CB ESF CHLR #2	4160.
112	(S1Y) CVCS CCP #3	4160.
113	(B) ACCW PMP #Z (SPARE)	4160.
114	(S5B) AUX FDWTR PMP #2	4160.
115	HS.480V SWGR 2BB06	4160.
116	LS.480V SWGR 2BB06	480.
117	(B) CTMT CCU #3 (HS)	480.
118	(B) CTMT CCU #4 (HS)	480.
119	(B) CTMT CCU #7 (HS)	480.
120	(B) CTMT CCU #8 (HS)	480.
121	480V MCC 2BBE	480.
122	(S1B) CTB POST LOCA CAV	480.
123	BATT CHRGR 2DD1CB	480.
124	BATT CHRGR 2BD1CB	480.
125	LS.120V 2BYE1 DIST PNL X	120.
126	HS.480V SWGR 2BB07	4160.
127	LS.480V SWGR 2BB07	480.
128	(S8B) DGB VENT FAN #2	480.
129	(S8B) DGB VENT FAN #4	480.
130	480V MCC 2BBA	480.
131	(S1B) CB CR CHLR RM VENT	480.
132	(S8B) CB ESF CHLD WTR PM	480.
133	(S1B) CB AUX RLY RM AC U	480.
134	(S8B) CB ES5 CHLR PKG	480.
135	BATT CHRGR 2BD1CA	480.
136	BATT CHRGR 2DD1CA	480.
137	LS.120V 2BYA1 DIST PNL X	120.
138	480V MCC 2BBC	480.
139	(S1B) CB SF BATT RM EXH	480.
140	(S1B) CB SF BATT RM EXH	480.
141	(S1B) CB SF ELEC EQ RM A	480.
142	480V MCC 2BBF	480.
143	(S1B) AFW PP HSE FAN #2	480.
144	(S1B) DSL TNL 2T4B VENT	480.
145	LS.120V 2BYF1 DIST PNL X	120.
146	HS.480V SWGR 2BB16	4160.
147	LS.480V SWGR 2BB16	480.
148	(S8B) NSCW CTWR FAN #1	480.
149	(S8B) NSCW CTWR FAN #2	480.
150	(S8B) NSCW CTWR FAN #3	480.
151	(S8B) NSCW CTWR FAN #4	480.
152	(B) SFT FUEL PIT PMP	480.
153	480V MCC 2BBB	480.
154	(S1B) ELEC MCC RM CLR #6	480.
155	(S1B) CCW PMP RM CLR #12	480.
156	(S1B) SFP PMP RM CLR #18	480.
157	(B) NSCW XFR PMP #7	480.
158	(S1B) NSCW TWR TUNNEL FA	480.
159	LS.120V 2BYB1 DIST PNL X	120.
160	480V MCC 2BBD	480.
161	(S1B) BORIC ACID XFER PM	480.
162	(S1B) ELEC MCC RM CLR #2	480.
163	(S1B) CS PMP RM CLR #10	480.
164	(S1B) RHR PMP RM CLR #8	480.
165	(S1B) CHRG PMP RM CLR	480.
166	(S1B) SIS PMP RM CLR	480.
167	(S1B) ELEC SWGR & MCC RM	480.
168	LS.120V 2BYD1 DIST PNL X	120.
169	HS.480V SWGR 2NB10	4160.
170	LS.480V SWGR 2NB10	480.
171	BATT CHRGR 2ND1BCA	480.
172	BATT CHRGR ANDCCB	480.
173	TURNING GEAR XFR SW.	480.
174	480V MCC 2NBO	480.
175	JET WTR CIRC PMP	480.
176	LS.120V 2NY06 DIST PNL X	120.
177	480V MCC 2NBR	480.
178	RESTRAINT VENT FAN #9	480.
179	LS.120V 2NTR1 DIST PNL X	120.
180	TAP BUS 1	0.
181	TAP BUS 2	0.

STUDY ASSUMPTIONS

1. AUXILIARY SYSTEM CONNECTION TO BE STUDIED - NORM-1E

2. SYSTEM TO BE STUDIED - 'AS-BUILT'

3. CABLE RESISTANCE CALCULATED AT 90.0 DEGREES C

4. MVSG OR DUMBUS LOADING

BUS NO.	BUS NAME		LOADING
28	4.16KV SWGR 2AA02	2-18	MAXIMUM
29	4.16KV SWGR 2BA03		MAXIMUM

LOAD FLOW STUDY ASSUMPTIONS

1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) = 100.00% ON A 230000. VOLT BASE
2. GENERATOR VOLTAGE TO BE HELD ON BUS # 30 (FOR LOAD FLOW) = 104.00% ON A 4160. VOLT BASE
3. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
4. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.0050000

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.
28	4.16KV SWGR 2AA02 2-18	102.04	0.9	4160.	0.	0.	1162.	560.
	MINIMUM VOLTAGE LIMIT	93.10						

TO BUS NUMBER	BUS NAME	CURRENT(AMPS) MAG.	ANGLE
21	CONDUCTOR BUS 21	508.8	-49.1
30	DIESEL GEN 2A	1185.0	144.2
31	(85A) CCW PMP MTR #3	37.7	-27.0
32	(85A) CCW PMP MTR #1	37.7	-27.0
33	(86A) RSCW PMP #3	88.8	-25.3
34	(87A) RSCW PMP #5 SP	88.8	-26.3
35	(88A) CB ESF CHLR #1	48.3	-24.0
36	(81X) CVCS CCP #2	81.6	-21.3
37	(A) ACCW PMP #1	70.8	-21.2
38	(85A) AUX FDWTR PMP	111.4	-21.0
39	BS.480V SWGR 2AB15	47.9	-31.8
63	BS.480V SWGR 2AB05	45.4	-39.7
87	BS.480V SWGR 2AB04	85.0	-39.1
97	BS.480V SWGR 2NB01	139.0	-20.2

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.	LINE FLOWS TO BUS NUMBER	BUS NAME	CURRENT(AMPS) MAG.	ANGLE
30	DIESEL GEN 2A	102.48	1.0	4160.	0.	0.	7000.	5250.	28	4.16KV SWGR 2AA02	1185.8	-35.8

LOAD FLOW STUDY ASSUMPTIONS

1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) - 105.00% ON A 230000. VOLT BASE
2. GENERATOR VOLTAGE TO BE HELD ON BUS # 30 (FOR LOAD FLOW) - 104.00% ON A 4160. VOLT BASE
3. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
4. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.0050000

	CURRENT VALUE	PROGRAM LIMIT
NUMBER OF BUSES	181	700
NUMBER OF LOAD FLOW LINES	163	1425
NUMBER OF HELD MOTORS	103	400
NUMBER OF MVSGs + DUMBUSes	2	20
NUMBER OF SWITCHGEAR	40	300

SOUTHERN COMPANY SERVICES STATION AUXILIARY DESIGN PROGRAM

DATE : 9/ 5/95 TIME :13:23:41

CONSULTING AND TESTING SERVICES - ELECTRICAL

PROGRAM STAUXR4.1

VERSION OF JULY 1994

CALCULATION NUMBER

3CA20

case # 3

DATA FILE

V2.93.1

PREPARED BY: TOM SIMS DATE 9/ 5/95

REVIEWED BY: Larry Wall DATE 9, 11, 95

PROGRAM VALIDATED ON --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	109EB	9.7	2
DN3000	FAF4	9.7	2
DN3000	13056	9.7	1
DN330	707A	9.7	2
DN330	704E	9.7	1
DN3000	39EBB	9.7	1

MACHINE USED FOR THIS RUN --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	39EBB	9.7	1

NOTE: PROGRAM DOCUMENTED AND VERIFIED IN ACCORDANCE WITH APPLICABLE STANDARDS AND PROCEDURES AND MAINTAINED AS QC DOCUMENT #P1239300101.

THE FOLLOWING IS A LIST OF SYSTEM BUSSES

NUMBER	NAME	VOLTAGE	NUMBER	NAME	VOLTAGE
1	230 KV SYSTEM	230000.	56	BATT CHGR ANDSICA	480.
2		0.	57	480V MCC ANAG	480.
3		0.	58	AMMON STR XFR PMP MTR	480.
4		0.	59	LS.120V PNL ANTG1	120.
5		0.	60	480V MCC ANBK	480.
6		0.	61	LIQ NIT CRYO PMP MTR	480.
7		0.	62	LS.120V PNL ANTK1	120.
8		0.	63	HS.480V SWGR ANB09	4160.
9		0.	64	LS.480V SWGR ANB09	480.
10		0.	65	480V MCC-M2 MAINT BLDG	480.
11	INNER BUS RAT 2NXRA	230000.	66	HS.480V SWGR ANB10	4160.
12	X-W RAT 2NXRA	13800.	67	LS.480V SWGR ANB10	480.
13	Y-W RAT 2NXRA	4160.	68	480V MCC-M1 MAINT BLDG	480.
14	INNER BUS RAT 2NXRB	230000.	69	HS.480V SWGR ANB06A	4160.
15	X-W RAT 2NXRB	13800.	70	LS.480V SWGR ANB06A	480.
16	Y-W RAT 2NXRB	4160.	71	DEGAS VAC PMP #6	480.
17	13.8 KV BUS 2NAA	13800.	72	DEGAS VAC PMP #5	480.
18	13.8 KV BUS 2NAB	13800.	73	UTIL WTR BOOSTER PMP	480.
19		0.	74	480V MCC ANBE	480.
20	CONDUCTOR BUS 20	4160.	75	DEG XFMR PMP #10	480.
21	CONDUCTOR BUS 21	4160.	76	LS.120V PNL ANTE1	120.
22	CONDUCTOR BUS 22	4160.	77	HS.480V SWGR 2NB28	4160.
23	CONDUCTOR BUS 23	4160.	78	LS.480V SWGR 2NB28	480.
24	CONDUCTOR BUS 24	4160.	79	480V MCC 2NBW	480.
25	4.16KV SWGR 2NA05	4160.	80	LS.120V PNL 2NYW1	120.
26	4.16KV SWGR 2NA01	4160.	81	480V MCC 2NBY	480.
27	4.16KV SWGR 2NA04	4160.	82	LS.120V PNL 2NYY1	120.
28	4.16KV SWGR 2AA02 2-18	4160.	83	480V MCC 2NBU	480.
29	4.16KV SWGR 2BA03	4160.	84	LS.120V PNL 2NYU1	120.
30	RCP #1 (HOT)	13800.	85	HS.480V SWGR 2NB17	4160.
31	RCP #3 (HOT)	13800.	86	LS.480V SWGR 2NB17	480.
32	COND PMP #1	13800.	87	BATT CHGR 2ND3BCB	480.
33	COND PUMP #2	13800.	88	BATT CHGR 2ND3ACB	480.
34	CWP #2	13800.	89	480V MCC 2NBG	480.
35	RCP #2 (HOT)	13800.	90	D/G ELEC TUNNEL SUMP PMP	480.
36	RCP #4 (HOT)	13800.	91	LS.120V PNL 2NYG1	120.
37	COND PMP #3	13800.	92	480V MCC 2NBQ	480.
38	CWP #1	13800.	93	AUX FDW SUMP PMP	480.
39	HTR DRN PMP-A	4160.	94	LS.120V PNL 2NYQ1	120.
40	TURB PLT CWTR PMP	4160.	95	HS.480V SWGR 2NB12	4160.
41	4.16KV SWGR ANA02	4160.	96	LS.480V SWGR 2NB12	480.
42	LS.4.16V WELL PMP HSE #1	4160.	97	GEN STATOR CLR PMP	480.
43	MAKE-UP WTR WELL #1 PMP	4160.	98	480V MCC 2NBN	480.
44	HS.480V MCC CNBJ WELL PM	4160.	99	TB EXH FAN #1	480.
45	LS.480V MCC CNBJ WELL PM	480.	100	LS.120V PNL 2NTM1	120.
46	HS.480V SWGR CNB01	4160.	101	LS.120V PNL 2NTM2	120.
47	LS.480V SWGR CNB01	480.	102	480V MCC 2NBD	480.
48	MCC-A1 ADMIN BLDG	480.	103	TB SUPPLY FAN #23	480.
49	MCC-A2 ADMIN BLDG	480.	104	LS.120V PNL 2NYD1	120.
50	MCC-A3 ADM BLDG	480.	105	HS.480V SWGR 2NB09	4160.
51	CHILLER #2	480.	106	LS.480V SWGR 2NB09	480.
52	HS.480V SWGR ANB02	4160.	107	CTB AUX CLG FAN #2	480.
53	LS.480V SWGR ANB02	480.	108	CONT BLDG A/C FAN MTR #2	480.
54	WST WTR RET XFR PMP	480.	109	ROD DRIVE MG SET	480.
55	WST WTR RET XFR PMP	480.	110	480V MCC 2NBF	480.

NUMBER	NAME	VOLTAGE
111	MINI PURGE FAN	480.
112	LS.120V PNL 2NYP1	120.
113	HS.480V SWGR 2NB03	4160.
114	LS.480V SWGR 2NB03	480.
115	EHC HYDR FLD PMP B MTR	480.
116	TPCW PMP MTR	480.
117	AIR COMPR #1 MTR	480.
118	480V MCC 2NBH	480.
119	TB SWGR RM LVL2 VENT FAN	480.
120	LS.120V PNL 2NTN1	120.
121	480V MCC 2NBL	480.
122	MAIN TURB LOP	480.
123	LS.120V PNL 2NTL1	120.
124	HS.480V SWGR ANB14	4160.
125	LS.480V SWGR ANB14	480.
126	FHB NORM A/C MTR #2	480.
127	FHB EXH FLTR MTR #2	480.
128	NORM CHLR WTR PMP MTR	480.
129	480V MCC ANBF	480.
130	CB CR RTN & EXH FAN MTR	480.
131	LS.120V PNL ANYP1	120.
132	HS.480V SWGR 2NBL2	4160.
133	LS.480V SWGR 2NBL2	480.
134	HS.480V SWGR 2NBL1	4160.
135	LS.480V SWGR 2NBL1	480.
136	HS.480V SWGR 2NB27	4160.
137	LS.480V SWGR 2NB27	480.
138	AUX BLDG A/C #2	480.
139	480V MCC 2NBEA	480.
140	DEGAS XFR PMP MOT	480.
141	LS.120V PNL 2NYKA1	120.
142	480V MCC 2NBJ	480.
143	CVCS CHIL PMP #4	480.
144	LS.120V PNL 2NYJ1	120.
145	HS.480V SWGR 2NB26	4160.
146	LS.480V SWGR 2NB26	480.
147	CVCS CHLR #9	480.
148	AUX BLDG A/C FAN #1	480.
149	HS.480V SWGR 2NB21	4160.
150	LS.480V SWGR 2NB21	480.
151	AUX BLDG EXH FAN #2	480.
152	480V MCC 2NBH	480.
153	SPENT RESIN SLUICE PMP M	480.
154	LS.120V PNL 2NYN1	120.
155	HS.480V SWGR 2NB20	4160.
156	LS.480V SWGR 2NB20	480.
157	AUX BLDG EXH FAN #1	480.
158	AUX BLDG EXH FAN #3	480.
159	480V MCC 2NBK	480.
160	WASTE MONITOR TK PMP	480.
161	LS.120V PNL 2NYK1	120.
162	HS.480V SWGR ANB28	4160.
163	LS.480V SWGR ANB28	480.
164	CVCS CHLR #8	480.
165	AUX BLDG ELEV #1	480.
166	480V MCC ANBD	480.
167	WASTE MONT. TK. PMP MOT	480.
168	LS.120V PNL ANYD1	120.
169	480V MCC ANBH	480.
170	WASTE MON TK PMP MTR	480.
171	LS.120V PNL ANYE1	120.
172	RTR DRN PMP-B	480.
173	NORM WTR CHL MTR	4160.
174	TURB PLT CWTR PMP MTR	4160.
175	4.16KV SWGR ANA01AAB	4160.
176	RVR MAKE-UP WTR PMP #6	4160.
177	RVR MAKE-UP WTR PMP #5	4160.
178	RVR MAKE-UP WTR PMP #3	4160.
179	HS.INTAKE STRUCT XFMR AN	4160.
180	LS.INTAKE STRUCT XFMR AN	480.
181	480V MCC ANBG	480.
182	BATT CHGR ANBG	480.
183	HS.INTAKE STRUCT XFMR AN	4160.
184	LS.INTAKE STRUCT XFMR AN	480.
185	480V MCC ANBA	480.
186	BATT CHGR ANBA	480.
187	LS.120V PNL ANYA1	120.
188	4.16KV SWGR ANA03	4160.
189	LS.4.16V WELL PMP ESE #2	4160.
190	M/U WELL PMP #2	4160.
191	HS.480V MCC CNBE	4160.
192	LS.480V MCC CNBE	480.
193	SG.480V MCC CNBE	480.
194	HS.480V SWGR ANB06B WTR	4160.
195	LS.480V SWGR ANB06B WTR	480.
196	UTL WTR BOOSTER PMP #1	480.
197	DEGAS VAC PMP #7	480.
198	480V MCC ANBB	480.
199	D.B. PMP MTR	480.
200	LS.120V ANYB1 DIST PNL X	120.
201	HS.480V SWGR ANB05	4160.
202	LS.480V SWGR ANB05	480.
203	480V MCC P1 PROD WBSE	480.
204	480V MCC P2 PROD WBSE	480.
205	HS.480V SWGR ANB03	4160.
206	LS.480V SWGR ANB03	480.
207	BATT CHGR ANDS1CB	480.
208	480V MCC ANBJ #1	480.
209	FPE JOCK PMP #1	480.
210	LS.120V PNL ANYJ1	208.
211	480V MCC CNBG	480.
212	LS.120V PNL CNYG1	120.
213	480V MCC CNBF	480.
214	POT WTR BOOSTER PMP	480.
215	LS.120V PNL CNYF1	120.
216	HS.480V SWGR ANB04	4160.
217	LS.480V SWGR ANB04	480.
218	WATERCHILLER WC-1	480.
219	480V MCC S1	480.
220	HS.480V SWGR ANB00	4160.

NUMBER	NAME	VOLTAGE
221	LS.480V SWGR ANB08	480.
222	WATERCHILLER WC-2	480.
223	480V MCC S2 SVCE BLDG	480.
224	LS.TELECOMM P/L CUB 5D	120.
225	HS.480V SWGR ANB11 PESB	4160.
226	LS.480V SWGR ANB11 PESB	480.
227	FER LTB PNL ANLP102	480.
228	480V MCC ANBL	480.
229	BAT CHGR ANDPCB	480.
230	HS.480V MCC ANBU TE	480.
231	LS.480V MCC ANBU TE	480.
232	SG.480V MCC ANBU TE	480.
233	BAT CHGR ANDTCA	480.
234	HS.480V SWGR 2NBL2	4160.
235	LS.480V SWGR 2NBL2	480.
236	HS.480V SWGR 2NBL1	4160.
237	LS.480V SWGR 2NBL1	480.
238	HS.480V SWGR ANB13	4160.
239	LS.480V SWGR ANB13	480.
240	NORM CHLR WTR PMP MTR	480.
241	FHB NORM EXH FLTR MTR	480.
242	FHB NORM A/C FAN MTR	480.
243	480V MCC ANBC	480.
244	CB CR RTN & EXH FAN	480.
245	LS.120V PNL ANYC1	120.
246	HS.480V SWGR ANB30	4160.
247	LS.480V SWGR ANB30	480.
248	HORN CHLD WTR PP	480.
249	CB SERV NORM EXH RET FAN	480.
250	CRCR A/C UNIT FAN	480.
251	480V MCC ANBN	480.
252	CB SHK EXH FAN	480.
253	LS.120V PNL ANYN1	120.
254	HS.480V SWGR 2NB02	4160.
255	LS.480V SWGR 2NB02	480.
256	VAC PMP MTR #4	480.
257	HYDR FLUID PMP	480.
258	TPCW PMP #1	480.
259	480V MCC 2NBC	480.
260	TB SUP FAN	480.
261	LS.120V PNL 2NYC1	120.
262	HS.480V SWGR 2NB08	4160.
263	LS.480V SWGR 2NB08	480.
264	CTB AUX CLG FAN #1	480.
265	CB WING AC UNIT #1	480.
266	ROD DRIVE MG SET	480.
267	480V MCC 2NBE	480.
268	CB DRN SUMP PMP	480.
269	LS.120V PNL 2NYE1	120.
270	HS.480V SWGR 2NB11	4160.
271	LS.480V SWGR 2NB11	480.
272	GEN STATOR CLG PMP-B	480.
273	AIR COMPR "2"	480.
274	BATT CHGR 2ND2CB	480.
275	480V MCC 2NBP	480.
276	STM GEN LAYUP PMP	480.
277	LS.120V PNL 2NYP1	120.
278	480V MCC 2NBB	480.
279	CWB DR PMP #5	480.
280	LS.120V PNL 2NYB1	120.
281	HS.480V SWGR 2NB19	4160.
282	LS.480V SWGR 2NB19	480.
283	AIR COMPR 3 MTR	480.
284	480V MCC 2NBA	480.
285	TB SUP FAN #27	480.
286	LS.120V PNL 2NYA1	120.
287	480V CTMT BREATHING AIR	480.
288	HS.480V SWGR 2NB25	4160.
289	LS.480V SWGR 2NB25	480.
290	480V MCC ANBT	480.
291	ACID XFR PMP	480.
292	LS.120V PNL ANYT1	120.
293	480V MCC ANBV D	480.
294	480V MCC 2NBT	480.
295	LS.120V PNL 2NYT1	120.
296	HS.480V SWGR 2NB29	4160.
297	LS.480V SWGR 2NB29	480.
298	480V MCC 2NBV	480.
299	LS.120V PNL 2NYV1	120.
300	480V MCC 2NBX	480.
301	LS.120V PNL 2NYX1	120.
302	480V MCC 2NBE	480.
303	TB EE VENT FAN	480.
304	LS.120V PNL 2NYS1	120.
305	(S5A) CCW PMP MTR #3	4160.
306	(S5A) CCW PMP MTR #1	4160.
307	(S6A) NSCW PMP #3	4160.
308	(S7A) NSCW PMP #5 SPARE	4160.
309	(S8A) CB ESF CHLR #1	4160.
310	(S1E) CVCS CCP #2	4160.
311	(A) ACCW PMP #I	4160.
312	(S5A) AUX FDWTR PMP #3	4160.
313	HS.480V SWGR 2AB15	4160.
314	LS.480V SWGR 2AB15	480.
315	(S8A) NSCW CTWR FAN #1	480.
316	(S8A) NSCW CTWR FAN #2	480.
317	(S8A) NSCW CTWR FAN #3	480.
318	(S8A) NSCW CTWR FAN #4	480.
319	(A) SPT FUEL PIT PMP #2	480.
320	480V MCC 2ABB	480.
321	(A) NSCW CTWR XFER PMP #	480.
322	(S1A) ESF PMP RM CLR #17	480.
323	(S1A) TB TUNNEL FAN #5	480.
324	(S1A) NSCW TWR TUNNEL FA	480.
325	(S1A) ELEC MCC RM CLR	480.
326	(S1A) CCW PMP RM CLR	480.
327	LS.120V 2AYB1 DIST PNL X	120.
328	480V MCC 2ABD	480.
329	(S1A) SIS PMP RM CLR #15	480.
330	(S1A) BORIC ACID XFER PM	480.

NUMBER	NAME	VOLTAGE
331	(S1A) ELEC MCC RM CLR #1	480.
332	(S1A) CHRG PMP RM CLR	480.
333	(S1A) CTMT SPRAY RM CLR	480.
334	(S1A) RHR RM CLR	480.
335	(S1A) ELEC SWGR & MCC RM	480.
336	LS.120V 2AYD1 DIST PNL X	120.
337	HS.480V SWGR 2AB05	4160.
338	LS.480V SWGR 2AB05	480.
339	(S8A) DGB VENT FAN #1	480.
340	(S8A) DGB VENT FAN #3	480.
341	480V MCC 2ABA	480.
342	(S8A) CB ESF CHILL WTR P	480.
343	(S1A) CB NORM AC #5	480.
344	(S1A) CB CR CHLR RM VENT	480.
345	(S8A) CB ESS CHLR PKG	480.
346	BAT CHGR 2AD1CA	480.
347	BAT CHGR 2CD1CB	480.
348	LS.120V 2AYA1 DIST PNL	120.
349	480V MCC 2ABC	480.
350	(S1A) CBSF BATT RM EXH F	480.
351	(S1A) CBSF BATT RM EXH F	480.
352	(S1A) CBSF ELEC EQUIP RM	480.
353	(S1A) CB AUX RELAY RM AC	480.
354	LS.120V 2AYC1 DIST PNL X	120.
355	480V MCC 2ABF	480.
356	(S1A) AFWP HSE FAN #1	480.
357	(S1A) DSL TUNNEL 2T4A VE	480.
358	(S1A) DSL OIL STORAGE TK	480.
359	(S1A) DSL OIL STORAGE TK	480.
360	LS.120V 2AYF1 DIST PNL X	120.
361	HS.480V SWGR 2AB04	4160.
362	LS.480V SWGR 2AB04	480.
363	(A) CTMT CCU #1 (HS)	480.
364	(A) CTMT CCU #2 (HS)	480.
365	(A) CTMT CCU #5 (HS)	480.
366	(A) CTMT CCU #6 (HS)	480.
367	480V MCC 2ABE	480.
368	(S1A) CTB POST LOCA CAV	480.
369	BAT CHGR 2CD1CA	480.
370	BAT CHGR 2AD1CB	480.
371	HS.480V SWGR 2NB01	4160.
372	LS.480V SWGR 2NB01	480.
373	BAT CHGR 2ND3ACA	480.
374	BAT CHGR 2ND1CA	480.
375	480V MCC 2NB8	480.
376	CTB RX SUPP COOL MTR #1	480.
377	LS.120V PNL 2NYS1	120.
378	480V MCC 2NBI	480.
379	LUBE OIL CIRC PMP	480.
380	LS.120V PNL 2NYI1	120.
381	(S5B) CCW PMP MTR #4	4160.
382	(S6B) CCW PMP MTR #6 (SP	4160.
383	(S6B) NSCW PMP #2	4160.
384	(S7B) NSCW PMP #6 (SPARE	4160.
385	(S8B) CB ESF CHLR #2	4160.
386	(S1Y) CVCS CCP #3	4160.
387	(B) ACCW PMP #7 (SPARE)	4160.
388	(S5B) AUX FDWTR PMP #2	4160.
389	HS.480V SWGR 2BB06	4160.
390	LS.480V SWGR 2BB06	480.
391	(B) CTMT CCU #3 (HS)	480.
392	(B) CTMT CCU #4 (HS)	480.
393	(B) CTMT CCU #7 (HS)	480.
394	(B) CTMT CCU #8 (HS)	480.
395	480V MCC 2BBE	480.
396	(S1B) CTB POST LOCA CAV	480.
397	BATT CHRG3 2DD1CB	480.
398	BATT CHRGR 2BD1CB	480.
399	LS.120V 2BYE1 DIST PNL X	120.
400	HS.480V SWGR 2BB07	4160.
401	LS.480V SWGR 2BB07	480.
402	(S8B) DGB VENT FAN #2	480.
403	(S8B) DGB VENT FAN #4	480.
404	480V MCC 2BBA	480.
405	(S1B) CB CR CHLR RM VENT	480.
406	(S8B) CB ESF CHLD WTR PM	480.
407	(S1B) CB AUX RLY RM AC U	480.
408	(S8B) CB ESS CHLR PKG	480.
409	BATT CHRGR 2BD1CA	480.
410	BATT CHRGR 2DD1CA	480.
411	LS.120V 2BYA1 DIST PNL X	120.
412	480V MCC 2BBC	480.
413	(S1B) CB SF BATT RM EXH	480.
414	(S1B) CB SF BATT RM EXH	480.
415	(S1B) CB SF ELEC EQ RM A	480.
416	480V MCC 2BBF	480.
417	(S1B) AFW PP HSE FAN #2	480.
418	(S1B) DSL TNL 2T4B VENT	480.
419	LS.120V 2BYF1 DIST PNL X	120.
420	HS.480V SWGR 2BB16	4160.
421	LS.480V SWGR 2BB16	480.
422	(S8B) NSCW CTWR FAN #1	480.
423	(S8B) NSCW CTWR FAN #2	480.
424	(S8B) NSCW CTWR FAN #3	480.
425	(S8B) NSCW CTWR FAN #4	480.
426	(B) SFP FUEL PIT PMP	480.
427	480V MCC 2BBB	480.
428	(S1B) ELEC MCC RM CLR #6	480.
429	(S1B) CCW PMP RM CLR #12	480.
430	(S1B) SFP PMP RM CLR #18	480.
431	(B) NSCW XFR PMP #7	480.
432	(S1B) NSCW TWR TUNNEL FA	480.
433	LS.120V 2BYB1 DIST PNL X	120.
434	480V MCC 2BBD	480.
435	(S1B) BORIC ACID XFER PM	480.
436	(S1B) ELEC MCC RM CLR #2	480.
437	(S1B) CS PMP RM CLR #10	480.
438	(S1B) RHR PMP RM CLR #8	480.
439	(S1B) CHRG PMP RM CLR	480.
440	(S1B) SIS PMP RM CLR	480.

NUMBER	NAME	VOLTAGE
441	(S1B) ELEC SWGR & MCC RM	480.
442	LS.120V 2BYD1 DIST PNL X	120.
443	HS.480V SWGR 2AB10	4160.
444	LS.480V SWGR 2NB10	480.
445	BATT CHRGR 2ND3BCA	480.
446	BATT CHRGR ANDCCB	480.
447	TURNING GEAR XFR SW.	480.
448	480V MCC 2NBO	480.
449	JKT WTR CIRC PMP	480.
450	LS.120V 2NY06 DIST PNL X	120.
451	480V MCC 2NBR	480.
452	RESTRAINT VENT FAN #9	480.
453	LS.120V 2NYR1 DIST PNL X	120.
454	TAP BUS 1	0.
455	TAP BUS 2	0.

STUDY ASSUMPTIONS

1. AUXILIARY SYSTEM CONNECTION TO BE STUDIED - NM/SP-A/B
2. SYSTEM TO BE STUDIED - 'AS-BUILT'
3. CABLE RESISTANCE CALCULATED AT 90.0 DEGREES C
4. MVSG OR DUMBUS LOADING

BUS NO.	BUS NAME		LOADING
17	13.8 KV BUS 2NAA		MAXIMUM
18	13.8 KV BUS 2NAB		MAXIMUM
26	4.16KV SWGR 2NA01		MAXIMUM
25	4.16KV SWGR 2NA05		MAXIMUM
27	4.16KV SWGR 2NA04		MAXIMUM
28	4.16KV SWGR 2AA02	2-18	MAXIMUM
29	4.16KV SWGR 2BA03		MAXIMUM

LOAD FLOW STUDY ASSUMPTIONS

1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) - 100.00% ON A 230000. VOLT BASE
2. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
3. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.005000%

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.
28	4.16KV SWGR 2AA02 2-18	95.51	-4.4	4160.	0.	0.	1162.	560.
	MINIMUM VOLTAGE LIMIT	93.10						

LINE FLOWS

TO BUS NUMBER	BUS NAME	CURRENT(AMPS) MAG.	ANGLE
21	CONDUCTOR BUS 21	735.4	148.1
305	(B5A) CCW PMP MTR #3	40.3	-32.3
306	(B5A) CCW PMP MTR #1	40.3	-32.3
307	(B6A) NSCW PMP #3	94.8	-31.6
308	(B7A) NSCW PMP #5 SP	94.8	-31.6
309	(B8A) CB ESF CHLR #1	51.6	-29.3
310	(B1X) CVCS CCP #2	87.8	-26.6
311	(A) ACCW PMP #1	75.7	-26.5
312	(B5A) AUX FDWTR PMP	119.1	-26.3
313	BS.480V SWGR 2AB15	51.2	-17.3
337	BS.480V SWGR 2AB05	48.0	-45.3
361	BS.480V SWGR 2AB04	91.3	-44.5
371	BS.480V SWGR 2NB01	136.1	-26.6

LOAD FLOW STUDY ASSUMPTIONS

1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) = 105.000 ON A 230000. VOLT BASE
2. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
3. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.0050004

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION MW	KVAR.
28	4.16KV SWGR 2AA02 2-18	100.58	-4.3	4160.	0.	0.	1162.	560.
	MINIMUM VOLTAGE LIMIT	93.10						

TO BUS NUMBER	BUS NAME	LINE FLOWS CURRENT(AMPS) MAG.	ANGLE
21	CONDUCTOR BUS 21	707.2	148.6
305	(S5A) CCW PMP MTR #3	38.3	-32.1
306	(S5A) CCW PMP MTR #1	38.3	-32.1
307	(S6A) NSCW PMP #3	89.2	-31.4
308	(S7A) NSCW PMP #5 SP	89.2	-31.4
309	(S8A) CB ESF CHLR #1	49.0	-29.2
310	(S1X) CVCS CCP #2	82.6	-26.5
311	(A) ACCW PMP #T	71.8	-26.3
312	(S5A) AUX FDWTR PMP	113.1	-26.2
313	RS.480V SWGR 2AB15	48.6	-37.0
337	RS.480V SWGR 2AB05	45.9	-45.0
361	RS.480V SWGR 2AB04	86.3	-44.1
371	RS.480V SWGR 2NB01	138.3	-25.6

	CURRENT VALUE	PROGRAM LIMIT
NUMBER OF BUSES	455	700
NUMBER OF LOAD FLOW LINES	443	1425
NUMBER OF HELD MOTORS	203	400
NUMBER OF MVSGs + DUMBUSes	7	20
NUMBER OF SWITCHGEAR	179	300

SOUTHERN COMPANY SERVICES STATION AUXILIARY DESIGN PROGRAM

DATE : 9/ 5/95 TIME :13:27:41

CONSULTING AND TESTING SERVICES - ELECTRICAL

PROGRAM STAUXR4.1

VERSION OF JULY 1994

CALCULATION NUMBER

X3CA20

Case #4

DATA FILE

V2.93.1

PREPARED BY: TOM SIMS DATE 9/ 5/95

REVIEWED BY: Larry Wall DATE 9, 11, 95

PROGRAM VALIDATED ON --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	109EB	9.7	2
DN3000	FAP4	9.7	2
DN3000	13056	9.7	1
DN330	707A	9.7	2
DN330	704E	9.7	1
DN3000	39EBB	9.7	1

MACHINE USED FOR THIS RUN --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	39EBB	9.7	1

NOTE: PROGRAM DOCUMENTED AND VERIFIED IN ACCORDANCE WITH APPLICABLE STANDARDS AND PROCEDURES AND MAINTAINED AS QC DOCUMENT #F1239300101.

THE FOLLOWING IS A LIST OF SYSTEM BUSSES

NUMBER	NAME	VOLTAGE
1	230 KV SYSTEM	230000.
2		0.
3		0.
4		0.
5		0.
6		0.
7		0.
8		0.
9		0.
10		0.
11	INNER BUS RAT 2NXRA	230000.
12	X-W RAT 2NXRA	13800.
13	Y-W RAT 2NXRA	4160.
14	INNER BUS RAT 2NXRB	230000.
15	X-W RAT 2NXRB	13800.
16	Y-W RAT 2NXRB	4160.
17	13.8 KV BUS 2NAA	13800.
18	13.8 KV BUS 2NAB	13800.
19		0.
20	CONDUCTOR BUS 20	4160.
21	CONDUCTOR BUS 21	4160.
22	CONDUCTOR BUS 22	4160.
23	CONDUCTOR BUS 23	4160.
24	CONDUCTOR BUS 24	4160.
25	4.16KV SWGR 2NA05	4160.
26	4.16KV SWGR 2NA01	4160.
27	4.16KV SWGR 2NA04	4160.
28	4.16KV SWGR 2AA02 2-18	4160.
29	4.16KV SWGR 2BA03	4160.
30	RCP #1 (HOT)	13800.
31	RCP #3 (HOT)	13800.
32	COND PMP #1	13800.
33	COND PUMP #2	13300.
34	CWP #2	13800.
35	RCP #2 (HOT)	13800.
36	RCP #4 (HOT)	13800.
37	COND PMP #3	13800.
38	CWP #1	13800.
39	HTR DRN PMP-A	4160.
40	TURB PLT CWTR PMP	4160.
41	4.16KV SWGR ANA02	4160.
42	LS.4.16V WELL PMP HSE #1	4160.
43	MAKE-UP WTR WELL #1 PMP	4160.
44	HS.480V MCC CNBJ WELL PM	4160.
45	LS.480V MCC CNBJ WELL PM	480.
46	HS.480V SWGR CNB01	4160.
47	LS.480V SWGR CNB01	480.
48	MCC-A1 ADMIN BLDG	480.
49	MCC-A2 ADMIN BLDG	480.
50	MCC-A3 ADM BLDG	480.
51	CHILLER #2	480.
52	HS.480V SWGR ANB02	4160.
53	LS.480V SWGR ANB02	480.
54	WST WTR RET XFR PMP	480.
55	WST WTR RET XFR PMP	480.
56	BATT CHGR ANDSICA	480.
57	480V MCC ANBG	480.
58	AMMON STR XFR PMP MTR	480.
59	LS.120V PNL ANYG1	120.
60	480V MCC ANBK	480.
61	LIQ NIT CRYO PMP MTR	480.
62	LS.120V PNL ANYK1	120.
63	HS.480V SWGR ANB09	4160.
64	LS.480V SWGR ANB09	480.
65	480V MCC-M2 MAINT BLDG	480.
66	HS.480V SWGR ANB10	4160.
67	LS.480V SWGR ANB10	480.
68	480V MCC-M1 MAINT BLDG	480.
69	HS.480V SWGR ANB06A	4160.
70	LS.480V SWGR ANB06A	480.
71	DEGAS VAC PMP #6	480.
72	DEGAS VAC PMP #5	480.
73	UTIL WTR BOOSTER PMP	480.
74	480V MCC ANBE	480.
75	DEG XFMR PMP #10	480.
76	LS.120V PNL ANYE1	120.
77	HS.480V SWGR 2NB28	4160.
78	LS.480V SWGR 2NB28	480.
79	480V MCC 2NBW	480.
80	LS.120V PNL 2NYW1	120.
81	480V MCC 2NBY	480.
82	LS.120V PNL 2NYY1	120.
83	480V MCC 2NBU	480.
84	LS.120V PNL 2NYU1	120.
85	HS.480V SWGR 2NB17	4160.
86	LS.480V SWGR 2NB17	480.
87	BATT CHGR 2ND3BCB	480.
88	BATT CHGR 2ND3ACB	480.
89	480V MCC 2NBG	480.
90	D/G ELEC TUNNEL SUMP PMP	480.
91	LS.120V PNL 2NYG1	120.
92	480V MCC 2NBQ	480.
93	AUX FDW SUMP PMP	480.
94	LS.120V PNL 2NYQ1	120.
95	HS.480V SWGR 2NB12	4160.
96	LS.480V SWGR 2NB12	480.
97	GEN STATOR CLR PMP	480.
98	480V MCC 2NBM	480.
99	TB EXH FAN #1	480.
100	LS.120V PNL 2NYM1	120.
101	LS.120V PNL 2NYM2	120.
102	480V MCC 2NBD	480.
103	TB SUPPLY FAN #23	480.
104	LS.120V PNL 2NYD1	120.
105	HS.480V SWGR 2NB09	4160.
106	LS.480V SWGR 2NB09	480.
107	CTB AUX CLG FAN #2	480.
108	CONT BLDG A/C FAN MTR #2	480.
109	ROD DRIVE MG SET	480.
110	480V MCC 2NBF	480.

NUMBER	NAME	VOLTAGE
111	MINI PURGE FAN	480.
112	LS.120V PNL 2NYP1	120.
113	HS.480V SWGR 2NB03	4160.
114	LS.480V SWGR 2NB03	480.
115	EHC HYDR FLD PMP B MTR	480.
116	TPCW PMP MTR	480.
117	AIR COMPR #1 MTR	480.
118	480V MCC 2NBN	480.
119	TB SWGR RM LVL2 VENT FAN	480.
120	LS.120V PNL 2NYN1	120.
121	480V MCC 2NBL	480.
122	MAIN TURB LOP	480.
123	LS.120V PNL 2NYL1	120.
124	HS.480V SWGR ANB14	4160.
125	LS.480V SWGR ANB14	480.
126	FHB NORM A/C MTR #2	480.
127	FHB EXH FLTR MTR #2	480.
128	NORM CHLR WTR PMP MTR	480.
129	480V MCC ANBP	480.
130	CB CR RTN & EXH FAN MTR	480.
131	LS.120V PNL ANTF1	120.
132	HS.480V SWGR 2NBL2	4160.
133	LS.480V SWGR 2NBL2	480.
134	HS.480V SWGR 2NBL1	4160.
135	LS.480V SWGR 2NBL1	480.
136	HS.480V SWGR 2NB27	4160.
137	LS.480V SWGR 2NB27	480.
138	AUX BLDG A/C #2	480.
139	480V MCC 2NBEA	480.
140	DEGAS XFR PMP MOT	480.
141	LS.120V PNL 2NYEA1	120.
142	480V MCC 2NBJ	480.
143	CVCS CHIL PMP #4	480.
144	LS.120V PNL 2NYJ1	120.
145	HS.480V SWGR 2NB26	4160.
146	LS.480V SWGR 2NB26	480.
147	CVCS CHLR #9	480.
148	AUX BLDG A/C FAN #1	480.
149	HS.480V SWGR 2NB21	4160.
150	LS.480V SWGR 2NB21	480.
151	AUX BLDG EXH FAN #2	480.
152	480V MCC 2NBS	480.
153	SPENT RESIN SLUICE PMP M	480.
154	LS.120V PNL 2NYE1	120.
155	HS.480V SWGR 2NB20	4160.
156	LS.480V SWGR 2NB20	480.
157	AUX BLDG EXH FAN #1	480.
158	AUX BLDG EXH FAN #3	480.
159	480V MCC 2NBK	480.
160	WASTE MONITOR TK PMP	480.
161	LS.120V PNL 2NYK1	120.
162	HS.480V SWGR ANB28	4160.
163	LS.480V SWGR ANB28	480.
164	CVCS CHLR #8	480.
165	AUX BLDG ELEV #1	480.
166	480V MCC ANBD	480.
167	WASTE MONT. TK. PMP MOT	480.
168	LS.120V PNL ANYD1	120.
169	480V MCC ANBB	480.
170	WASTE MON TK PMP MTR	480.
171	LS.120V PNL ANYE1	120.
172	HTR DRN PMP-B	480.
173	NORM WTR CHL MTR	4160.
174	TURB PLT CWTR PMP MTR	4160.
175	4.16KV SWGR ANA01A&B	4160.
176	RVR MAKE-UP WTR PMP #6	4160.
177	RVR MAKE-UP WTR PMP #5	4160.
178	RVR MAKE-UP WTR PMP #3	4160.
179	HS.INTAKE STRUCT XFMR AN	4160.
180	LS.INTAKE STRUCT XFMR AN	480.
181	480V MCC ANBS	480.
182	BATT CHGR ANBS	480.
183	HS.INTAKE STRUCT XFMR AN	4160.
184	LS.INTAKE STRUCT XFMR AN	480.
185	480V MCC ANBA	480.
186	BATT CHGR ANBA	480.
187	LS.120V PNL ANYA1	120.
188	4.16KV SWGR ANA03	4160.
189	LS.4.16V WELL PMP HSL #2	4160.
190	M/U WELL PMP #2	4160.
191	HS.480V MCC CNBK	4160.
192	LS.480V MCC CNBK	480.
193	SG.480V MCC CNBK	480.
194	HS.480V SWGR ANB06B WTR	4160.
195	LS.480V SWGR ANB06B WTR	480.
196	UTL WTR BOOSTER PMP #1	480.
197	DEGAS VAC PMP #7	480.
198	480V MCC ANBB	480.
199	D.B. PMP MTR	480.
200	LS.120V ANYB1 DIST PNL X	120.
201	HS.480V SWGR ANB05	4160.
202	LS.480V SWGR ANB05	480.
203	480V MCC P1 PROD WBSZ	480.
204	480V MCC P2 PROD WBSZ	480.
205	HS.480V SWGR ANB03	4160.
206	LS.480V SWGR ANB03	480.
207	BATT CHGR ANDS1CB	480.
208	480V MCC ANBJ #1	480.
209	FPH JOCK PMP #1	480.
210	LS.120V PNL ANYJ1	208.
211	480V MCC CNBG	480.
212	LS.120V PNL CNYG1	120.
213	480V MCC CNBF	480.
214	POT WTR BOOSTER PMP	480.
215	LS.120V PNL CNYF1	120.
216	HS.480V SWGR ANB04	4160.
217	LS.480V SWGR ANB04	480.
218	WATERCHILLER WC-1	480.
219	480V MCC S1	480.
220	HS.480V SWGR ANB08	4160.

NUMBER	NAME	VOLTAGE
221	LS.480V SWGR ANB08	480.
222	WATERCHILLER WC-2	480.
223	480V MCC S2 SVCE BLDG	480.
224	LS.TELECOMM PNL CUB 5D	120.
225	HS.480V SWGR ANB11 PESB	4160.
226	LS.480V SWGR ANB11 PESB	480.
227	PER LTB PNL ANLP102	480.
228	480V MCC ANBL	480.
229	BAT CHGR ANDPCB	480.
230	HS.480V MCC ANBU TE	480.
231	LS.480V MCC ANBU TE	480.
232	SG.480V MCC ANBU TE	480.
233	BAT CHGR ANDTCA	480.
234	HS.480V SWGR 2NBL2	4160.
235	LS.480V SWGR 2NBL2	480.
236	HS.480V SWGR 2NBL1	4160.
237	LS.480V SWGR 2NBL1	480.
238	HS.480V SWGR ANB13	4160.
239	LS.480V SWGR ANB13	480.
240	NORM CHLR WTR PMP MTR	480.
241	FHB NORM EXH FLTR MTR	480.
242	FHB NORM A/C FAN MTR	480.
243	480V MCC ANBC	480.
244	CB CR RTN & EXH FAN	480.
245	LS.120V PNL ANYC1	120.
246	HS.480V SWGR ANB30	4160.
247	LS.480V SWGR ANB30	480.
248	NORM CHLD WTR PP	480.
249	CB SERV NORM EXH RET FAN	480.
250	CBCR A/C UNIT FAN	480.
251	480V MCC ANBH	480.
252	CB EMK EXH FAN	480.
253	LS.120V PNL ANYH1	120.
254	HS.480V SWGR 2NB02	4160.
255	LS.480V SWGR 2NB02	480.
256	VAC PMP MTR #4	480.
257	HYDR FLUID PMP	480.
258	TPCW PMP #1	480.
259	480V MCC 2NBC	480.
260	TB SUP FAN	480.
261	LS.120V PNL 2NYC1	120.
262	HS.480V SWGR 2NB08	4160.
263	LS.480V SWGR 2NB08	480.
264	CTB AUX CLG FAN #1	480.
265	CB WING AC UNIT #1	480.
266	ROD DRIVE MG SET	480.
267	480V MCC 2NBE	480.
268	CB DRN SUMP PMP	480.
269	LS.120V PNL 2NYE1	120.
270	HS.480V SWGR 2NB11	4160.
271	LS.480V SWGR 2NB11	480.
272	GEN STATOR CLG PMP-B	480.
273	AIR COMPR "2"	480.
274	BATT CHGR 2ND2CB	480.
275	480V MCC 2NBP	480.
276	STN GEN LAYUP PMP	480.
277	LS.120V PNL 2NYP1	120.
278	480V MCC 2NBB	480.
279	CWB DR PMP #5	480.
280	LS.120V PNL 2NYB1	120.
281	HS.480V SWGR 2NB19	4160.
282	LS.480V SWGR 2NB19	480.
283	AIR COMPR 3 MTR	480.
284	480V MCC 2NBA	480.
285	TB SUP FAN #27	480.
286	LS.120V PNL 2NYA1	120.
287	480V CTMT BREATHING AIR	480.
288	HS.480V SWGR 2NB25	4160.
289	LS.480V SWGR 2NB25	480.
290	480V MCC ANBT	480.
291	ACID XFR PMP	480.
292	LS.120V PNL ANYT1	120.
293	480V MCC ANBV D	480.
294	480V MCC 2NBT	480.
295	LS.120V PNL 2NYT1	120.
296	HS.480V SWGR 2NB29	4160.
297	LS.480V SWGR 2NB29	480.
298	480V MCC 2NBV	480.
299	LS.120V PNL 2NYV1	120.
300	480V MCC 2NBX	480.
301	LS.120V PNL 2NYX1	120.
302	480V MCC 2NBZ	480.
303	TB NE VENT FAN	480.
304	LS.120V PNL 2NYZ1	120.
305	DIESEL GEN 2A	4160.
306	(S5A) CCW PMP MTR #2	4160.
307	(S5A) CCW PMP MTR #1	4160.
308	(S6A) NSCW PMP #3	4160.
309	(S7A) NSCW PMP #5 SPARE	4160.
310	(S8A) CB ESF CHLR #1	4160.
311	(S1X) CVCS CCP #2	4160.
312	(A) ACCW PMP #T	4160.
313	(S5A) AUX FDWTR PMP #3	4160.
314	HS.480V SWGR 2AB15	4160.
315	LS.480V SWGR 2AB15	480.
316	(S8A) NSCW CTWR FAN #1	480.
317	(S8A) NSCW CTWR FAN #2	480.
318	(S8A) NSCW CTWR FAN #3	480.
319	(S8A) NSCW CTWR FAN #4	480.
320	(A) SPT FUEL PIT PMP #2	480.
321	480V MCC 2ABS	480.
322	(A) NSCW CTWR XFER PMP #	480.
323	(S1A) SFP PMP RM CLR #17	480.
324	(S1A) TB TUNNEL FAN #5	480.
325	(S1A) NSCW TWR TUNNEL FA	480.
326	(S1A) ELEC MCC RM CLR	480.
327	(S1A) CCW PMP RM CLR	480.
328	LS.120V 2AYB1 DIST PNL X	120.
329	480V MCC 2ABD	480.
330	(S1A) SIS PMP RM CLR #15	480.

NUMBER	NAME	VOLTAGE
331	(S1A) BORIC ACID XFER PM	480.
332	(S1A) ELEC MCC RM CLR #1	480.
333	(S1A) CHRG PMP RM CLR	480.
334	(S1A) CTMT SPRAY RM CLR	480.
335	(S1A) RHR RM CLR	480.
336	(S1A) ELEC SWGR & MCC RM	480.
337	LS.120V 2AYD1 DIST PNL X	120.
338	HS.480V SWGR 2AB05	4160.
339	LS.480V SWGR 2AB05	480.
340	(S8A) DGB VENT FAN #1	480.
341	(S8A) DGB VENT FAN #3	480.
342	480V MCC 2ABA	480.
343	(S8A) CB ESF CHILL WTR P	480.
344	(S1A) CB NORM AC #5	480.
345	(S1A) CB CR CHLR RM VENT	480.
346	(S8A) CB ESS CHLR PKG	480.
347	BAT CHGR 2AD1CA	480.
348	BAT CHGR 2CD1CB	480.
349	LS.120V 2AYA1 DIST PNL	120.
350	480V MCC 2ABC	480.
351	(S1A) CBSF BATT RM EXH F	480.
352	(S1A) CBSF BATT RM EXH F	480.
353	(S1A) CBSF ELEC EQUIP RM	480.
354	(S1A) CB AUX RELAY RM AC	480.
355	LS.120V 2AYC1 DIST PNL X	120.
356	480V MCC 2ABF	480.
357	(S1A) AFWP HSE FAN #1	480.
358	(S1A) DSL TUNNEL 2T4A VE	480.
359	(S1A) DSL OIL STORAGE TK	480.
360	(S1A) DSL OIL STORAGE TK	480.
361	LS.120V 2AYF1 DIST PNL X	120.
362	HS.480V SWGR 2AB04	4160.
363	LS.480V SWGR 2AB04	480.
364	(A) CTMT CCU #1 (HS)	480.
365	(A) CTMT CCU #2 (HS)	480.
366	(A) CTMT CCU #5 (HS)	480.
367	(A) CTMT CCU #6 (HS)	480.
368	480V MCC 2ABE	480.
369	(S1A) CTB POST LOCA CAV	480.
370	BAT CHGR 2CD1CA	480.
371	BAT CHGR 2AD1CB	480.
372	HS.480V SWGR 2NB01	4160.
373	LS.480V SWGR 2NB01	480.
374	BAT CHGR 2ND3ACA	480.
375	BAT CHGR 2ND1CA	480.
376	480V MCC 2NBG	480.
377	CTB RZ SUPP COOL WTR #1	480.
378	LS.120V PNL 2NYS1	120.
379	480V MCC 2NBI	480.
380	LUBP OIL CIRC PMP	480.
381	LS.120V PNL 2NYI1	120.
382	(S5B) CCW PMP MTR #4	4160.
383	(S6B) CCW PMP MTR #6 (SP	4160.
384	(S6B) NSCW PMP #2	4160.
385	(S7B) NSCW PMP #6 (SPARE	4160.
386	(S8B) CB ESF CHLR #2	4160.
387	(S1Y) CVCS CCP #3	4160.
388	(B) ACCW PMP #Z (SPARE)	4160.
389	(S5B) AUX FDWTR PMP #2	4160.
390	HS.480V SWGR 2BB06	4160.
391	LS.480V SWGR 2BB06	480.
392	(B) CTMT CCU #3 (HS)	480.
393	(B) CTMT CCU #4 (HS)	480.
394	(B) CTMT CCU #7 (HS)	480.
395	(B) CTMT CCU #8 (HS)	480.
396	480V MCC 2BBE	480.
397	(S1B) CTB POST LOCA CAV	480.
398	BATT CHRGR 2DD1CB	480.
399	BATT CHRGR 2BD1CB	480.
400	LS.120V 2BYE1 DIST PNL X	120.
401	HS.480V SWGR 2BB07	4160.
402	LS.480V SWGR 2BB07	480.
403	(S8B) DGB VENT FAN #2	480.
404	(S8B) DGB VENT FAN #4	480.
405	480V MCC 2BBA	480.
406	(S1B) CB CR CHLR RM VENT	480.
407	(S8B) CB ESF CHLD WTR PM	480.
408	(S1B) CB AUX RLY RM AC U	480.
409	(S8B) CB ESS CHLR PKG	480.
410	BATT CHRGR 2BD1CA	480.
411	BATT CHRGR 2DD1CA	480.
412	LS.120V 2BYA1 DIST PNL X	120.
413	480V MCC 2BBC	480.
414	(S1B) CB SF BATT RM EXH	480.
415	(S1B) CB SF BATT RM EXH	480.
416	(S1B) CB SF ELEC EQ RM A	480.
417	480V MCC 2BBF	480.
418	(S1B) AFW PP HSE FAN #2	480.
419	(S1B) DSL TNL 2T4B VENT	480.
420	LS.120V 2BYF1 DIST PNL X	120.
421	HS.480V SWGR 2BB16	4160.
422	LS.480V SWGR 2BB16	480.
423	(S8B) NSCW CTWR FAN #1	480.
424	(S8B) NSCW CTWR FAN #2	480.
425	(S8B) NSCW CTWR FAN #3	480.
426	(S8B) NSCW CTWR FAN #4	480.
427	(B) SPT FUEL PIT PMP	480.
428	480V MCC 2BBB	480.
429	(S1B) ELEC MCC RM CLR #6	480.
430	(S1B) CCW PMP RM CLR #12	480.
431	(S1B) SFP PMP RM CLR #18	480.
432	(B) NSCW XFR PMP #7	480.
433	(S1B) NSCW TWR TUNNEL FA	480.
434	LS.120V 2BYB1 DIST PNL X	120.
435	480V MCC 2BBD	480.
436	(S1B) BORIC ACID XFER PM	480.
437	(S1B) ELEC MCC RM CLR #2	480.
438	(S1B) CS PMP RM CLR #10	480.
439	(S1B) RHR PMP RM CLR #8	480.
440	(S1B) CHRG PMP RM CLR	480.

NUMBER	NAME	VOLTAGE
441	(S1B) SIS PMP RM CLR	480.
442	(S1B) ELEC SWGR & MCC RM	480.
443	LS.120V 2BYD1 DIST PNL X	120.
444	HS.480V SWGR 2NB10	4160.
445	LS.480V SWGR 2NB10	480.
446	BATT CHRGR 2ND3BCA	480.
447	BATT CHRGR AMDCCB	480.
448	TURNING GEAR XFR SW.	480.
449	480V MCC 2NBO	480.
450	JKY WTR CIRC PMP	480.
451	LS.120V 2NY06 DIST PNL X	120.
452	480V MCC 2NBR	480.
453	RESTRAINT VENT FAN #9	480.
454	LS.120V 2NYR1 DIST PNL X	120.
455	TAP BUS 1	0.
456	TAP BUS 2	0.

STUDY ASSUMPTIONS

1. AUXILIARY SYSTEM CONNECTION TO BE STUDIED - NN/SP-A/B
2. SYSTEM TO BE STUDIED - 'AS-BUILT'
3. CABLE RESISTANCE CALCULATED AT 90.0 DEGREES C
4. MVSG OR DUMBUS LOADING

BUS NO.	BUS NAME		LOADING
17	13.8 KV BUS 2NAA		MAXIMUM
18	13.8 KV BUS 2NAB		MAXIMUM
26	4.16KV SWGR 2NA01		MAXIMUM
25	4.16KV SWGR 2NA05		MAXIMUM
27	4.16KV SWGR 2NA04		MAXIMUM
28	4.16KV SWGR 2AA02	2-18	MAXIMUM
29	4.16KV SWGR 2BA03		MAXIMUM

LOAD FLOW STUDY ASSUMPTIONS

1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) - 100.00% ON A 230000. VOLT BASE
2. GENERATOR VOLTAGE TO BE HELD ON BUS # 305 (FOR LOAD FLOW) - 104.00% ON A 4160. VOLT BASE
3. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
4. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.0050000

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.
28	4.16KV SWGR 2AA02 2-18	99.72	-1.7	4160.	0.	0.	1162.	560.
	MINIMUM VOLTAGE LIMIT	93.10						

TO BUS NUMBER	BUS NAME	LINE FLOWS CURRENT(AMPS) MAG.	ANGLE
21	CONDUCTOR BUS 21	523.6	-51.4
305	DIESEL GEN 2A	1212.2	141.5
306	(S5A) CCW PMP MTR #3	38.6	-29.6
307	(S5A) CCW PMP MTR #1	38.6	-29.6
308	(S6A) NSCW PMP #3	98.0	-28.9
309	(S7A) NSCW PMP #5 SP	98.0	-28.9
310	(S8A) CB ESF CHLR #1	49.4	-26.6
311	(S1X) CVCS CCP #2	83.3	-23.9
312	(A) ACCW PMP #T	72.5	-23.8
313	(S5A) AUX FDWTR PMP	114.0	-23.6
314	BS.480V SWGR 2AB15	49.0	-34.5
338	BS.480V SWGR 2AB05	46.3	-42.5
362	BS.480V SWGR 2ABC4	87.1	-41.8
372	BS.480V SWGR 2NB01	137.9	-23.2

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.
305	DIESEL GEN 2A	100.18	-1.6	4160.	0.	0.	7000.	5250.

TO BUS NUMBER	BUS NAME	LINE FLOWS CURRENT(AMPS) MAG.	ANGLE
28	4.16KV SWGR 2AA02	1212.2	-38.5

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* LOAD FLOW STUDY ASSUMPTIONS *
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1. SYSTEM VOLTAGE TO BE HELD (FOR LOAD FLOW) - 105.00% ON A 230000. VOLT BASE
2. GENERATOR VOLTAGE TO BE HELD ON BUS # 305 (FOR LOAD FLOW) - 104.00% ON A 4160. VOLT BASE
3. STATIC LOADS ARE MODELLED AS CONSTANT IMPEDANCE
4. LOAD FLOW SOLUTION DELTA V ON ANY BUS = 0.0050000

********** LOADFLOW **********
********** CASE CONVERGED, NO. OF ITERATIONS = 4 **********

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ACTUAL BUS VOLTAGE(%) ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	LINE FLOWS STATIC LOAD KVAR.	LINE FLOWS ROTATING LOAD/GENERATION KW	LINE FLOWS ROTATING LOAD/GENERATION KVAR.
28	4.16KV SWGR 2AA02 2-18	103.64	-1.8	4160.	0.	0.	1162.	560.
	MINIMUM VOLTAGE LIMIT	93.10						

TO BUS NUMBER	BUS NAME	CURRENT(AMPS) MAG.	CURRENT(AMPS) ANGLE
21	CONDUCTOR BUS 21	371.7	-32.6
305	DIESEL GEN 2A	1063.0	149.9
306	(S5A) CCW PMP MTR #3	37.1	-29.7
307	(S5A) CCW PMP MTR #1	37.1	-29.7
308	(S6A) NSCW PMP #3	86.6	-28.9
309	(S7A) NSCW PMP #5 SP	86.6	-28.9
310	(S6A) CB ESF CHLR #1	47.5	-26.7
311	(S1K) CVCS CCP #2	80.2	-24.0
312	(A) ACCW PMP #I	69.7	-23.8
313	(S5A) AUX FDWTR PMP	109.7	-23.7
314	BS.480V SWGR 2AB15	47.2	-34.5
338	BS.480V SWGR 2AB05	44.8	-43.4
362	BS.480V SWGR 2AB04	83.6	-41.8
372	BS.480V SWGR 2NB01	139.8	-22.6

FROM BUS NUMBER	BUS NAME	ACTUAL BUS VOLTAGE(%) MAG.	ANG.	BASE VOLTAGE (VOLTS)	LINE FLOWS STATIC LOAD KW.	KVAR.	ROTATING LOAD/GENERATION KW	KVAR.	LINE FLOWS TO BUS NUMBER	BUS NAME	CURRENT(AMPS) MAG.	ANGLE
305	DIESEL GEN 2A	104.00	-1.6	4160.	0.	0.	7000.	3802.	28	4.16KV SWGR 2AA02	1063.0	-30.1

	CURRENT VALUE	PROGRAM LIMIT
NUMBER OF BUSES	456	700
NUMBER OF LOAD FLOW LINES	444	1425
NUMBER OF HELD MOTORS	203	400
NUMBER OF MVSGs + DUMBUSes	7	20
NUMBER OF SWITCHGEAR	179	300

SOUTHERN COMPANY SERVICES STATION AUXILIARY DESIGN PROGRAM

DATE : 9/11/1995 TIME :11:55:29

****

* CONSULTING AND TESTING SERVICES - ELECTRICAL *

****

PROGRAM START

VERSION OF JUNE 1992

CALCULATION NUMBER

95615PG

Case#5

DATA FILE

DIESEL_LOAD_REJECT

DATA COMPILED BY: TRS DATE 9,11,95

DATA CREATED BY: TRS DATE 9,11,95

DATA REVIEWED BY: Larry Way DATE 9,11,95

PROGRAM VALIDATED ON --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	109EB	9.7	2
DN3000	39EBB	9.7	1
DN3000	FAF4	9.7	2
DN3000	13056	9.7	1
DN330	6D79	9.7	1
DN330	707A	9.7	1
DN330	704E	9.7	1
DN330	6F43	9.7	1

MACHINE USED FOR THIS RUN --

NODETYPE	NODEID	SOFTWARE REV.	HARDWARE REV.
DN3000	39EBB	9.7	1

NOTE: PROGRAM DOCUMENTED AND VERIFIED IN ACCORDANCE WITH APPLICABLE STANDARDS AND PROCEDURES AND MAINTAINED AS QC DOCUMENT #P1239108703.

DATE: 9/11/1995

PROGRAM: START REVISION 3.2 DATA FILE: DIESEL_LOAD_REJECT

OFFSITE DYNAMIC STUDY 100% SWTD VOLTAGE

SUMMARY OF BUS NAMES

BUS NUMBER	BUS NAME	VOLTAGE (KV)	PRINTOUT STATUS
1	230 KV SYSTEM	230.000	0
2	BUS 1AA02	4.160	1
3	ES 1AB04X	4.160	0
4	ES 1AB05X	4.160	0
5	ES 1AB15X	4.160	0
6	SWGR 1AB04	0.480	1
7	SWGR 1AB05	0.480	1
8	SWGR 1AB15	0.480	1
9	MCC 1ABE	0.480	1
10	MCC 1ABA	0.480	1
11	MCC 1ABC	0.480	1
12	MCC 1ABF	0.480	1
13	MCC 1ABB	0.480	1
14	MCC 1ABD	0.480	1
15	NSCW PMP #1	4.160	0
16	NSCW PMP #3	4.160	0
17	CCW PMP #1	4.160	0
18	CCW PMP #3	4.160	0
19	CCP PMP	4.160	0
20	AFW PMP	4.160	0
21	SI PMP	4.160	0
22	RHR PMP	4.160	0
23	CS PMP	4.160	0
24	ACCW PMP	4.160	0
25	ESF CHLR	4.160	0
26	LSCCU #1	0.480	0
27	LSCCU #2	0.480	0
28	LSCCU #5	0.480	0
29	LSCCU #6	0.480	0
30	EP F/E FAN	0.480	0
31	DGB VENT FAN #1	0.480	0
32	DGB VENT FAN #3	0.480	0
33	CB CR FLTR UNIT #1	0.480	0
34	FP F/E FAN	0.480	0
35	NSCW CTWR FAN #1	0.480	0
36	NSCW CTWR FAN #2	0.480	0
37	NSCW CTWR FAN #3	0.480	0
38	NSCW CTWR FAN #4	0.480	0
39	LS (4.16KV) 1NXRA	4.160	0

NOTE: PRINTOUT STATUS = 1 INDICATES PRINTOUT REQUESTED OTHERWISE NOT REQUESTED.

SYSTEM DATA

FROM BUS	SYSTEM VOLTAGE (% OF 230.000 KV)	SYSTEM SERIES RESISTANCE (%)	SYSTEM SERIES REACTANCE (%)
1	100.00	0.0010	0.0010

NOTE: ALL IMPEDANCES ARE IN PERCENT ON 100 MVA BASE

LINE DATA

FROM BUS	TO BUS	LINE SERIES RESISTANCE (%)	LINE SERIES REACTANCE (%)	LINE SHUNT CONDUCTANCE (%)	LINE SHUNT SUSCEPTANCE (%)
6	0	68705.00	405746.00	N/A	N/A
7	0	63861.00	379278.00	N/A	N/A
8	0	78546.00	427580.00	N/A	N/A
39	2	1.94	2.35	N/A	N/A

NOTE: ALL IMPEDANCES ARE IN PERCENT ON 100 MVA BASE

CABLE DATA

FROM BUS	TO BUS	VOLTAGE (KV)	LENGTH (FT)	SIZE MCM/AWG	COND/PHASE	RESISTANCE (%)	REACTANCE (%)	CONDUCTANCE (%)	SUSCEPTANCE (%)
2	3	4.160	332.00	250 MCM	1	10.62	6.73	N/A	N/A
2	4	4.160	327.00	250 MCM	1	10.66	6.63	N/A	N/A
2	5	4.160	689.00	250 MCM	1	22.45	13.97	N/A	N/A
6	9	0.480	123.00	350 MCM	1	107.84	78.48	N/A	N/A
7	10	0.480	426.00	500 MCM	2	261.63	262.55	N/A	N/A
7	11	0.480	64.00	350 MCM	1	112.22	81.67	N/A	N/A
7	12	0.480	383.00	350 MCM	1	671.58	488.72	N/A	N/A
8	13	0.480	238.00	500 MCM	1	292.34	293.37	N/A	N/A
8	14	0.480	179.00	350 MCM	1	313.87	228.41	N/A	N/A
2	15	4.160	1010.00	250 MCM	1	32.92	20.49	N/A	N/A
2	16	4.160	983.00	250 MCM	1	32.04	19.94	N/A	N/A
2	17	4.160	705.00	250 MCM	1	22.98	14.30	N/A	N/A
2	18	4.160	740.00	250 MCM	1	24.12	15.01	N/A	N/A
2	19	4.160	811.00	250 MCM	1	26.43	16.45	N/A	N/A
2	20	4.160	692.00	250 MCM	1	22.55	14.04	N/A	N/A
2	21	4.160	768.00	250 MCM	1	25.03	15.58	N/A	N/A
2	22	4.160	589.00	250 MCM	1	19.20	11.95	N/A	N/A
2	23	4.160	703.00	250 MCM	1	22.91	14.26	N/A	N/A
2	24	4.160	871.00	250 MCM	1	28.39	17.67	N/A	N/A
2	25	4.160	342.00	250 MCM	1	11.15	6.94	N/A	N/A
6	26	0.480	471.00	4/0 AWG	1	1343.09	607.15	N/A	N/A
6	27	0.480	446.00	4/0 AWG	1	1277.50	577.50	N/A	N/A
6	28	0.480	377.00	4/0 AWG	1	1075.04	485.98	N/A	N/A
6	29	0.480	399.00	4/0 AWG	1	1137.77	514.34	N/A	N/A
7	30	0.480	201.00	2/0 AWG	1	919.51	273.06	N/A	N/A
7	31	0.480	804.00	2/0 AWG	1	3678.02	1092.24	N/A	N/A
7	32	0.480	531.00	2/0 AWG	1	2429.14	721.37	N/A	N/A
7	33	0.480	531.00	350 MCM	1	931.09	677.58	N/A	N/A
8	34	0.480	301.00	1/0 AWG	1	1732.32	420.67	N/A	N/A
8	35	0.480	767.00	350 MCM	1	1346.91	978.72	N/A	N/A
8	36	0.480	660.00	350 MCM	1	1157.29	842.19	N/A	N/A
8	37	0.480	618.00	350 MCM	1	1083.65	788.59	N/A	N/A
8	38	0.480	663.00	350 MCM	1	1162.55	846.02	N/A	N/A

NOTE: ALL IMPEDANCES ARE IN PERCENT ON 100 MVA BASE

TRANSFORMER DATA

FROM BUS	TO BUS	HIGH SIDE (KV)	LOW SIDE (KV)	RESISTANCE (%)	REACTANCE (%)	TAP SETTING (%)	OA RATING (KVA)	FND RATING (KVA)	TOP RATING (KVA)
3	6	4.16	0.48	0.97	5.61	97.50	1000.00	0.00	1000.00
4	7	4.16	0.48	0.98	5.62	97.50	1000.00	0.00	1000.00
5	8	4.16	0.48	1.02	5.59	97.50	1000.00	0.00	1000.00
1	39	230.00	4.16	0.32	10.12	100.00	15000.00	20000.00	25000.00

NOTE: IMPEDANCES ARE BASED ON OA RATING.

MOTOR DATA

MOTOR NUMBER	FROM BUS	MOTOR NAME/CONNECTED BUS NAME	VOLTAGE (KV)	HORSEPOWER	SYNCHRONOUS (RPM)	START/STOP TIME(SEC)	PRINTOUT STATUS
1	15	NSCW PMP #1	4.000	700.0	1200.0	-1.000/******	0
2	16	NSCW PMP #3	4.000	700.0	1200.0	-1.000/******	0
3	17	CCW PMP #1	4.000	300.0	1800.0	-1.000/******	0
4	18	CCW PMP #3	4.000	300.0	1800.0	-1.000/******	0
5	19	CCP PMP	4.000	600.0	1800.0	-1.000/******	0
6	20	AFW PMP	4.000	900.0	3600.0	-1.000/******	0
7	21	SI PMP	4.000	450.0	3600.0	-1.000/******	0
8	22	RHR PMP	4.000	400.0	1800.0	-1.000/******	0
9	23	CS PMP	4.000	400.0	1800.0	-1.000/******	0
10	25	ESF CHLR	4.000	400.0	3600.0	-1.000/******	0
11	26	LSCCU #1	0.460	62.5	600.0	-1.000/******	0
12	27	LSCCU #2	0.460	62.5	600.0	-1.000/******	0
13	28	LSCCU #5	0.460	62.5	600.0	-1.000/******	0
14	29	LSCCU #6	0.460	62.5	600.0	-1.000/******	0
15	30	EP F/E FAN	0.460	62.5	600.0	-1.000/******	0
16	31	DGB VENT FAN #1	0.460	60.0	3600.0	-1.000/******	0
17	32	DGB VENT FAN #3	0.460	50.0	900.0	-1.000/******	0
18	33	CB CR FLTR UNIT #1	0.460	50.0	900.0	-1.000/******	0
19	34	PP F/E FAN	0.460	125.0	1800.0	-1.000/******	0
20	35	NSCW CTWR FAN #1	0.460	75.0	1800.0	-1.000/******	0
21	36	NSCW CTWR FAN #2	0.460	100.0	1800.0	-1.000/******	0
22	37	NSCW CTWR FAN #3	0.460	100.0	1800.0	-1.000/******	0
23	38	NSCW CTWR FAN #4	0.460	100.0	1800.0	-1.000/******	0
24	10	MCC 1ABA	0.460	100.0	1800.0	-1.000/******	0
25	10	MCC 1ABA	0.460	50.0	1200.0	-1.000/******	0
26	13	MCC 1ABB	0.460	50.8	1200.0	-1.000/******	0
27	11	MCC 1ABC	0.460	25.0	1200.0	-1.000/******	0
28	14	MCC 1ABD	0.460	45.8	1200.0	-1.000/******	0
29	9	MCC 1ABE	0.460	43.8	1200.0	-1.000/******	0
30	12	MCC 1ABF	0.460	5.0	1200.0	-1.000/******	0
31	10	MCC 1ABA	0.460	11.0	1200.0	-1.000/******	0
32	10	MCC 1ABA	0.460	2.0	1800.0	-1.000/******	0
33	13	MCC 1ABB	0.460	0.4	1800.0	-1.000/******	0
34	13	MCC 1ABB	0.460	12.0	1800.0	-1.000/******	0
35	11	MCC 1ABC	0.460	0.2	1800.0	-1.000/******	0
36	14	MCC 1ABD	0.460	13.4	1800.0	-1.000/******	0
37	9	MCC 1ABE	0.460	13.6	1800.0	-1.000/******	0
38	12	MCC 1ABF	0.460	18.5	1800.0	-1.000/******	0
39	12	MCC 1ABF	0.460	0.9	1800.0	-1.000/******	0
			0.460	0.6	1800.0	-1.000/******	0

NOTES: START TIME = -1 INDICATES THAT MOTOR IS OPERATING IN STEADY-STATE BEFORE TIME = 0.
PRINTOUT STATUS = 1 INDICATES PRINTOUT REQUESTED OTHERWISE NOT REQUIRED.
STOP TIME ****** INDICATES MOTOR REMAINS ON.

P+JQ LOAD DATA

FROM BUS	VOLTAGE (KV)	LOAD (KVA)	POWER FACTOR (%)	START/STOP TIME(SEC)
7	0.480	118.00	100.00	-1.000/*******
8	0.480	80.00	100.00	-1.000/*******
9	0.480	189.00	66.80	-1.000/*******
10	0.480	211.00	72.60	-1.000/*******
11	0.480	58.10	93.60	-1.000/*******
12	0.480	22.50	86.80	-1.000/*******
13	0.480	30.00	85.00	-1.000/*******
14	0.480	16.70	85.00	-1.000/*******
39	4.160	6000.00	91.70	-1.000/*******
2	4.160	8750.00	-80.00	-1.000/ 0.010

NOTE: START TIME = -1 INDICATES THAT LOAD IS CONNECTED BEFORE TIME = 0.
STOP TIME ******* INDICATES LOAD REMAINS ON.

SUMMARY OF SYSTEM ELEMENTS

NUMBER OF BUSSES	= 39
NUMBER OF LINES	= 4
NUMBER OF CABLES	= 33
NUMBER OF TRANSFORMERS	= 4
NUMBER OF MOTORS	= 39
NUMBER OF P+JQ LOADS	= 10

BUS VOLTAGE OUTPUT

TIME SEC	BUS # 2 % OF 4.160 KV	BUS # 6 % OF 0.480 KV	BUS # 7 % OF 0.480 KV	BUS # 8 % OF 0.480 KV	BUS # 9 % OF 0.480 KV	BUS # 10 % OF 0.480 KV	BUS # 11 % OF 0.480 KV	BUS # 12 % OF 0.480 KV	BUS # 13 % OF 0.480 KV	BUS # 14 % OF 0.480 KV
0.000	99.7100	99.0977	98.8092	99.5822	98.7877	97.6342	98.6291	98.5117	99.2532	99.2377
0.000	99.7100	99.0977	98.8093	99.5822	98.7877	97.6342	98.6291	98.5117	99.2532	99.2377
0.005	99.7100	99.0977	98.8093	99.5822	98.7877	97.6342	98.6291	98.5117	99.2532	99.2377
0.010	99.7100	99.0977	98.8093	99.5822	98.7877	97.6342	98.6291	98.5117	99.2532	99.2377
0.010	96.3188	95.9077	95.7850	96.7043	95.6064	94.6758	95.6280	95.5099	96.4222	96.4256
0.015	96.2622	95.8336	95.6848	96.5972	95.5264	94.5627	95.5221	95.4043	96.3040	96.3040
0.020	96.2044	95.7577	95.5853	96.4903	95.4467	94.4522	95.4186	95.3007	96.1887	96.1864
0.025	96.1461	95.6831	95.4894	96.3871	95.3696	94.3468	95.3197	95.2015	96.0796	96.0755
0.030	96.0879	95.6106	95.3975	96.2884	93.2957	94.2468	95.2257	95.1071	95.9768	95.9714
0.035	96.0298	95.5401	95.3096	96.1943	95.2264	94.1518	95.1363	95.0171	95.8798	95.8733
0.040	95.9723	95.4716	95.2254	96.1043	95.1553	94.0615	95.0511	94.9313	95.7878	95.7803
0.045	95.9160	95.4051	95.1450	96.0185	95.0884	93.9756	94.9697	94.8495	95.7004	95.6920
0.050	95.8614	95.3408	95.0683	95.9367	95.0238	93.8940	94.8923	94.7715	95.6174	95.6082
0.055	95.8091	95.2790	94.9955	95.8592	94.9618	93.8169	94.8189	94.6977	95.5388	95.5289
0.060	95.7597	95.2204	94.9270	95.7862	94.9029	93.7445	94.7498	94.6282	95.4648	95.4543
0.065	95.7138	95.1652	94.8631	95.7181	94.8475	93.6770	94.6853	94.5633	95.3957	95.3844
0.070	95.6717	95.1139	94.8040	95.6550	94.7960	93.6146	94.6257	94.5034	95.3317	95.3201
0.075	95.6338	95.0668	94.7499	95.5971	94.7487	93.5575	94.5712	94.4485	95.2731	95.2609
0.080	95.6002	95.0241	94.7009	95.5446	94.7057	93.5057	94.5217	94.3988	95.2198	95.2071
0.085	95.5710	94.9857	94.6569	95.4974	94.6672	93.4592	94.4774	94.3542	95.1719	95.1588
0.090	95.5461	94.9518	94.6180	95.4558	94.6331	93.4180	94.4381	94.3147	95.1293	95.1158
0.095	95.5253	94.9221	94.5839	95.4186	94.6032	93.3817	94.4036	94.2799	95.0918	95.0780
0.100	95.5082	94.8963	94.5542	95.3864	94.5773	93.3501	94.3737	94.2498	95.0591	95.0450
0.105	95.4946	94.8742	94.5287	95.3588	94.5550	93.3228	94.3479	94.2238	95.0309	95.0164
0.110	95.4841	94.8554	94.5071	95.3352	94.5362	93.2996	94.3260	94.2017	95.0068	94.9921
0.115	95.4762	94.8396	94.4888	95.3153	94.5203	93.2799	94.3075	94.1831	94.9865	94.9716
0.120	95.4705	94.8264	94.4735	95.2986	94.5069	93.2634	94.2920	94.1675	94.9694	94.9543
0.125	95.4667	94.8154	94.4609	95.2849	94.4959	93.2497	94.2792	94.1545	94.9553	94.9401
0.130	95.4644	94.8062	94.4504	95.2735	94.4867	93.2384	94.2686	94.1438	94.9437	94.9284
0.135	95.4631	94.7986	94.4419	95.2643	94.4790	93.2290	94.2599	94.1350	94.9342	94.9188
0.140	95.4627	94.7921	94.4348	95.2568	94.4725	93.2213	94.2527	94.1277	94.9265	94.9110
0.145	95.4627	94.7866	94.4289	95.2507	94.4669	93.2148	94.2467	94.1217	94.9203	94.9047
0.150	95.4630	94.7818	94.4239	95.2457	94.4621	93.2094	94.2417	94.1165	94.9151	94.8995
0.155	95.4634	94.7774	94.4196	95.2415	94.4577	93.2047	94.2373	94.1121	94.9108	94.8951
0.160	95.4636	94.7733	94.4157	95.2378	94.4535	93.2006	94.2334	94.1081	94.9070	94.8914
0.165	95.4636	94.7692	94.4121	95.2346	94.4495	93.1967	94.2297	94.1043	94.9037	94.8880
0.170	95.4632	94.7652	94.4085	95.2315	94.4454	93.1930	94.2261	94.1007	94.9005	94.8849
0.175	95.4623	94.7611	94.4049	95.2284	94.4413	93.1892	94.2225	94.0971	94.8974	94.8818
0.180	95.4611	94.7568	94.4013	95.2253	94.4370	93.1854	94.2188	94.0933	94.8943	94.8787
0.185	95.4594	94.7524	94.3974	95.2221	94.4326	93.1815	94.2149	94.0894	94.8910	94.8754
0.190	95.4572	94.7478	94.3934	95.2187	94.4279	93.1773	94.2109	94.0853	94.8876	94.8720
0.195	95.4546	94.7430	94.3892	95.2152	94.4232	93.1730	94.2067	94.0811	94.8840	94.8684
0.200	95.4518	94.7381	94.3848	95.2114	94.4182	93.1686	94.2023	94.0766	94.8801	94.8646
0.205	95.4486	94.7331	94.3803	95.2074	94.4132	93.1639	94.1977	94.0720	94.8761	94.8606
0.210	95.4453	94.7281	94.3757	95.2033	94.4082	93.1592	94.1931	94.0674	94.8720	94.8564

BUS VOLTAGE OUTPUT

TIME SEC	BUS # 2 % OF 4.160 KV	BUS # 6 % OF 0.480 KV	BUS # 7 % OF 0.480 KV	BUS # 8 % OF 0.480 KV	BUS # 9 % OF 0.480 KV	BUS # 10 % OF 0.480 KV	BUS # 11 % OF 0.480 KV	BUS # 12 % OF 0.480 KV	BUS # 13 % OF 0.480 KV	BUS # 14 % OF 0.480 KV
0.215	95.4419	94.7232	94.3711	95.1992	94.4032	93.1544	94.1884	94.0627	94.0677	94.0523
0.220	95.4384	94.7183	94.3665	95.1950	94.3983	93.1496	94.1838	94.0579	94.0634	94.0479
0.225	95.4350	94.7135	94.3620	95.1907	94.3935	93.1448	94.1792	94.0533	94.0591	94.0436
0.230	95.4317	94.7090	94.3575	95.1866	94.3889	93.1402	94.1747	94.0488	94.0549	94.0393
0.235	95.4285	94.7047	94.3533	95.1825	94.3846	93.1357	94.1704	94.0444	94.0507	94.0352
0.240	95.4256	94.7007	94.3492	95.1786	94.3805	93.1314	94.1663	94.0403	94.0467	94.0311
0.245	95.4228	94.6970	94.3455	95.1749	94.3768	93.1274	94.1625	94.0364	94.0429	94.0273
0.250	95.4204	94.6936	94.3419	95.1714	94.3733	93.1236	94.1588	94.0327	94.0392	94.0236
0.255	95.4182	94.6905	94.3387	95.1681	94.3702	93.1201	94.1556	94.0294	94.0359	94.0202
0.260	95.4163	94.6878	94.3357	95.1650	94.3675	93.1169	94.1526	94.0263	94.0327	94.0170
0.265	95.4146	94.6854	94.3330	95.1622	94.3650	93.1140	94.1498	94.0235	94.0298	94.0141
0.270	95.4133	94.6833	94.3307	95.1597	94.3629	93.1114	94.1476	94.0210	94.0271	94.0114
0.275	95.4121	94.6814	94.3285	95.1574	94.3610	93.1090	94.1452	94.0188	94.0247	94.0090
0.280	95.4112	94.6799	94.3267	95.1553	94.3595	93.1069	94.1433	94.0169	94.0225	94.0068
0.285	95.4105	94.6786	94.3251	95.1534	94.3581	93.1051	94.1416	94.0151	94.0205	94.0048
0.290	95.4099	94.6775	94.3236	95.1517	94.3570	93.1035	94.1401	94.0136	94.0188	94.0030
0.295	95.4095	94.6766	94.3224	95.1502	94.3561	93.1020	94.1388	94.0123	94.0171	94.0014
0.300	95.4092	94.6758	94.3213	95.1488	94.3553	93.1008	94.1377	94.0111	94.0157	93.9999
0.305	95.4090	94.6752	94.3204	95.1476	94.3547	93.0997	94.1367	94.0101	94.0144	93.9986
0.310	95.4089	94.6747	94.3195	95.1465	94.3541	93.0986	94.1358	94.0092	94.0132	93.9974
0.315	95.4087	94.6742	94.3188	95.1455	94.3537	93.0977	94.1351	94.0084	94.0121	93.9963
0.320	95.4086	94.6738	94.3181	95.1445	94.3532	93.0969	94.1343	94.0076	94.0111	93.9953
0.325	95.4086	94.6735	94.3175	95.1436	94.3529	93.0961	94.1336	94.0069	94.0101	93.9943
0.330	95.4085	94.6732	94.3168	95.1427	94.3525	93.0954	94.1330	94.0062	94.0091	93.9934
0.335	95.4084	94.6729	94.3162	95.1419	94.3522	93.0947	94.1324	94.0055	94.0082	93.9924
0.340	95.4083	94.6726	94.3156	95.1411	94.3519	93.0939	94.1317	94.0049	94.0073	93.9915
0.345	95.4081	94.6722	94.3150	95.1402	94.3515	93.0932	94.1311	94.0042	94.0064	93.9906
0.350	95.4079	94.6719	94.3144	95.1394	94.3512	93.0925	94.1304	94.0035	94.0055	93.9897
0.355	95.4077	94.6716	94.3138	95.1386	94.3508	93.0918	94.1298	94.0029	94.0046	93.9888
0.360	95.4075	94.6712	94.3132	95.1377	94.3505	93.0911	94.1291	94.0022	94.0037	93.9880
0.365	95.4072	94.6709	94.3125	95.1369	94.3501	93.0903	94.1285	94.0015	94.0028	93.9871
0.370	95.4070	94.6705	94.3119	95.1360	94.3497	93.0896	94.1278	94.0008	94.0019	93.9862
0.375	95.4067	94.6702	94.3113	95.1352	94.3494	93.0888	94.1271	94.0001	94.0010	93.9853
0.380	95.4064	94.6698	94.3106	95.1344	94.3490	93.0881	94.1264	93.9994	94.0001	93.9844
0.385	95.4061	94.6694	94.3100	95.1336	94.3486	93.0873	94.1258	93.9987	93.9992	93.9835
0.390	95.4059	94.6691	94.3093	95.1327	94.3482	93.0866	94.1251	93.9979	93.9984	93.9826
0.395	95.4056	94.6688	94.3087	95.1319	94.3479	93.0859	94.1244	93.9973	93.9975	93.9818
0.400	95.4053	94.6684	94.3081	95.1312	94.3475	93.0851	94.1238	93.9966	93.9966	93.9809
0.405	95.4051	94.6681	94.3074	95.1304	94.3472	93.0844	94.1231	93.9959	93.9958	93.9801
0.410	95.4049	94.6678	94.3069	95.1297	94.3469	93.0837	94.1225	93.9953	93.9950	93.9793
0.415	95.4047	94.6675	94.3063	95.1289	94.3466	93.0831	94.1219	93.9946	93.9943	93.9785
0.420	95.4044	94.6673	94.3057	95.1283	94.3463	93.0825	94.1213	93.9940	93.9935	93.9778
0.425	95.4043	94.6670	94.3052	95.1276	94.3460	93.0818	94.1208	93.9934	93.9928	93.9771
0.430	95.4041	94.6668	94.3047	95.1269	94.3458	93.0812	94.1202	93.9929	93.9921	93.9764
0.435	95.4039	94.6665	94.3042	95.1263	94.3455	93.0806	94.1197	93.9924	93.9914	93.9757

BUS VOLTAGE OUTPUT

TIME SEC	BUS # 2 % OF 4.160 KV	BUS # 6 % OF 0.480 KV	BUS # 7 % OF 0.480 KV	BUS # 8 % OF 0.480 KV	BUS # 9 % OF 0.480 KV	BUS # 10 % OF 0.480 KV	BUS # 11 % OF 0.480 KV	BUS # 12 % OF 0.480 KV	BUS # 13 % OF 0.480 KV	BUS # 14 % OF 0.480 KV
0.440	95.4038	94.6663	94.3037	95.1257	94.3453	93.0801	94.1192	93.9918	93.7907	94.7750
0.445	95.4037	94.6661	94.3032	95.1251	94.3451	93.0795	94.1187	93.9913	94.7901	94.7744
0.450	95.4035	94.6659	94.3028	95.1245	94.3449	93.0790	94.1182	93.9908	94.7895	94.7738
0.455	95.4034	94.6657	94.3024	95.1240	94.3447	93.0785	94.1177	93.9903	94.7889	94.7732
0.460	95.4033	94.6655	94.3019	95.1235	94.3445	93.0780	94.1173	93.9898	94.7883	94.7726
0.465	95.4032	94.6654	94.3015	95.1230	94.3443	93.0775	94.1169	93.9893	94.7877	94.7721
0.470	95.4031	94.6652	94.3011	95.1225	94.3441	93.0770	94.1164	93.9889	94.7872	94.7715
0.475	95.4029	94.6650	94.3007	95.1220	94.3439	93.0765	94.1160	93.9884	94.7866	94.7710
0.480	95.4028	94.6649	94.3003	95.1215	94.3437	93.0760	94.1155	93.9880	94.7861	94.7705
0.485	95.4027	94.6647	94.2999	95.1210	94.3435	93.0756	94.1151	93.9875	94.7856	94.7700
0.490	95.4026	94.6645	94.2995	95.1206	94.3434	93.0751	94.1147	93.9871	94.7851	94.7695
0.495	95.4025	94.6643	94.2991	95.1201	94.3431	93.0747	94.1143	93.9867	94.7846	94.7690
0.500	95.4024	94.6642	94.2987	95.1197	94.3430	93.0742	94.1139	93.9863	94.7841	94.7685
0.505	95.4023	94.6640	94.2983	95.1192	94.3428	93.0738	94.1135	93.9858	94.7836	94.7680
0.510	95.4022	94.6638	94.2980	95.1188	94.3426	93.0734	94.1131	93.9854	94.7831	94.7676
0.515	95.4020	94.6636	94.2976	95.1184	94.3424	93.0729	94.1127	93.9850	94.7827	94.7671
0.520	95.4019	94.6635	94.2972	95.1180	94.3422	93.0725	94.1123	93.9846	94.7822	94.7667
0.525	95.4018	94.6633	94.2969	95.1176	94.3420	93.0721	94.1120	93.9842	94.7818	94.7662
0.530	95.4017	94.6632	94.2965	95.1172	94.3419	93.0717	94.1116	93.9838	94.7813	94.7658
0.535	95.4016	94.6630	94.2962	95.1168	94.3417	93.0713	94.1112	93.9834	94.7809	94.7654
0.540	95.4016	94.6629	94.2959	95.1164	94.3415	93.0709	94.1108	93.9831	94.7805	94.7650
0.545	95.4015	94.6627	94.2955	95.1161	94.3414	93.0705	94.1105	93.9827	94.7801	94.7646
0.550	95.4014	94.6626	94.2952	95.1158	94.3412	93.0702	94.1102	93.9823	94.7797	94.7642
0.555	95.4013	94.6625	94.2949	95.1154	94.3411	93.0698	94.1098	93.9820	94.7793	94.7638
0.560	95.4013	94.6624	94.2946	95.1151	94.3410	93.0694	94.1095	93.9817	94.7789	94.7635
0.565	95.4012	94.6622	94.2943	95.1147	94.3408	93.0691	94.1092	93.9813	94.7786	94.7631
0.570	95.4011	94.6621	94.2940	95.1144	94.3407	93.0688	94.1089	93.9810	94.7782	94.7628
0.575	95.4011	94.6620	94.2938	95.1142	94.3406	93.0685	94.1086	93.9807	94.7779	94.7624
0.580	95.4010	94.6619	94.2935	95.1139	94.3404	93.0681	94.1083	93.9804	94.7776	94.7621
0.585	95.4010	94.6618	94.2932	95.1136	94.3403	93.0678	94.1080	93.9801	94.7772	94.7618
0.590	95.4009	94.6617	94.2930	95.1133	94.3402	93.0675	94.1078	93.9798	94.7769	94.7615
0.595	95.4009	94.6616	94.2927	95.1130	94.3401	93.0672	94.1075	93.9795	94.7766	94.7612
0.600	95.4008	94.6615	94.2925	95.1128	94.3400	93.0669	94.1072	93.9792	94.7763	94.7609
0.605	95.4008	94.6613	94.2922	95.1125	94.3399	93.0667	94.1070	93.9790	94.7760	94.7606
0.610	95.4007	94.6613	94.2920	95.1122	94.3397	93.0664	94.1067	93.9787	94.7757	94.7603
0.615	95.4007	94.6612	94.2917	95.1120	94.3396	93.0661	94.1064	93.9784	94.7755	94.7600
0.620	95.4007	94.6611	94.2915	95.1117	94.3395	93.0658	94.1062	93.9781	94.7752	94.7598
0.625	95.4006	94.6610	94.2913	95.1115	94.3394	93.0656	94.1060	93.9779	94.7749	94.7595
0.630	95.4006	94.6609	94.2910	95.1113	94.3393	93.0653	94.1057	93.9776	94.7746	94.7593
0.635	95.4005	94.6608	94.2908	95.1110	94.3392	93.0650	94.1055	93.9774	94.7744	94.7590
0.640	95.4004	94.6607	94.2906	95.1108	94.3391	93.0648	94.1052	93.9771	94.7741	94.7588
0.645	95.4004	94.6606	94.2904	95.1106	94.3390	93.0645	94.1050	93.9769	94.7738	94.7585
0.650	95.4003	94.6605	94.2902	95.1104	94.3388	93.0643	94.1048	93.9766	94.7736	94.7582
0.655	95.4003	94.6604	94.2899	95.1101	94.3388	93.0640	94.1045	93.9764	94.7733	94.7580
0.660	95.4002	94.6603	94.2897	95.1099	94.3387	93.0638	94.1043	93.9761	94.7731	94.7577

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OFFSITE DYNAMIC STUDY 1004 SWYD VOLTAGE CASE
39          *** BUSES ***
 1 230 '230 KV SYSTEM' 0
 2 4.16 'BUS 1AA02' 1
 3 4.16 'BS 1AB04X' 0
 4 4.16 'BS 1AB05X' 0
 5 4.16 'BS 1AB15X' 0
 6 0.48 'SWGR 1AB04' 1
 7 0.48 'SWGR 1AB05' 1
 8 0.48 'SWGR 1AB15' 1
 9 0.48 'MCC 1ABE' 1
10 0.48 'MCC 1ABA' 1
11 0.48 'MCC 1ABC' 1
12 0.48 'MCC 1ABF' 1
13 0.48 'MCC 1ABB' 1
14 0.48 'MCC 1ABD' 1
15 4.16 'NSCW PMP #1' 0
16 4.16 'NSCW PMP #3' 0
17 4.16 'CCW PMP #1' 0
18 4.16 'CCW PMP #3' 0
19 4.16 'CCP PMP' 0
20 4.16 'AFW PMP' 0
21 4.16 'SI PMP' 0
22 4.16 'RHR PMP' 0
23 4.16 'CS PMP' 0
24 4.16 'ACCW PMP' 0    N/A
25 4.16 'ESF CHLR' 0
26 0.48 'LSCCU #1' 0
27 0.48 'LSCCU #2' 0
28 0.48 'LSCCU #5' 0
29 0.48 'LSCCU #6' 0
30 0.48 'EP F/E FAN' 0
31 0.48 'DGB VENT FAN #1' 0
32 0.48 'DGB VENT FAN #3' 0
33 0.48 'CB CB FLTR UNIT #1' 0
34 0.48 'PP F/E FAN' 0
35 0.48 'NSCW CTWR FAN #1' 0
36 0.48 'NSCW CTWR FAN #2' 0
37 0.48 'NSCW CTWR FAN #3' 0
38 0.48 'NSCW CTWR FAN #4' 0
39 4.1  'LS (4.16KV) 1NERA' 0
1 230 230 .001 .001    ***SYSTEM IMPEDANCE***
4          ***LINES***
 6 0 68785.00 405746.00 0 0          *1AB04X NO LOAD LOSSES
 7 0 63861.00 379276.00 0 0          *1AB05X NO LOAD LOSSES
 8 0 78546.00 427580.00 0 0          *1AB15X NO LOAD LOSSES
39 2 1.0618 2.3543 0 0            *CALVERT SUB DUCT IMPEDANCE
33          ***CABLES***
2 3 4.16 332 250 1 0      *1AA02 TO 1AB04X
2 4 4.16 327 250 1 0      *1AA02 TO 1AB05X
2 5 4.16 689 250 1 0      *1AA02 TO 1AB15X
6 9 0.48 123 350 2 0      *1AB04 TO 1ABE
7 10 0.48 426 500 2 0     *1LJ305 TO 1ABA
7 11 0.48 64 350 1 0      *1AB05 TO 1ABA
7 12 0.48 383 350 1 0     *1AB05 TO 1ABC
8 13 0.48 238 500 1 0     *1AB15 TO 1ABF
8 14 0.48 179 350 1 0     *1AB15 TO 1ABB
2 15 4.16 1010 250 1 0    *1AA02 TO NSCW #1
2 16 4.16 983 250 1 0     *1AA02 TO NSCW #3
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2 17 4.16 705 250 1 0     *1AA02 TO CCW #1
2 18 4.16 748 250 1 0     *1AA02 TO CCW #3
2 19 4.16 811 250 1 0     *1AA02 TO CCP
2 20 4.16 692 250 1 0     *1AA02 TO AFW
2 21 4.16 768 250 1 0     *1AA02 TO SI
2 22 4.16 589 250 1 0     *1AA02 TO RHR
2 23 4.16 703 250 1 0     *1AA02 TO CS
2 24 4.16 871 250 1 0     *1AA02 TO ACCW    N/A
2 25 4.16 142 250 1 0     *1AA02 TO CHLR
6 26 0.48 471 40 1 0      *1AB04 TO LSCCU #1
6 27 0.48 448 40 1 0      *1AB04 TO LSCCU #2
6 28 0.48 377 40 1 0      *1AB04 TO LSCCU #5
6 29 0.48 399 40 1 0      *1AB04 TO LSCCU #6
7 30 0.48 201 20 1 0      *1AB05 TO EP F/E FAN
7 31 0.48 804 20 1 0      *1AB05 TO DGB FAN #1
7 32 0.48 531 20 1 0      *1AB05 TO DGB FAN #3
7 33 0.48 531 350 1 0     *1AB05 TO CBCB FAN
8 34 0.48 301 10 1 0      *1AB15 TO PP F/E FAN
8 35 0.48 767 350 1 0     *1AB15 TO NSCW CTWR #1
8 36 0.48 660 350 1 0     *1AB15 TO NSCW CTWR #2
8 37 0.48 618 350 1 0     *1AB15 TO NSCW CTWR #3
8 38 0.48 663 350 1 0     *1AB15 TO NSCW CTWR #4
4          *TRANSFORMERS
3 6          1AB04X
4.160 0.480 0.9732 5.6062 97.5 1000 0 1000
4 7          1AB05X
4.160 0.480 0.975 5.616 97.5 1000 0 1000
5 8          1AB15X
4.160 0.480 1.0245 5.5868 97.5 1000 0 1000
1 39         1NERA
230 4.160 .31623 10.1151 100 15000 20000 25000
39          ***MOTORS***
15 4000 700 1200 -1 999 0                    *NSCW #1
0.581777 2.750108 110.004400 0.441353 0.444525 0.935106 3.904348 0.067232
3233 0 0 846
16 4000 700 1200 -1 999 0                    *NSCW #3
0.581777 2.750108 110.004400 0.441353 0.444525 0.935106 3.904348 0.067232
3233 0 0 846
17 4000 300 1800 -1 999 0                    *CCW #1
1.660199 5.029164 201.166700 1.757610 0.966815 4.983157 7.773041 0.075635
925 0 0 127.9
18 4000 300 1800 -1 999 0                    *CCW #3
1.660199 5.029164 201.166700 1.757610 0.966815 4.983157 7.773041 0.075635
925 0 0 127.9
19 4000 600 1800 -1 999 0                    *CCP
0.569887  3.755205  150.208300  0.839281  0.399947  0.910985  2.198241  0.067924
2102 0 0 499.4
20 4000 900 3600 -1 999 0                    *AFW
0.292940 2.560375 102.415100 0.416639 0.239633 0.699649 1.377392 0.061668
1360 0 0 183.5
21 4000 450 3600 -1 999 0                    *SI
0.493909  4.191089  167.643700  0.952303  0.570329  1.392426  2.548559  0.085701
685 0 0 153.8
22 4000 400 1800 -1 999 0                    *RHR
1.090456 5.632783 225.311500 0.954213 0.447748 1.405102 3.562269 0.049096
1206 0 0 184
23 4000 400 1800 -1 999 0                    *CS
1.146595  5.632776  225.311300  1.264993  0.496880  2.404358  4.204374  0.050889
1208 0 0 199.7
25 4000 400 3600 -1 999 0                 *ESF CHLR
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 1.343995 4.583904 183.356400 0.996680 0.356760 2.824500 4.651867 0.038705
598 0 0 53.4
 26 460 62.5 600 -1 999 0                    *LSCCU #1
 0.057993  0.086497    3.459890  0.106772  0.044756  0.458963  0.842465  0.048198
568 0 0 3006
 27 460 62.5 600 -1 999 0                    *LSCCU #2
 0.057993  0.086497    3.459890  0.106772  0.044756  0.458963  0.842465  0.048198
568 0 0 3006
 28 460 62.5 600 -1 999 0                    *LSCCU #5
 0.057993  0.086497    3.459890  0.106772  0.044756  0.458963  0.842465  0.048198
568 0 0 3006
 29 460 62.5 600 -1 999 0                    *LSCCU #6
 0.057993  0.086497    3.459890  0.106772  0.044756  0.458963  0.842465  0.048198
568 0 0 3006
 30 460 60 3600 -1 999 0                     *EP F/E FAN
 0.127553 0.284096 11.363840 0.115319 0.068807 0.327496 0.646785 0.073804
93 0 0 80
 31 460 50 900 -1 999 0                      *DGB VENT FAN #1
 0.070913 0.249139 9.965573 0.187017 0.124893 0.394929 0.765699 0.123518
317 0 0 1069
 32 460 50 900 -1 999 0                      *DGB VENT FAN #2
 0.070913 0.249139 9.965573 0.187017 0.124893 0.394929 0.765699 0.123518
317 0 0 1069
 33 460 125 1800 -1 999 0                    *CBCE FLTR FAN
 0.024921 0.146887 5.875486 0.068345 0.020654 0.136384 0.240447 0.053714
377 0 0 668
 34 480 75 1800 -1 999 0                     *PP F/E FAN
 0.086677  0.235822    9.432905  0.084650  0.054913  0.148049  0.347368  0.094990
229 0 0 252
 35 460 100 1800 -1 999 0                    *HSCW CTWR FAN #1
 0.029705 0.182986 7.319467 0.098972 0.045091 0.205665 0.321638 0.090001
308 0 0 534
 36 460 100 1800 -1 999 0                    *HSCW CTWR FAN #2
 0.029705 0.182986 7.319467 0.098972 0.045091 0.205665 0.321638 0.090001
308 0 0 534
 37 460 100 1800 -1 999 0                    *HSCW CTWR FAN #3
 0.029705 0.182986 7.319467 0.098972 0.045091 0.205665 0.321638 0.090001
308 0 0 534
 38 460 100 1800 -1 999 0                    *HSCW CTWR FAN #4
 0.029705 0.182986 7.319467 0.098972 0.045091 0.205665 0.321638 0.090001
308 0 0 534
 10  460   50.00 1200.00 -1 999 0            *1ABA  0  LOSP/SI & LOSP
  0.086783  0.287893   11.515740  0.201115  0.105744  0.432477  0.711625  0.106158
240 0 0 600
 10  460   50.75 1200.00 -1 999 0            *1ABA 35.5 LOSP/SI(R)
  0.085747  0.283732   11.349280  0.198114  0.104210  0.426505  0.701231  0.106149
244 0 0 277
 13  460   25.00 1200.00 -1 999 0            *1ABB 0 LOSP/SI & LOSP
  0.175142  0.575786   23.031470  0.400689  0.211447  0.864960  1.423338  0.106126
120 0 0 300
 11  460   45.00 1200.00 -1 999 0            *1ABC 0 LOSP/SI & LOSP
  0.096718  0.319881   12.795270  0.223176  0.117486  0.480531  0.790711  0.106147
216 0 0 540
 14  460   43.80 1200.00 -1 999 0            *1ABD 0 LOSP/SI & LOSP
  0.100076  0.328645   13.145820  0.228118  0.120686  0.492581  0.812414  0.106122
210 0 0 301
  9  460    5.00 1200.00 -1 999 0            *1ABE 0 LOSP/SI & LOSP
  0.867833  2.878933  115.157400  2.011153  1.057439  4.324774  7.116250  0.106158
24 0 0 60
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```
12  460   11.00 1200.00 -1 999 0            *1ABF 0 LOSP/SI & LOSP
  0.396748  1.308605   52.344260  0.911930  0.480596  1.965814  3.234787  0.106137
52.8 0 0 99.6
 10  460    2.00 1800.00 -1 999 0            *1ABA MOV 0 LOSP/SI & LOSP
3.856024  2.107332   84.293370  4.412343  2.871418  4.364706  6.397593  0.320332
0 0 12 27
 10  460    0.60 1800.00 -1 999 0            *1ABA MOV 35.5 LOSP/SI(R)
15.280120 10.536660  421.466900 22.061710 14.357090 21.823530 31.988000  0.320331
0 0 2.4 5.4
 13  460   12.00 1800.00 -1 999 0            *1ABB MOV 0 LOSP/SI
0.509337  0.351222   14.048900  0.735390  0.478570  0.727451  1.066266  0.320332
0 0 72 162
 13  460    0.20 1800.00 -1 999 0            *1ABB SEQ MOV 15 LOSP/SI & LOSP
30.560230 21.073330  842.933800 44.123430 28.714180 43.647060 63.976010  0.320331
0 0 1.2 2.7
 11  460   13.63 1800.00 -1 999 0            *1ABC MOV 0 LOSP/SI
0.454963  0.313844   12.553780  0.657349  0.427640  0.650073  0.952755  0.320354
0 0 80.6 181.31
 14  460   13.61 1800.00 -1 999 0            *1ABD MOV 0 LOSP/SI
0.445085  0.309712   12.388500  0.648376  0.422009  0.641362  0.940234  0.320339
0 0 81.7 183.74
  9  460   10.44 1800.00 -1 999 0            *1ABE MOV 0 LOSP/SI
0.331097  0.228334    9.133368  0.478032  0.311125  0.472863  0.693186  0.320337
0 0 111 249.21
12  460    0.90 1800.00 -1 999 0            *1ABF MOV 0 LOSP/SI & LOSP
6.791145  4.682961  187.318600  9.805202  6.380929  9.699350 14.216870  0.320332
0 0 5.4 12.15
12  460    0.60 1800.00 -1 999 0            *1ABF MOV 35.5 LOSP/SI(R)
19.186750  7.024442  280.977900 14.707810  9.571394 14.549020 21.325330  0.320331
0 0 3.6 8.1
10
7 118 100 -1 999                           *CBCE ETR (1AB05)
8 80 100 -1  999                           *PP F/E ETR (1AB15)
9 189 66.8 -1  999                         *1ACE LUMP
10 211 72.6 -1  999                        *1ABA LUMP
11 58.1 93.6 -1  999                       *1ABC LUMP
12 22.5 86.8 -1  999                       *1ABF LUMP
13 30 85 -1  999                           *1ABB LUMP
14 16.7 85 -1 999                          *1ABD LUMP
39 6000 91.7 -1 999                        * 2NA01+2NA05 - ADJUSTED TO MATCH CASE#4 1AA02 BUS VOLTAGE OF 99.72%
2 -8750 80 -1  .01                         * DIESEL GENERATOR TRIP
1.0  .005
```