

March 30, 1992

Docket Nos. 50-325
and 50-324

LICENSEE: CAROLINA POWER & LIGHT COMPANY

FACILITY: BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

SUBJECT: MEETING REGARDING ELECTRICAL POWER SUPPLY SYSTEMS
MODIFICATIONS - BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

The staff met with Carolina Power & Light Company (CP&L) on February 19, 1992, in Rockville, Maryland, to discuss the status and progress of the licensee's activities related to the modifications of the off-site and on-site power supply systems for the Brunswick Steam Electric Plant, Units 1 and 2. This meeting was designed as a follow-up of a previous staff meeting with CP&L on December 12, 1991.

A meeting summary is provided as Enclosure 1, a list of attendees is included as Enclosure 2, and a copy of the licensee's handout prepared by the licensee for discussion at the meeting is enclosed as Enclosure 3.

Original signed by

Ngoc B. Le, Project Manager
Project Directorate II-1
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/enclosure:
See next page

*See previous concurrence

OFFICE	LA: PDII-1	PM: PDII-1	*BC: SELB	D: PDII-1	
NAME	PAAnderson	NLe:dt	FRosa	EAdensam	
	3/13/92	3/13/92	03/23/92	3/13/92	1/1

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Mr. L. W. Eury
Carolina Power & Light Company

Brunswick Steam Electric Plant
Units 1 and 2

cc:

Mr. Russell B. Starkey, Jr.
Vice President
Brunswick Nuclear Project
P. O. Box 10429
Southport, North Carolina 28461

Mr. H. A. Cole
Special Deputy Attorney General
State of North Carolina
P. O. Box 629
Raleigh, North Carolina 27602

Mr. H. Ray Starling
Manager - Legal Department
Carolina Power & Light Company
P. O. Box 1551
Raleigh, North Carolina 27602

Mr. Robert P. Gruber
Executive Director
Public Staff - NCUC
P. O. Box 29520
Raleigh, North Carolina 27626-0520

Mr. Kelly Holden, Chairman
Board of Commissioners
P. O. Box 249
Bolivia, North Carolina 28422

Resident Inspector
U. S. Nuclear Regulatory Commission
Star Route 1
P. O. Box 208
Southport, North Carolina 28461

Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
101 Marietta Street, Suite 2900
Atlanta, Georgia 30323

Mr. Dayne H. Brown, Director
Division of Radiation Protection
N. C. Department of Environmental,
Commerce and Natural Resources
P. O. Box 27687
Raleigh, North Carolina 27611-7687

Mr. J. W. Spencer
Plant General Manager
Brunswick Steam Electric Plant
P. O. Box 10429
Southport, North Carolina 28461

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P. Anderson
OGC
E. Jordan
ACRS (10)
L. Reyes

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MEETING SUMMARYBRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

A meeting was held with Carolina Power & Light Company (CP&L) on February 19, 1992, in Rockville, Maryland. This meeting was the second follow-up of the June 18, 1991, meeting (Meeting Summary dated June 26, 1991) with CP&L regarding their efforts to resolve the General Design Criterion 17 (GDC) concerns and to effect other enhancements of the Brunswick Steam Electric Plant, Units 1 and 2 (BSEP), electrical distribution systems (EDS). The first followup meeting was held December 12, 1991, and that meeting summary was issued January 13, 1992.

The licensee summarized the June 1991 action plan and provided more detail of the selected option to resolve the GDC-17 concerns and enhance the EDS. Along with the new hardware installation for improving off-site power availability, CP&L will add a 25MVA transformer to each unit, new DC storage batteries for 230KV breaker control, and new voltage regulators. In addition, the existing secondary (Y-bus) side of the start-up transformer will be upgraded to 5000 amp capacity. New hardware for improving the on-site emergency power supply includes the addition of a new 4000KW, non-class 1E diesel generator (DG) with capability of feeding through underground cables to any one of the four existing E-buses. This new DG will be housed in a new building and will have the capability of being started remotely from the control room and automatically connected to any E-bus when the normally connected DG is out-of-service. The safety benefit resulting from new hardware additions includes an improvement in the core melt frequency from $1.37E-05$ to $6.89E-06$ (6 percent from the off-site power improvement and 49 percent from that of the on-site power improvement).

The licensee also proposed changes to the plant Technical Specifications (TS) to establish LCO requirements both during construction and normal operation after construction has been complete. Details of the licensee's proposed TS changes and comparative safety benefits for both pre- and post-modification are provided in the handout (see Enclosure 3). The staff observed from the meeting that the licensee's proposed hardware modifications and TS changes were well thought out. When implemented, these changes should improve the BSEP's core melt frequency, enhance the plant safety goal, and increase the availability of both off-site and on-site power supply systems. The licensee plans to discuss in detail their design basis documents and control logic changes at another meeting at sometime in the future.

ENCLOSURE 2

NRC/CP&L MEETING
February 19, 1992

Names

Tommy Le
Stephen D. Floyd
Ron Oates
Bill Styron
Indru Narayani
Jim Doitrick
George Attarian
Peter J. Kang
Michael T. Markley
Chris Christensen
Paul Gill
E. G. Adensam
Michael Webb
Gus Lainas

Organizations

NRC, PDII-1
CP&L Nuclear Licensing
CP&L Nuclear Licensing
CP&L NED/ELEC Unit
EBASCO Elec Eng.
CP&L NEO/Elec Unit
CP&L NED/ELEC
NRC/NRR/SELB
NRC/NRR/LPEB
NRC/RII/Section Chief
NRC/NRR/SELB
NRC/NRR/PDII-1
NRC/NRR/PDII-1
NRC/NRR/AD RII

Carolina Power & Light Company

*Brunswick Nuclear Plant
AC Power Source Improvement Project*

NRC/CPL Meeting February 19, 1992

Meeting Agenda

- | | |
|--------------------------|----------------|
| 1. Introduction | Steve Floyd |
| 2. Project Overview | Bill Styron |
| 3. Conceptual Design | Indru Narayani |
| 4. Construction LCO | Indru Narayani |
| 5. Open Floor Discussion | |

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK STEAM ELECTRIC PLANT

AC POWER SOURCE IMPROVEMENT

OBJECTIVES:

Primary

IMPROVED GDC-17 COMPLIANCE PER IEEE 765
STANDARDS

ALTERNATE AC POWER SOURCE

Secondary

Non-Seg Bus Upgrade

ε-Bus Voltage Improvement

Switchyard Voltage Schedule Improvement

Additional System Capacity

EDSFI Concerns

BNP COMPLIANCE WITH GDC-17

**ONE OFF-SITE PREFERRED POWER
CIRCUIT AVAILABLE WITHIN A FEW
SECONDS.**

(Start-up transformer upon automatic dead bus transfer)

**SECOND OFF-SITE POWER CIRCUIT
AVAILABLE WITHIN 8-HOURS OF
POST ACCIDENT UNIT SHUTDOWN.**

(Back feed through main transformer)

1983 IEEE 765 REQUIREMENTS *(In parts)*

(5) A second circuit shall be designed to be available within a time period demonstrated to be adequate by the safety analysis of the station.

(6) An improved design should have two circuits automatically available to provide preferred power to Class 1E buses within a few seconds following an accident.

ALTERNATE AC POWER SOURCE

**Plant LCO Extension during one EGD
out of service**

Plant SBO coping time improvement

DESIGN REQUIREMENTS:

General

Non Class 1E equipment

Design features of Class 1E EDG

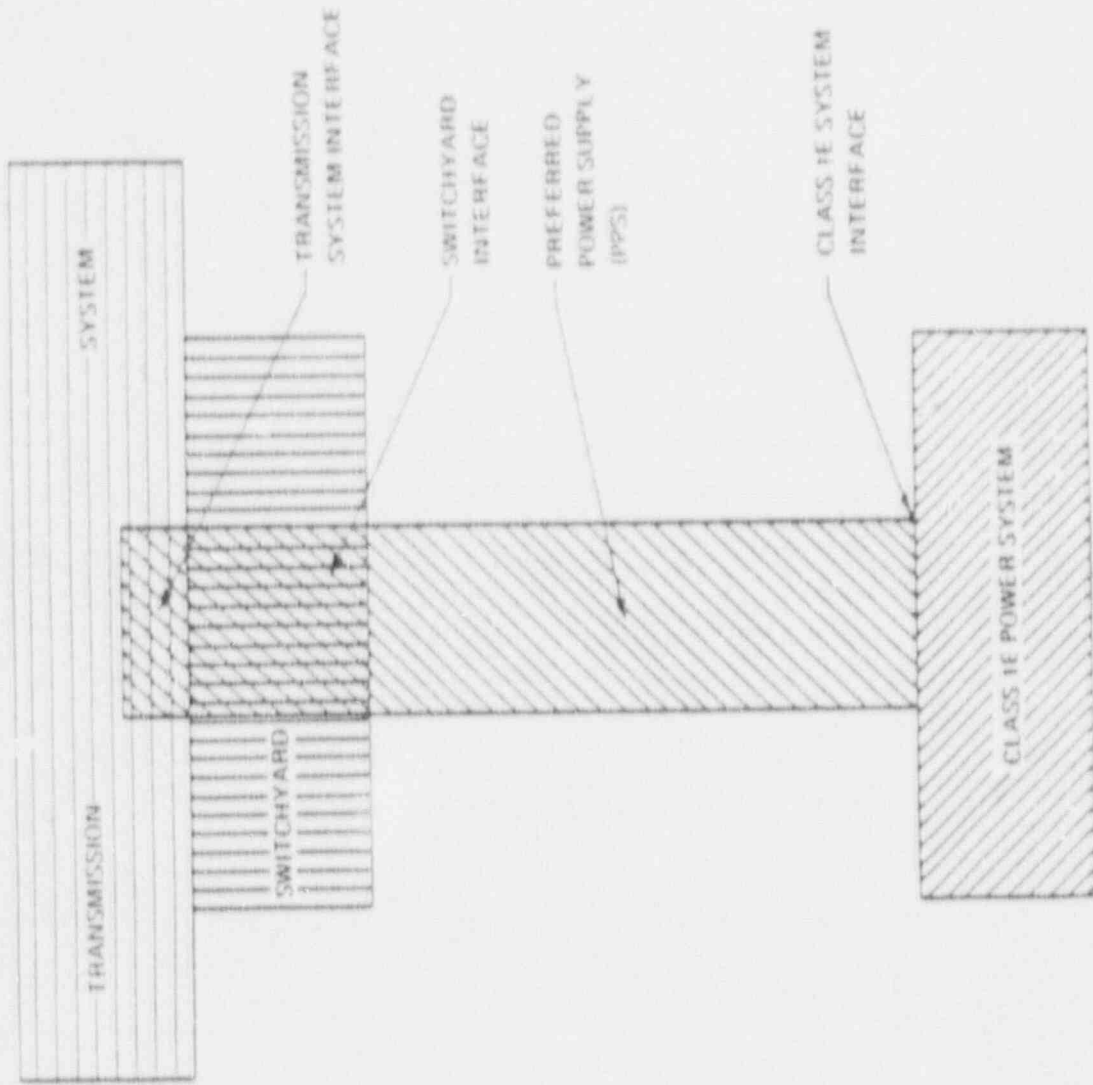
Plant surveillance similar to EDGs

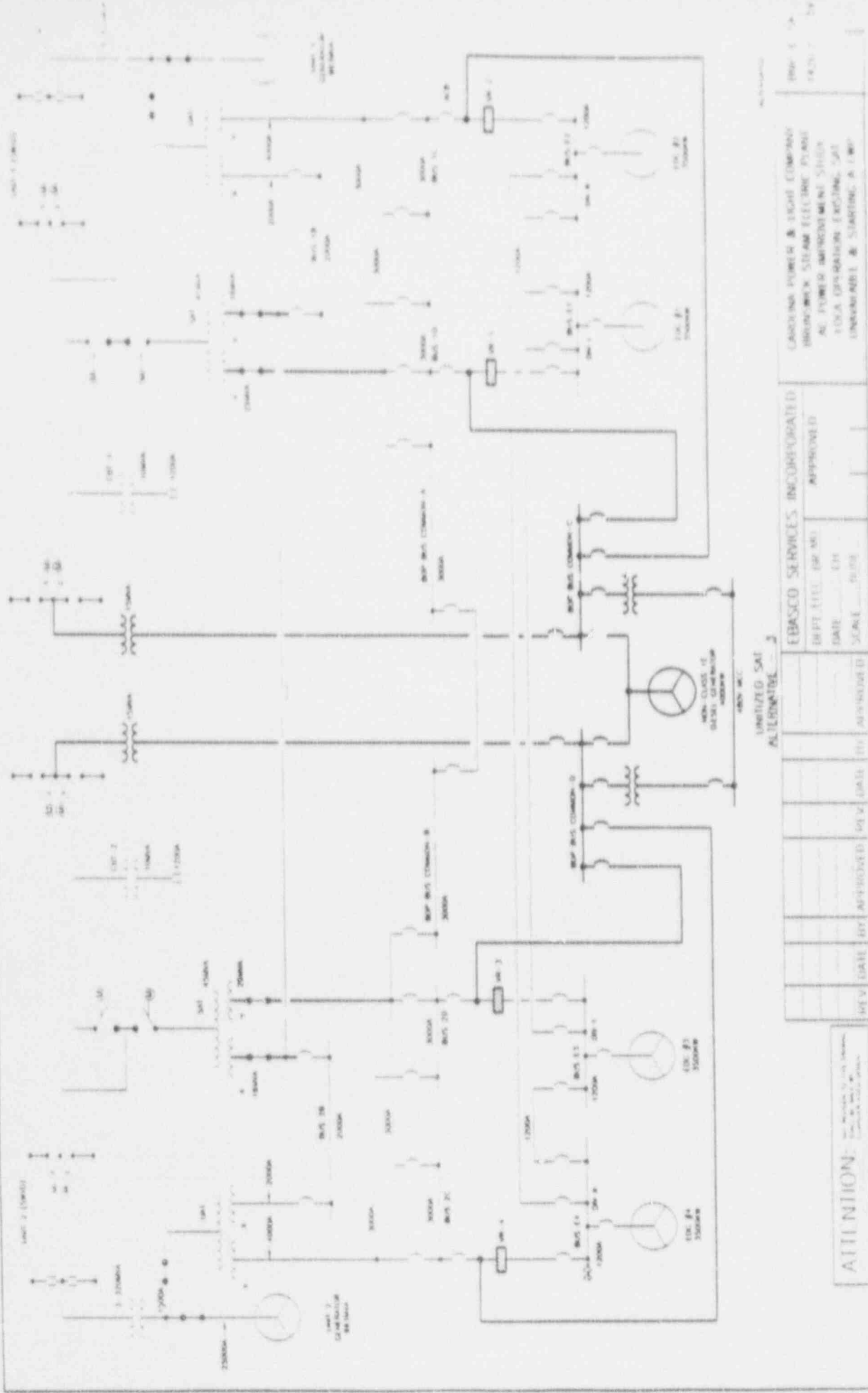
Equipment maintenance schedule similar to EDGs

Building design to meet NUMARC 87.00

All feeder cables in underground ductbank

Preferred Power Supply (PPS) Interface Diagram





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CARDINAL PAPER & LOGS COMPANY
 BROWN STEAM ELECTRIC PLANT
 ALL POWER EQUIPMENT SHALL
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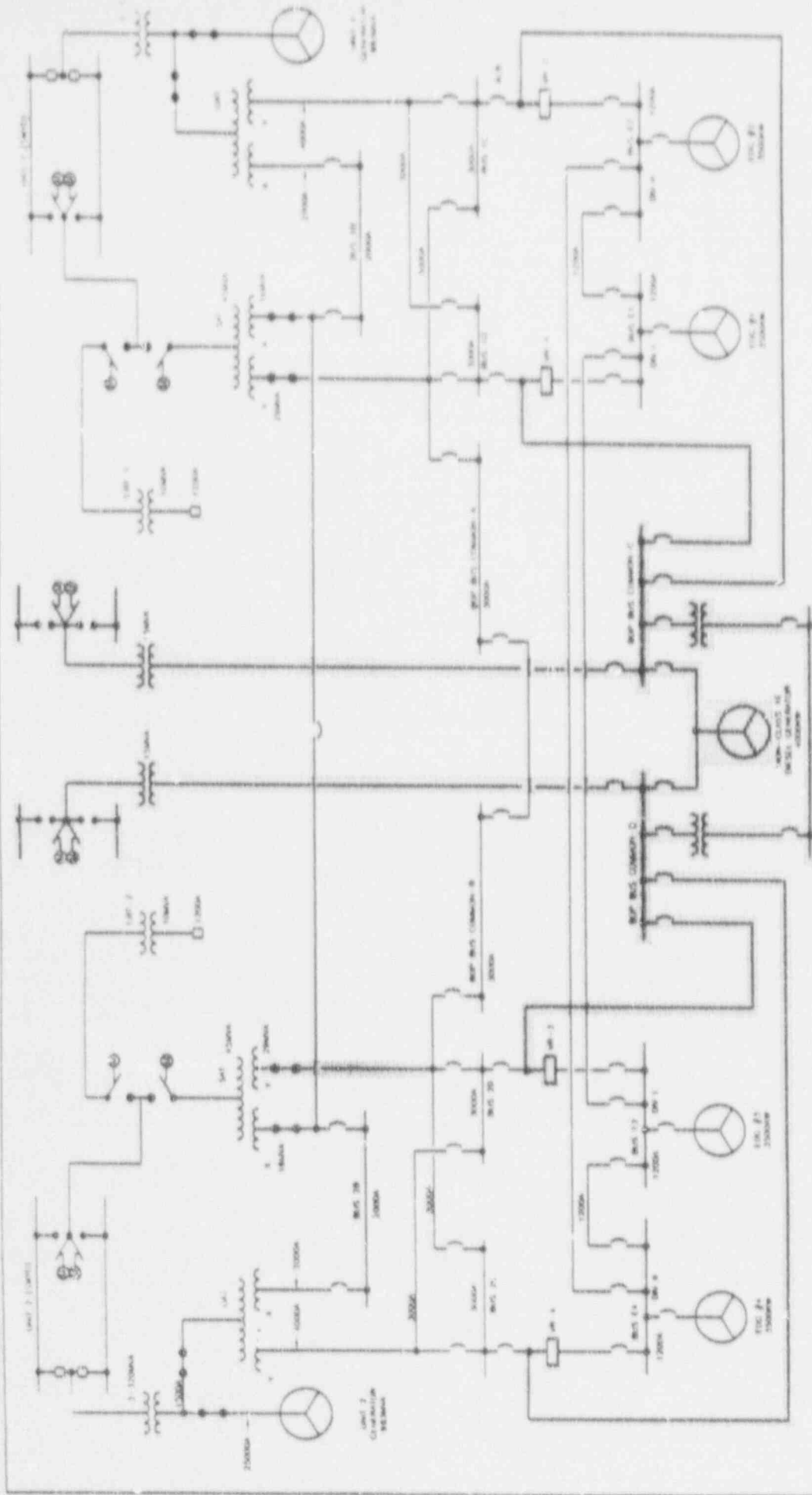
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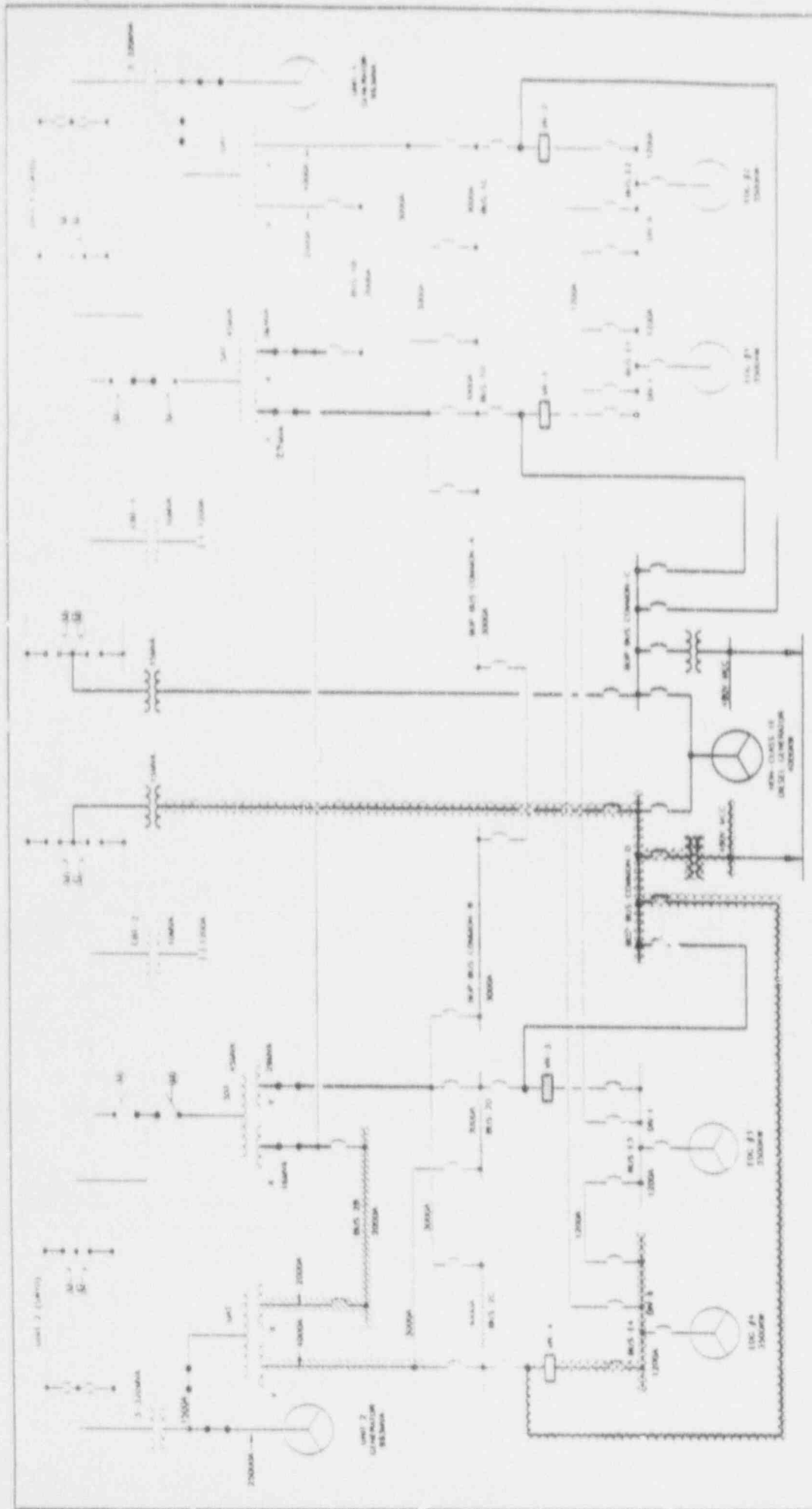
ATTENTION: See Appendix 1 for a list of all equipment and materials used in this study.

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ALTERNATIVE 3

CARDINAL PUMPER & LIGHT COMPANY
DRYDEN STEAM ELECTRIC
GENERATING STATION
AC POWER IMPROVEMENT STUDY
ALTERNATIVE 3

MAJOR EQUIPMENT:

- Two SWYD Bays with 2-Circuit Switchers Each
- 2-Two Winding Transformers 230-4.16 kv, 15/20/25 MVA
- 1-4000 KW Diesel Generator
- 4-Voltage Regulators
- 2-4160 Volt, 350 MVS SWGRs
- 2-Dry Type 4160-480 V Transformers
- 2-480 Volt MCCs
- Power & Control Cables
- 5 KV Non Seg Bus
- 1-6000 Gal Fuel Oil Tank
- 1-refab Building (60' x 70')
- Existing Non Seg Bus Upgrade



UNITIZED SMT
ALTERNATIVE - 3

ORIONA POWER & LIGHT COMPANY
BROOKLYN STEAM ELECTRIC
LOADING STATION
AC POWER IMPROVEMENT STUDY
ALTERNATIVE 3

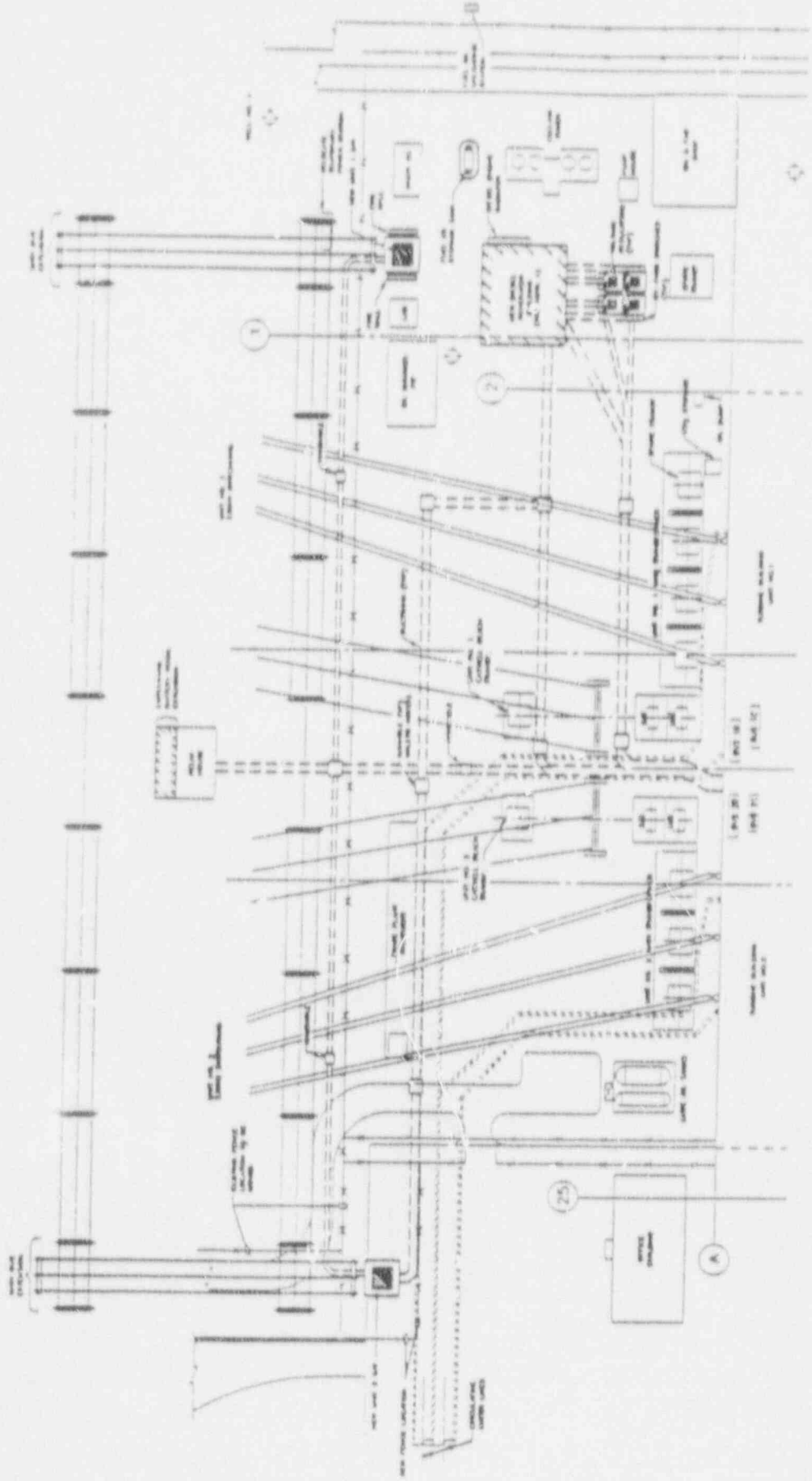
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PLEASE NORTH


FIGURE

1. SYSTEMS FOR THE TANK AND PUMP SERVICES (MATERIALS) IN THE PLANT AREA OF THE RESEARCH LABORATORY OF THE U.S. ATOMICS ENERGY COMMISSION, BETHLEHEM, PENNSYLVANIA



CONSOLIDATED POWER & LIGHT COMPANY
 BETHLEHEM STEEL ELECTRIC PLANT
 AT POWER SERVICE IMPROVEMENT PROJECT
 BETHLEHEM, PA.

DESIGNED BY: [Name]
 DEPT. OF: [Name]
 DATE: [Date]
 SCALE: [Scale]

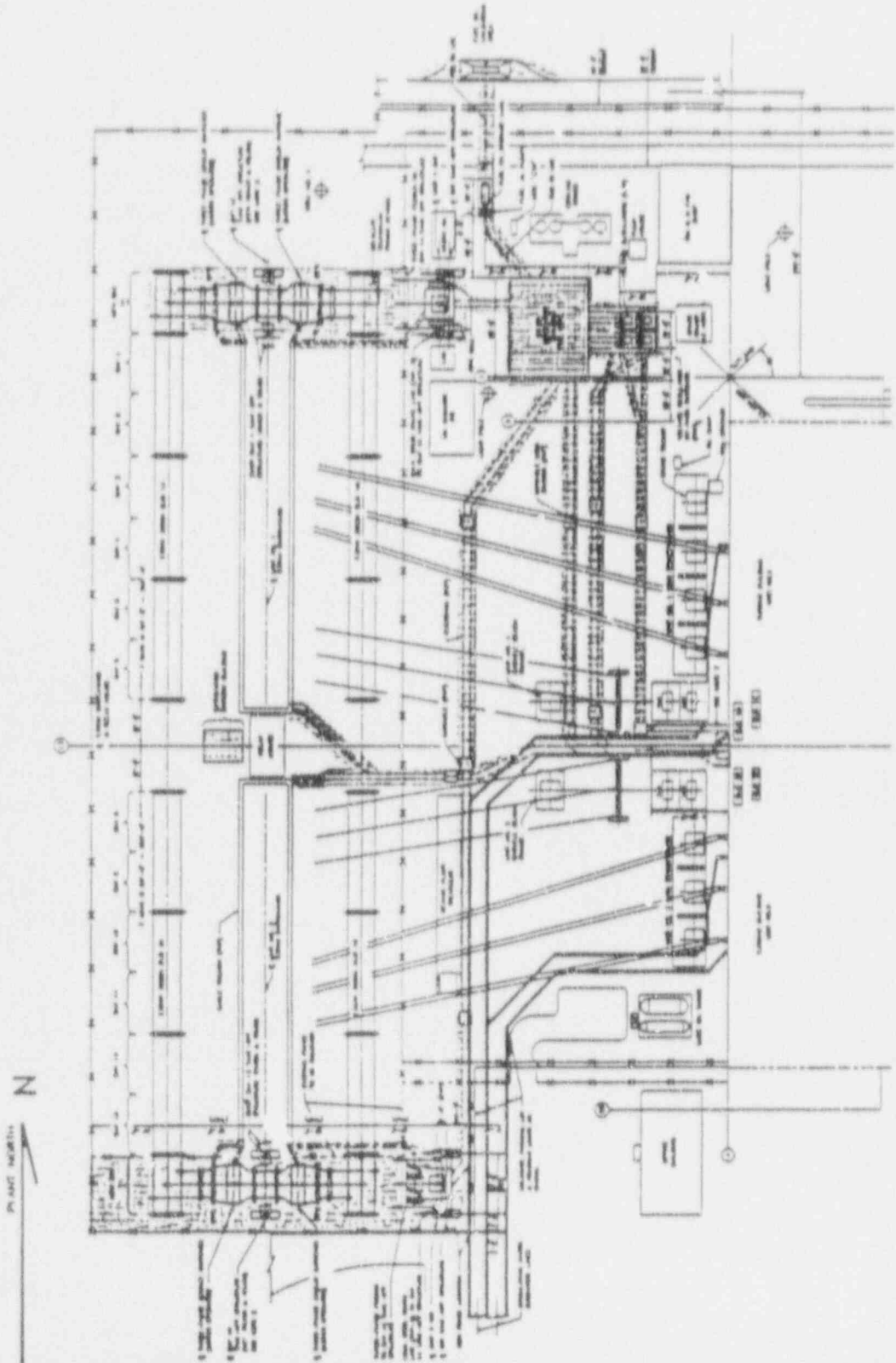
APPROVED BY: [Name]
 TITLE: [Title]

PROJECT NO. [Number]
 SHEET NO. [Number]

DATE: [Date]

NOTE:

1. ALL WORK TO BE DONE IN ACCORDANCE WITH THE SPECIFICATIONS FOR THE PROJECT.
2. ALL MATERIALS TO BE USED MUST BE OF THE HIGHEST QUALITY AND APPROVED BY THE ENGINEER.
3. ALL WORK TO BE COMPLETED WITHIN THE SPECIFIED TIME FRAME.
4. ALL WORK TO BE DONE IN ACCORDANCE WITH THE LOCAL, STATE AND FEDERAL CODES.
5. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT SCHEDULE.
6. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT BUDGET.
7. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT RISK MANAGEMENT PLAN.
8. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT CHANGE MANAGEMENT PLAN.
9. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT COMMUNICATIONS PLAN.
10. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT STAKEHOLDER ENGAGEMENT PLAN.
11. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT QUALITY MANAGEMENT PLAN.
12. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT SAFETY AND HEALTH PLAN.
13. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT ENVIRONMENTAL MANAGEMENT PLAN.
14. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT SOCIAL AND ETHICAL MANAGEMENT PLAN.
15. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT INFORMATION MANAGEMENT PLAN.
16. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT LEGAL AND COMPLIANCE MANAGEMENT PLAN.
17. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT PROJECT MANAGEMENT PLAN.
18. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT RISK MANAGEMENT PLAN.
19. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT STAKEHOLDER ENGAGEMENT PLAN.
20. ALL WORK TO BE DONE IN ACCORDANCE WITH THE PROJECT QUALITY MANAGEMENT PLAN.



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		DEPT. LILL. DR. 13*		APPROVED		BRUNSWICK STEAM ELECTRIC PLANT	
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AC POWER SOURCE IMPROVEMENT PROJECT
ALTERNATIVE 3C

**Brunswick Steam Electric Generating Station
AC Power Source Improvement
Proposed Control Logic**

- o The proposed logic allows complete flexibility of operation.
- o Existing single control switch for both Master and Slave breakers supplying E-Bus will be separated.
- o Control logic of the existing BOP buses C & D will not change.
 - o Automatic quick dead bus transfer from UAT to existing SAT upon loss of unit.
 - o Manual live bus transfer from existing SAT to UAT.
- o Loss of SAT will automatically transfer E-Bus to the remaining SAT.
- o Operator can manually feed E-Buses from UAT under manual plant operation.
- o With one of the four EDGs out for service, the fifth non-safety diesel generator will receive all auto-start signals. Selection of diesel is under keylock control.
- o Upon loss of off-site power, the fifth non-safety diesel will automatically start. Alignment to any E-Bus, if required, is manual.

CONSTRUCTION LCO REQUIREMENTS

FEATURES OF PROPOSED TECHNICAL SPECIFICATION REVISIONS

A. DURING CONSTRUCTION

1. BOTH OFF-SITE POWER CIRCUITS MUST BE DISCONNECTED FROM AN E-BUS TO MODIFY FEEDER BREAKERS.
2. CURRENT TECHNICAL SPECIFICATIONS REQUIRE DUAL-UNIT SHUTDOWN ON LOSS OF BOTH OFF-SITE CIRCUITS TO AN E-BUS EXCEEDING 24 HOURS (NOTE: ASSUMES TWO UNITS OPERATING).
3. TWENTY-FOUR HOURS IS INSUFFICIENT TO COMPLETE ELECTRICAL CONNECTIONS.
4. PROPOSED REVISION WOULD ALLOW ONE-TIME EXTENSION TO SEVEN DAYS. (NOTE: E-BUS COULD BE POWERED FROM ITS EDG OR FROM OPERATING UNIT'S E-BUS VIA CROSS-TIES.)

B. OFF-SITE POWER - NORMAL OPERATION

1. NO CHANGES TO TECHNICAL SPECIFICATIONS REQUIRED.
2. CHANGES TO BASES TO DEFINE THE TWO PHYSICALLY INDEPENDENT SOURCES OF OFF-SITE POWER AS THE EXISTING AND NEW SATs (THIRD SOURCE IS UAT BACKFEED).

FEATURES OF PROPOSED TECHNICAL SPECIFICATION
REVISIONS (CONTINUED)

C. ON-SITE POWER - NORMAL OPERATION

	<u>CURRENT ALLOWED OUTAGE TIME (AAC SOURCE UNAVAILABLE)</u>	<u>PROPOSED ALLOWED OUTAGE TIME (AAC SOURCE AVAILABLE)</u>
<u>BOTH UNITS AT POWER</u>		
LOSS OF EDG #1 OR #2	7 DAYS BOTH UNITS	7 DAYS UNIT 1 30 DAYS UNIT 2
LOSS OF EDG #3 OR #4	7 DAYS BOTH UNITS	7 DAYS UNIT 2 30 DAYS UNIT 1
<u>UNIT 1 AT POWER/UNIT 2 SHUTDOWN</u>		
LOSS OF ANY EDG	7 DAYS UNIT 1	30 DAYS UNIT 1
<u>UNIT 2 AT POWER/UNIT 1 SHUTDOWN</u>		
LOSS OF ANY EDG	7 DAYS UNIT 2	30 DAYS UNIT 2

SUMMARY OF JUNE ACTION PLAN IMPLEMENTATION

A. INTEGRATED OPTION REFINEMENT

1. CRITERIA

- TECHNICALLY FEASIBLE
- MINIMAL IMPACT ON EXISTING SYSTEM
- REDUCED OPERATOR BURDEN
- ACHIEVABLE WITHIN 12-WEEK REFUELING OUTAGE
- PROACTIVELY ADDRESS WIDE RANGE OF ELECTRICAL ISSUES

2. ISSUES EVALUATED

- GDC-17
- STATION BLACKOUT
- FIRE PROTECTION
- NON-SEGREGATED BUS DUCT
- SWITCHYARD DC CONTROL POWER
- PLANT BUS VOLTAGE IMPROVEMENT
- CDF IMPROVEMENT
- POTENTIAL EDG RELIABILITY IMPROVEMENT

B. TOTAL OF 15 OPTIONS EVALUATED AGAINST CRITERIA AND ISSUES

SUMMARY OF JUNE ACTION PLAN IMPLEMENTATION
(CONTINUED)

C. SELECTED OPTION

1. OFF-SITE POWER

- ADD ONE 25MVA 230/4.16 KV START-UP TRANSFORMER PER UNIT
 - * PRIMARY SIDE CONNECTED TO SWITCHYARD VIA NEW BAY WITH CIRCUIT SWITCHERS
 - * SECONDARY SIDE CONNECTED TO NEW 4160V SWITCHGEAR
 - * RESOLVES GDC-17 ISSUE

- NEW VOLTAGE REGULATORS TO 4160V EMERGENCY BUS FEEDS
 - * IMPROVES PLANT BUS VOLTAGE

- NEW DC STORAGE BATTERY FOR 230 KV BREAKER CONTROL
 - * BREAKER CONTROL INDEPENDENT OF STATION BATTERIES

- Y-BUS OF SAT UPGRADED TO 5000 AMPS
 - * RESOLVES NON-SEGREGATED BUS DUCT ISSUE

SUMMARY OF JUNE ACTION PLAN IMPLEMENTATION
(CONTINUED)

2. ON-SITE POWER

- NEW 4000KW NON-CLASS 1E DIESEL GENERATOR
 - * CAPABLE OF FEEDING ANY ONE OF FOUR EXISTING E-BUSSES
 - * INDEPENDENT OF CLASS 1E POWER
- SEPARATE DC POWER SUPPLY
- AIR-COOLED
- SEPARATE FUEL OIL SUPPLY
- UNDERGROUND CABLE TO E-BUSSES
 - * REMOTE START CAPABILITY FROM CONTROL ROOM (MEETS NUMARC 8700 SECTION 7.1.2 CRITERIA AS A 10-MINUTE ALTERNATE AC POWER SOURCE)
 - * MAINTENANCE PROGRAM
 - * TARGET RELIABILITY OF 0.95 PER DEMAND

SAFETY BENEFITS OF ENHANCEMENTS

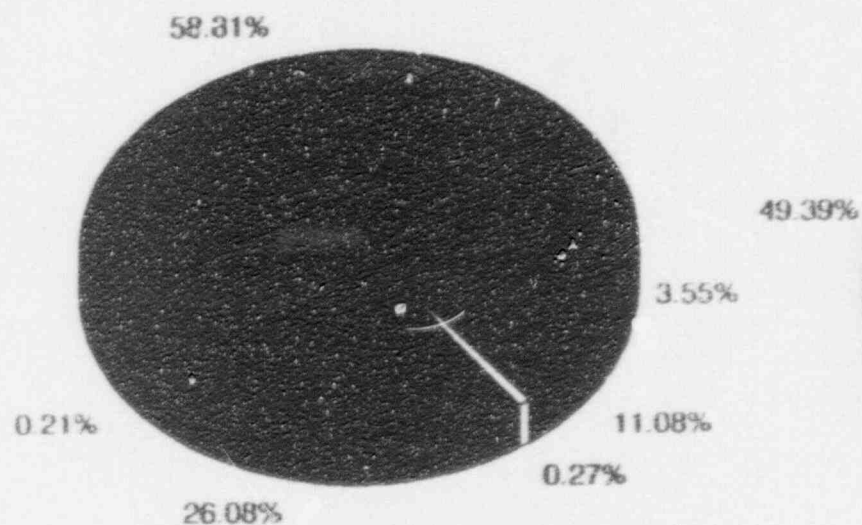
A. OFF-SITE POWER

1. IMPROVED RELIABILITY OF OFF-SITE POWER TO E-BUSSES BY PROVIDING REDUNDANT SAT
2. VOLTAGE REGULATORS REDUCE EFFECT OF OFF-SITE POWER VOLTAGE FLUCTUATIONS ON E-BUSSES
3. REDUCED OPERATOR BURDEN
 - ELIMINATES UAT BACKFEED AS SECOND SOURCE OF OFF-SITE POWER
 - ELIMINATES ADMINISTRATIVE CONTROLS ON TRANSFORMER Y-WINDINGS LOADING
4. IMPROVED CORE DAMAGE FREQUENCY FROM 1.37 E-5 TO 1.3 E-5 (6 PERCENT REDUCTION)

B. ON-SITE POWER

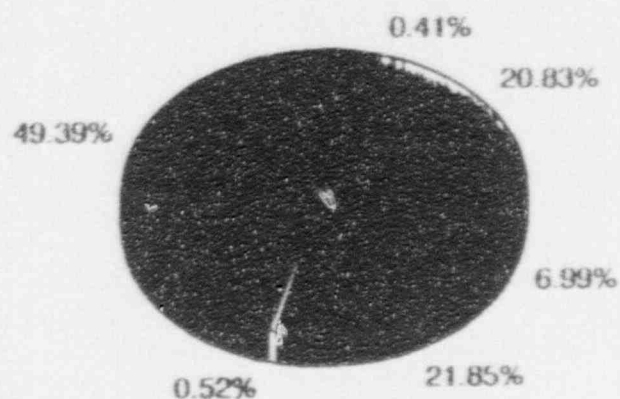
1. IMPROVED RELIABILITY OF ON-SITE POWER TO E-BUSSES
2. REDUCED OPERATOR BURDEN
 - SIMPLIFIES STATION BLACKOUT SCENARIO
 - SIMPLIFIES SOME APPENDIX R SCENARIOS
3. IMPROVED CORE DAMAGE FREQUENCY FROM 1.37 E-5 TO 7.03 E-6 (49 PERCENT REDUCTION)

BASE CASE

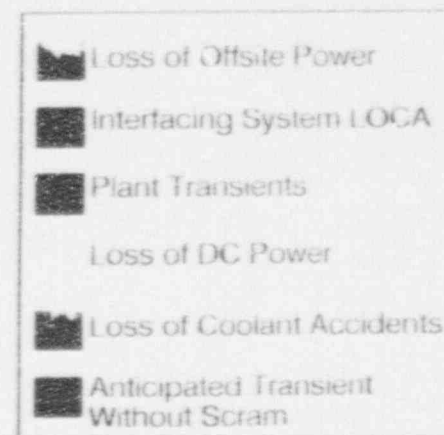


CDF = 1.37E-05

PROPOSED



CDF = 6.89E-06



CONTRIBUTION TO CORE DAMAGE FREQUENCY BY INITIATING EVENT CATEGORY

FEATURES OF PROPOSED TECHNICAL SPECIFICATION REVISIONS

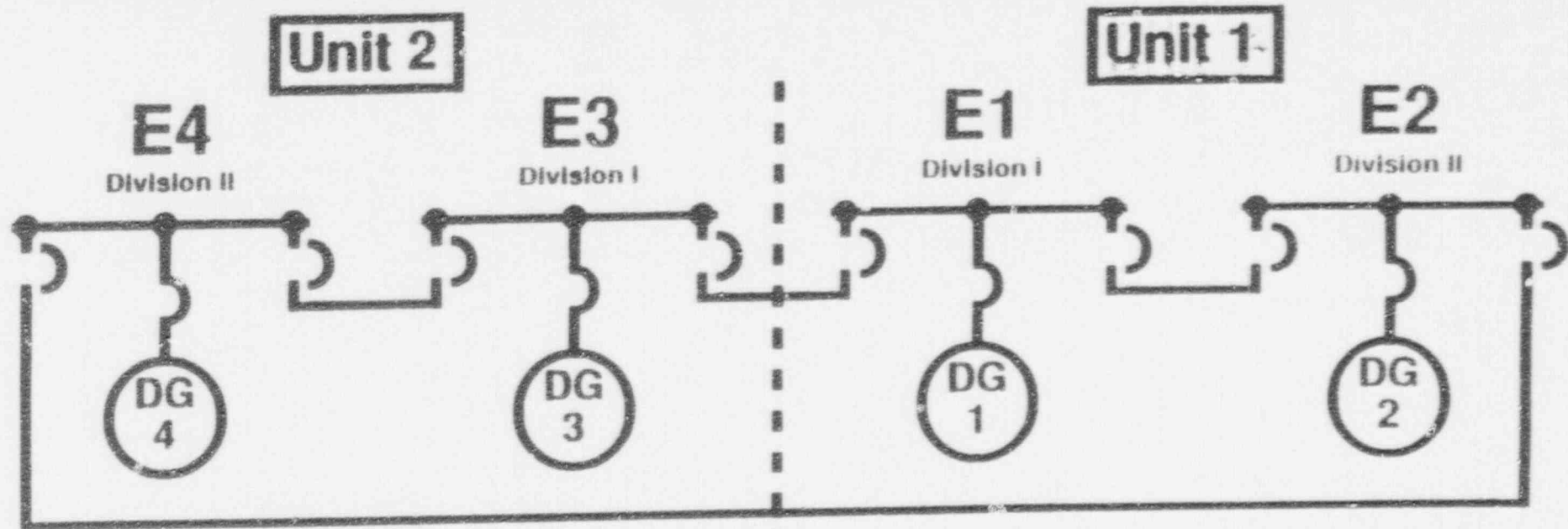
A. DURING CONSTRUCTION

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3. TWENTY-FOUR HOURS IS INSUFFICIENT TO COMPLETE ELECTRICAL CONNECTIONS.
4. PROPOSED REVISION WOULD ALLOW ONE-TIME EXTENSION TO SEVEN DAYS. (NOTE: E-BUS COULD BE POWERED FROM ITS EDG OR FROM OPERATING UNIT'S E-BUS VIA CROSS-TIES.)

B. OFF-SITE POWER - NORMAL OPERATION

1. NO CHANGES TO TECHNICAL SPECIFICATIONS REQUIRED.
2. CHANGES TO BASES TO DEFINE THE TWO PHYSICALLY INDEPENDENT SOURCES OF OFF-SITE POWER AS THE EXISTING AND NEW SATs (THIRD SOURCE IS UAT BACKFEED).

Diesel Generator Emergency Power System



E4 Equipment NSW Pump 2B Motor RHR Pump 2B Motor CS Pump 2B Motor Fire Pump Motor
RHR Pump 1B Motor
CSW Pump 2B Motor RHR SW Pump 2B Motor RHR SW Pump 1B Motor CSW Pump 1A Motor

E3 Equipment NSW Pump 2A Motor RHR Pump 2A Motor CS Pump 2A Motor
RHR Pump 1A Motor
CSW Pump 2A Motor RHR SW Pump 2A Motor RHR SW Pump 1A Motor

E1 Equipment NSW Pump 1A Motor RHR Pump 1C Motor CS Pump 1A Motor
RHR Pump 2C Motor
CSW Pump 1B Motor RHR SW Pump 1C Motor RHR SW Pump 2C Motor CSW Pump 2C Motor

E2 Equipment NSW Pump 1B Motor RHR Pump 1D Motor CS Pump 1B Motor Fire Pump Motor
RHR Pump 2D Motor
CSW Pump 1C Motor RHR SW Pump 1D Motor RHR SW Pump 2D Motor

FEATURES OF PROPOSED TECHNICAL SPECIFICATION
REVISIONS (CONTINUED)

C. ON-SITE POWER - NORMAL OPERATION

	<u>CURRENT ALLOWED OUTAGE TIME (AAC SOURCE UNAVAILABLE)</u>	<u>PROPOSED ALLOWED OUTAGE TIME (AAC SOURCE AVAILABLE)</u>
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<u>UNIT 1 AT POWER/UNIT 2 SHUTDOWN</u>		
LOSS OF ANY EDG	7 DAYS UNIT 1	30 DAYS UNIT 1
<u>UNIT 2 AT POWER/UNIT 1 SHUTDOWN</u>		
LOSS OF ANY EDG	7 DAYS UNIT 2	30 DAYS UNIT 2

D. SAFETY PERSPECTIVES OF PROPOSED TECHNICAL SPECIFICATION REVISIONS

- CURRENT ELECTRICAL SYSTEM CONFIGURATION IS ACCEPTABLY SAFE
 - * CDF OF 1.37 E-5 MEETS SAFETY GOAL

- PROPOSED TECHNICAL SPECIFICATION REVISION VIEWED AS A SAFETY BENEFIT
 - * ALLOWS MORE EXTENSIVE MAINTENANCE ON SHUTDOWN PLANT DIESELS
 - * HIGHER-QUALITY MAINTENANCE CAN BE PERFORMED WITHOUT PRESSURE OF AFFECTING OPERATING UNIT
 - * POTENTIAL TO IMPROVE EDG RELIABILITY/ AVAILABILITY

- ENHANCED ELECTRICAL SYSTEM CONFIGURATION WITH REVISED TECHNICAL SPECIFICATION PROVIDES IMPROVED PUBLIC HEALTH AND SAFETY
 - * CDF WITH 30-DAY LCO IS 7.08 E-5
 - * CDF REDUCED 48 PERCENT OVER CURRENT CONFIGURATION AND TECHNICAL SPECIFICATIONS

RISK ASSESSMENT OF EXTENDED EDG ALLOWED OUTAGE TIMES

