NORTHEAST UTILITIES
The Connecticut Light And Power Company
Western Massachusetts Electric Company
Holyoke Water Power Company
Northeast Utilities Service Company
Northeast Nuclear Energy Company

General Offices · Selden Street, Berlin Connecticut

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Re: 10CFR50.73(a)(2)(iv)
10CFR50.73(a)(2)(v)
September 11, 1992
MP-92-993

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Reference: Facility Operating License No. DPR-65
Docket No. 50-336
Licensee Event Report 92-012-01

Gentlemen:

This letter forwards update Licensee Event Report 92-012-01.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Stephen E. Scace
Vice President - Millstone Station

SES/RJL:ljs

Attachment: LER 92-012-01

cc: T. T. Martin, Region I Administrator
P.D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2 and 3
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2

16nn21

NRC Form 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

Estimated burden per response to comply with this information collection request: 50.0 hrs. Forward comments regarding burden estimate to the Records and Reports Management Branch (P-530), U.S. Nuclear Regulatory Commission, Washington, DC 20555, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): Millstone Nuclear Power Station Unit 2

DOCKET NUMBER (2): 0 5 0 0 0 3 6 1

PAGE (3): 1 OF 0 6

TITLE (4): Partial Loss of Normal Power (LNP)

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER
0 7	0 6	9 2	9 2	0 1 2	0 1	0 9	1 1	9 2		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
6	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10): 0 0 0	20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Robert J. LaFrance, Engineer, Ext. 4855	AREA CODE 2 0 3 — 4 4 7 - 1 7 9 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

X YES (If yes, complete EXPECTED SUBMISSION DATE) ☐ NO

EXPECTED SUBMISSION DATE (15): MONTH 1 2 DAY 1 8 YEAR 9 2

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On 7/3/92, at 0946, with the plant in refueling mode with all fuel transferred to the spent fuel pool, an inadvertent ESAS actuation occurred on the Facility 1 4160 volt vital AC bus (24C). This resulted in a partial Loss of Normal Power (LNP). This happened when an Operator secured power to two (of four) ESAS sensor cabinets, while tagging out equipment in preparation for inverter replacement. This action caused a Facility Z1 undervoltage actuation, which isolated vital AC bus 24C and generated a Facility Z1 load shed signal. The "A" Emergency Diesel Generator (EDG) started, came up to speed and closed in on bus 24C, but did not pick up any of the loads programmed by the sequencer. Immediate operator actions for recovery were hampered by the fact that no major vital equipment could be started on the vital bus. After several unsuccessful attempts to energize Service Water Pumps from 24C, the operator secured the EDG. Operators then restored power to one of the two sensor cabinets, which allowed manual reset of the undervoltage signal and subsequent restoration of power to vital AC bus 24C from the RSST. In parallel with this event, 14 inches of Spent Fuel Pool level was drained to the Reactor Vessel.

Subsequent investigation and analysis has shown that the problem was not in the EDG or its associated sequencer. Rather, the components that receive a "load shed" signal, in the initial stage of the LNP response, continued to receive that signal through subsequent stages. This was caused by an interaction between the Automatic Test Insertion (ATI) circuit and the Load Shed Actuation Module in the ESAS.

I. Description of Event

On July 6, 1992, at 0946, Millstone Unit 2 experienced an inadvertent ESF actuation which resulted in a partial Loss of Normal Power (LNP) on the Facility 1 4160 volt vital AC bus (24C). The plant was shutdown at the time, with all fuel offloaded to the Spent Fuel Pool. The LNP occurred when an Operator secured power to the second of four ESAS sensor cabinets, while tagging out equipment in preparation for inverter replacement. This satisfied the 2 out of 4 logic needed for ESAS actuation, and a Facility Z1 undervoltage actuation occurred. This action isolated vital AC bus 24C and generated a Facility Z1 load shed signal. The "A" Emergency Diesel Generator (EDG) started, came up to speed and closed in on bus 24C, but was not able to provide uninterrupted power to any of the loads normally placed on the bus by the EDG Sequencer. Immediate Operator action was taken to attempt a manual start of the "A" Service Water Pump. When this proved to be unsuccessful, the Operator attempted to start the "B" Service Water Pump (swing unit, aligned to "A" header). This was also unsuccessful, so the Operator secured "A" EDG due to unavailability of cooling. Subsequent Operator action was taken to restore power to one of the sensor cabinets (Sensor Cabinet "D"). This action satisfied the logic required to remove the load shed signal, which in turn permitted restoration of power to vital bus 24C from the Reserve Station Service Transformer (RSST). Power was lost to the bus for 19 minutes. The other Vital bus, 24D, remained energized throughout the event from off-site power through the Normal Station Service Transformer (NSST). Off-site power was also available from the RSST and, through a cross-tie, from Unit 1. During the Facility 1 Outage, the Operator elected to align the Shutdown Cooling System to provide cooling to the Spent Fuel Pool. In so doing, he opened a flow path which permitted the Spent Fuel Pool to gravity drain to the Reactor Coolant System. Approximately 14 inches (10,000 gallons) of SFP water was drained.

II. Cause of Event

The Facility 1 Loss of Normal Power occurred as a result of deenergizing 2 (of 4) ESAS sensor cabinets while 1 (of 2) ESAS actuation cabinet was still energized. This is an abnormal electrical alignment, which occurred because of the planned replacement of 2 of the vital 120 volt inverters at the same time. The Plant Design Change Record (PDCR), prepared to define this modification, detailed the sequence in which the work should be accomplished. This sequence was not clearly transmitted to the personnel preparing the Automated Work Order (AWO). As a result, the consequences of tagging out more than one Sensor Cabinet at a time were not adequately evaluated. The tagging guidance provided to Operations, while correct from a personnel safety aspect, created the situation which resulted in the LNP.

The root cause of the LNP was personnel error in not recognizing the consequences associated with the deenergization of two sensor cabinets, and not fully reviewing the design package associated with the inverter replacement.

The circumstance under which the EDG was unable to provide uninterrupted power to the sequenced loads is an ESAS design problem. In the abnormal electrical alignment outlined above (two ESAS sensor cabinets de-energized with one ESAS actuation cabinet energized), the load shed signal from the de-energized cabinet "locks in." The Automatic Test Insertion (ATI) unit continues to send a signal that causes the load shed actuation modules to shed the equipment as the EDG sequencer puts the equipment on the bus. However, if the Z1 ESAS actuation cabinet is the one which is deenergized, the ATI unit will also be deenergized, and it will provide no output signal and thus will not affect the load shed actuation modules. Preliminary analysis of the existing design points to the possibility that Millstone Unit 2 may not meet the design basis with respect to mitigating the effects of a LOCA, while assuming a single failure. Specifically, the single failure of one DC bus at the time of turbine trip, without crediting the backup non-safety grade inverter, will disable one train of on-site AC power and cause deenergization of two UV sensor channels, which will prohibit proper operation of the opposite train of onsite AC power to mitigate an accident.

Subsequent review and analysis have confirmed the design basis problem. If the electrical alignment outlined above is obtained (two sensor cabinets deenergized), and Actuation Cabinet 5 (the power source for the ATI circuit) is still energized, the scenario stated above occurs. This problem is being corrected through the design change process.

III. Analysis of Event

This report is being submitted pursuant to 10CFR paragraphs 50.73(a)(2)(iv) and 50.73(a)(2)(v) to describe an event that resulted in the automatic actuation of an Engineered Safety Feature and to report a condition that alone could possibly have prevented the fulfillment of the safety function of systems that are needed to mitigate the consequences of an accident. During this event, decay heat removal capability (spent fuel pool cooling) was effectively out of service for approximately 90 minutes. This resulted in a 4 degree temperature rise in the Spent Fuel Pool (88 degrees Fahrenheit to 92 degrees Fahrenheit). The safety consequence of this situation is the potential to exceed the Technical Specification limit (140 degrees Fahrenheit) and, ultimately, to reach the boiling point in the Spent Fuel Pool. Considering the time factor involved (approximately 10 hours to challenge the Technical Specification limit) and the availability of electrical power, the safety consequences were minimal.

There were no safety consequences associated with the ESAS design problem, since the plant was in cold shutdown with all fuel offloaded to the Spent Fuel Pool. The length of time from shutdown to this event (37 days) had significantly reduced the decay heat load. In addition, the operator action which initiated this event (i.e., securing power to 2 sensor cabinets simultaneously) should only occur during a period when the plant is in cold shutdown.

In light of the situation described above, the entire ESAS circuitry is being reviewed for any other potential interface problems. This review has thus far identified two additional problems.

1. The assumed electrical alignment (loss of a DC bus and assumed unavailability of the backup power sources for the associated 120 VAC panels) results in a simultaneous Safety Injection Actuation Signal (SIAS) and Sump Recirculation Actuation Signal (SRAS). The former signal automatically starts the Low Pressure Safety Injection (LPSI) pump, while the latter signal automatically stops the same pump. The result is that the LPSI pump is stopped.

2. Under the same electrical alignment, the Pressurizer Power Operated Relief Valves (PORVs) will fail open.

IV. Corrective Action

Immediate corrective action was taken to restore power to Facility 1 vital 4160 volt electrical bus (24C), after restoring power to Sensor Cabinet D and clearing the undervoltage signal.

The pertinent operating procedure (OP 2384) is currently being reviewed to evaluate whether added Caution notes (or similar warnings) might assist in precluding this type of event from occurring. Procedure changes will be implemented as indicated by the review.

Implementation of the pertinent aspects of the Performance Enhancement Program (e.g., augmentation of Plant Engineering for assignment of system engineers, and additional Operations personnel for work control/planning) will enhance pre-performance review of design change records and resolution of plant requirements to support multiple work activities in outage planning.

The ESAS analysis described above has identified three areas in which design changes are planned prior to returning to power. These include:

1. Eliminate the interaction of the ATI with the Load Shed Actuation Module.

2. Modify the action of the simultaneous SIAS/SRAS signals, to eliminate the LPSI pump trip.

TEXT (If more space is required, use additional NRC Form 366A's) (17)

3. Modify the PORV control relay logic to prevent inadvertent opening on loss of control power.

An Independent Review Committee was also formed to investigate this event. The recommendations of this Committee have been received, and are under evaluation. The final actions planned as a result of these recommendations will be addressed in the supplementary report.

V. Additional Information

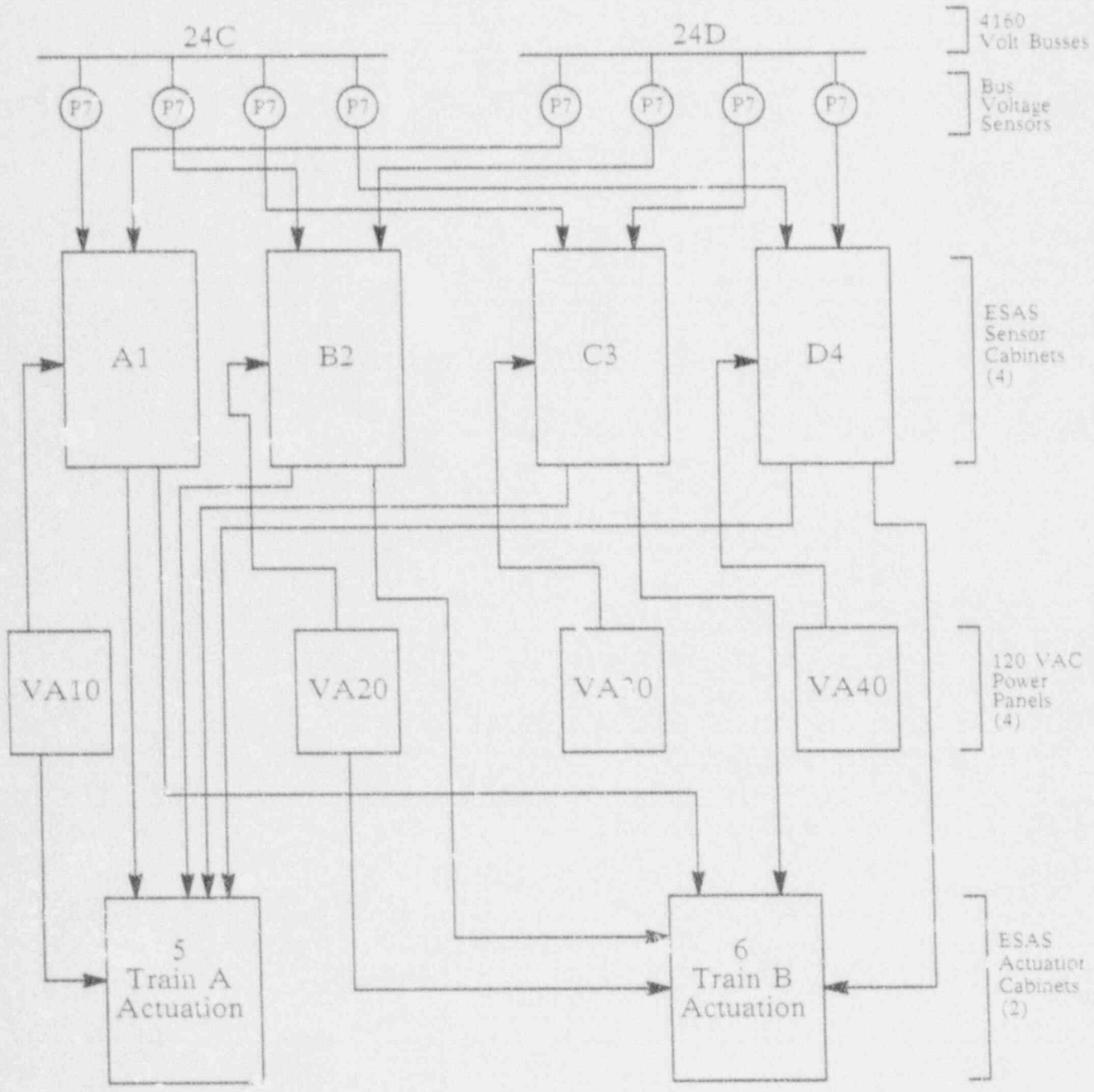
Similar LERS: 88-002-00, 88-005-00, 75-17

EIIS Code Identifiers

ESAS - JE-XC-C560

Inverters - EF-UJX-5250

4160 Volt Vital Busses - EB-BU-G082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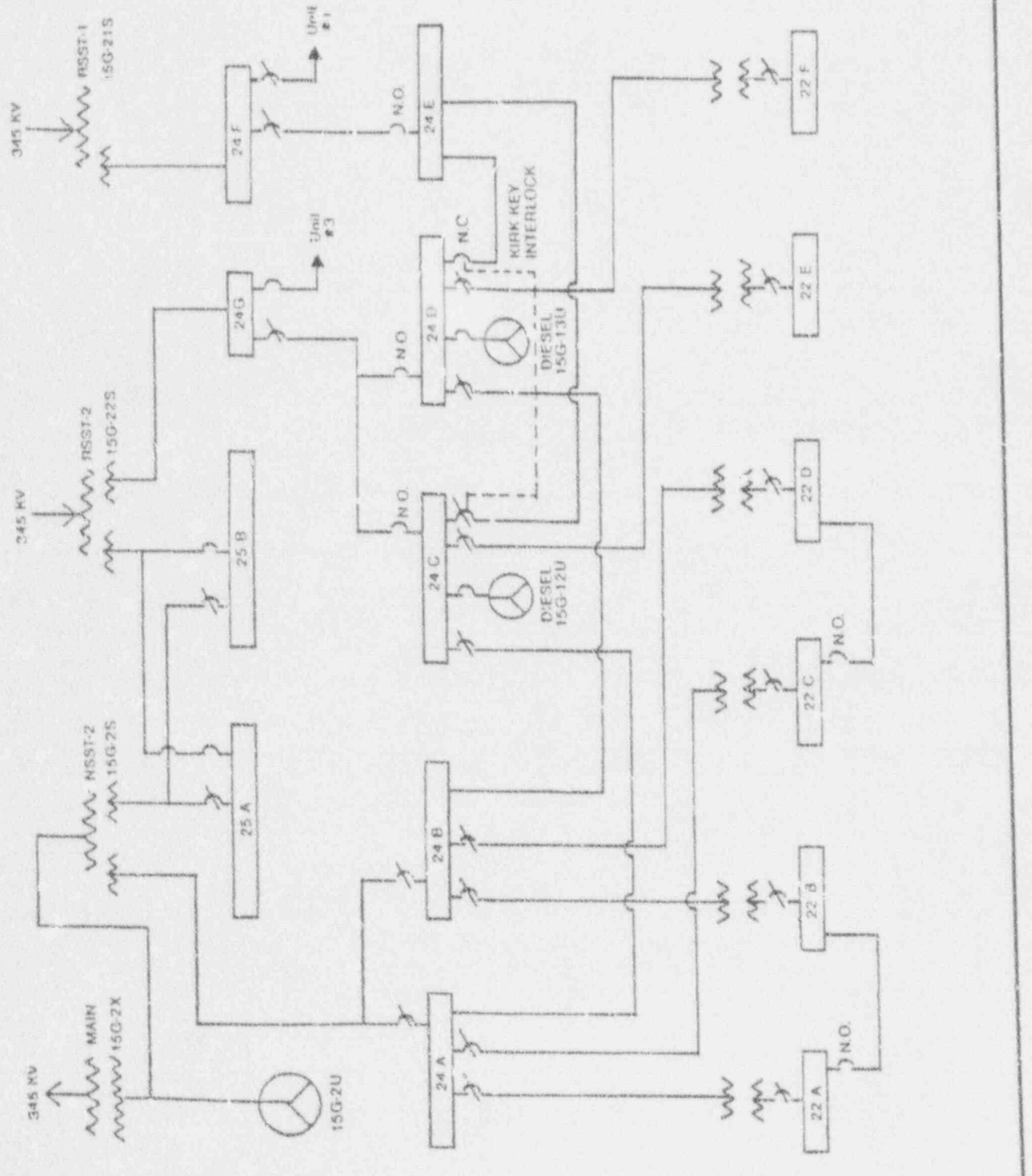
24D
4160 Volt Busses
P7
Bus Voltage Sensors
A1
B2
C3
D4
ESAS Sensor Cabinets (4)
VA10
VA20
VA30
VA40
120 VAC Power Panels (4)
5 Train A Actuation
6 Train B Actuation
ESAS Actuation Cabinets (2)


345 KV
RSST-1
15G-21S
24F
Unit #1
N.O.
24E
22F
KIRK KEY INTERLOCK
Unit #3
24G
N.C
24D
N.O.
DIESEL 15G-13U
22E
345 KV
RSST-2
15G-22S
25B
N.O.
24C
DIESEL 15G-12U
22D
22C
N.O.
RSST-2
15G-2S
25A
24B
22B
345 KV
MAIN
15G-2X
15G-2U
24A
22A
N.O.