

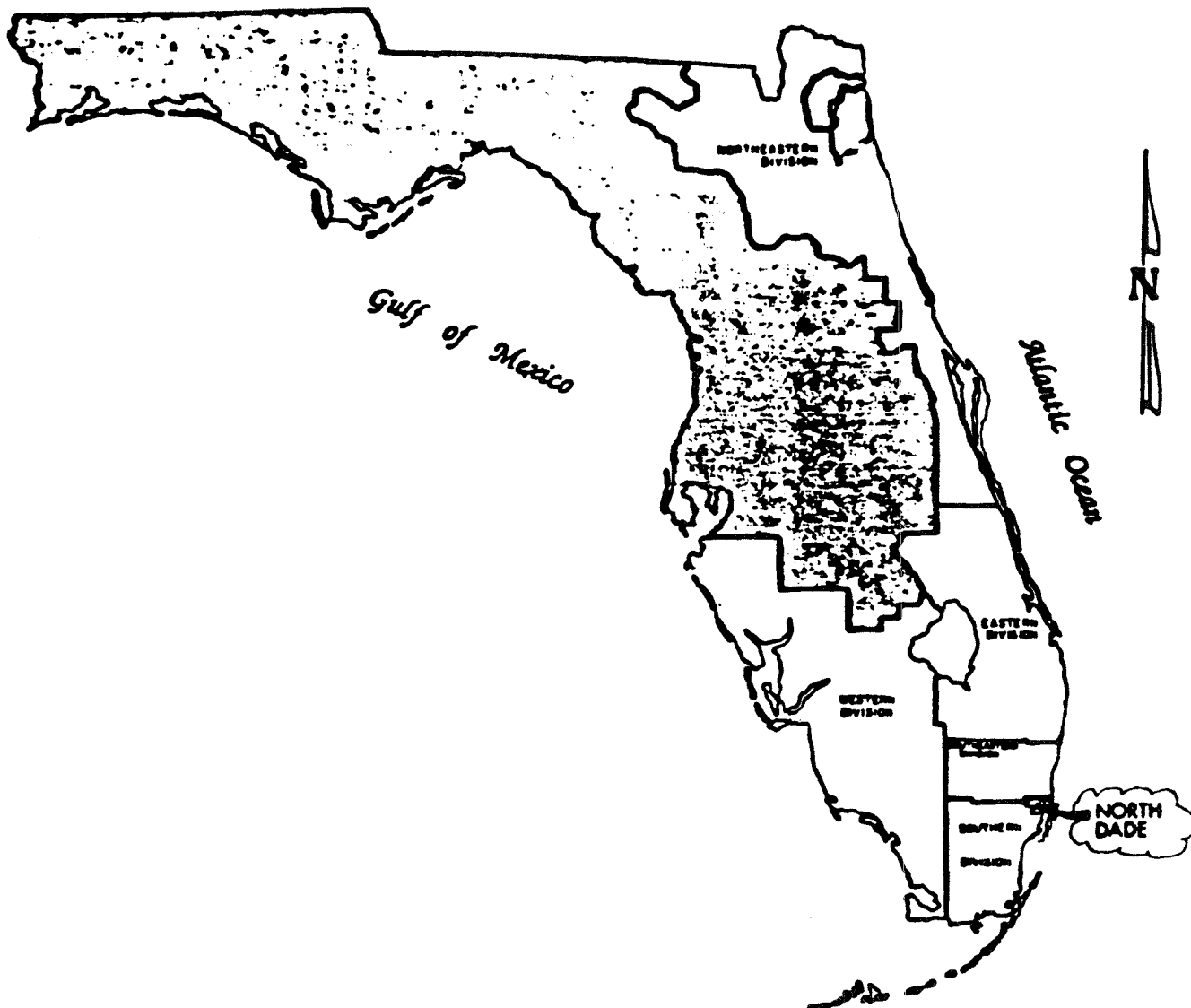
**A STUDY REPORT FOR
APPLICATION EXPERT COURSE
CLASS 1**

**MARY M. KUROWSKI
NORTH DADE DISTRICT**

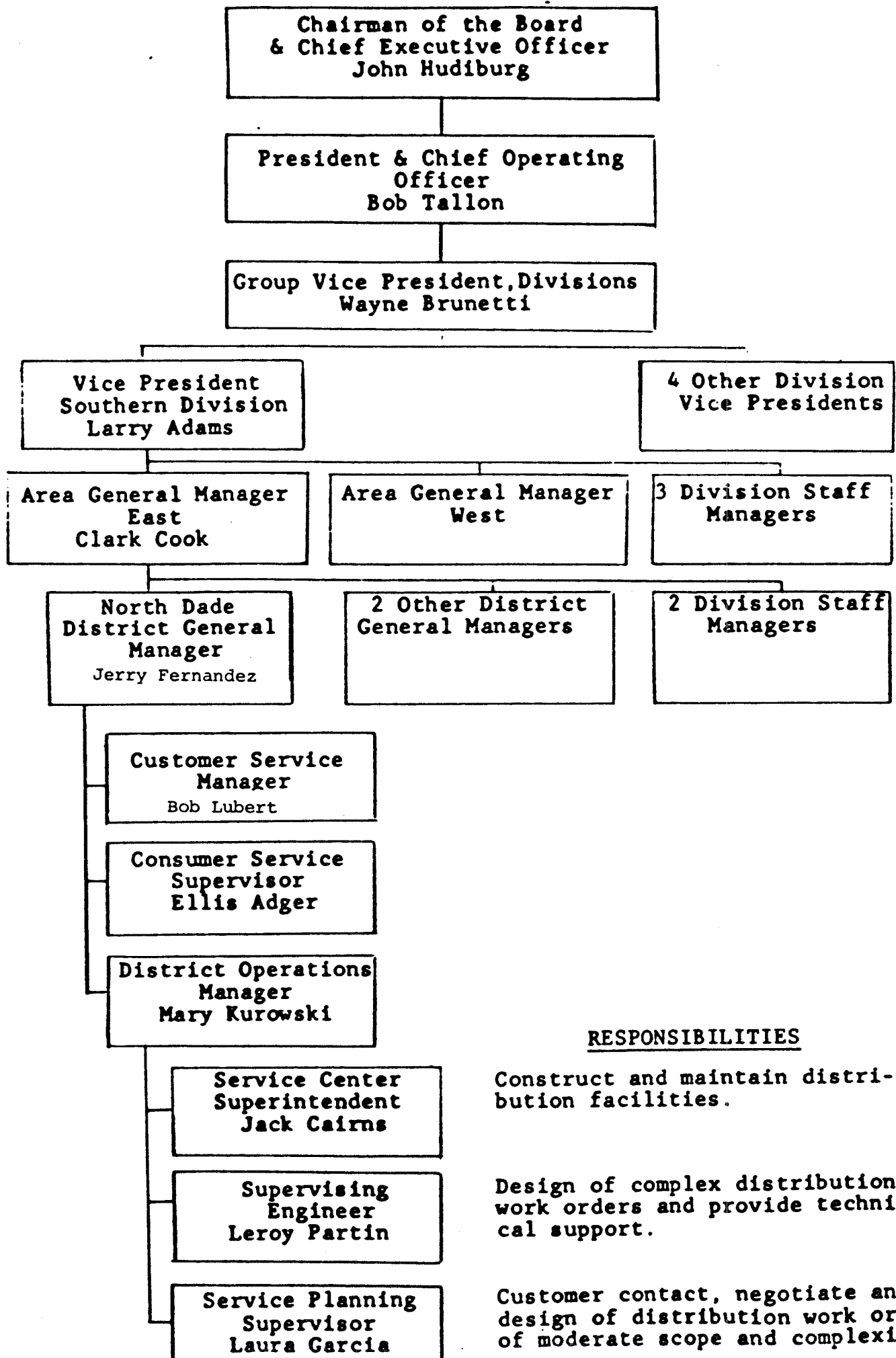
JULY 27, 1987

**THEME:
REDUCE THE NUMBER
OF CUSTOMER INTERRUPTIONS
IN THE NORTH DADE DISTRICT**

WHO WE ARE



DISTRICT	TERRITORY (SQUARE MILES)	CUSTOMERS	ANNUAL NEW CUSTOMERS	ANNUAL GROWTH RATE	EMPLOYEES	OPERATING BUDGET (\$ MILLIONS)
NORTH DADE	60	121,348	2,851	2.3	221	8.4



RESPONSIBILITIES

Construct and maintain distribution facilities.

Design of complex distribution work orders and provide technical support.

Customer contact, negotiate and design of distribution work orders of moderate scope and complexity.

REASON FOR IMPROVEMENT

DIVISION MID-TERM PLAN
"ACHIEVE CUSTOMER
SATISFACTION"

DIVISION SHORT-TERM PLAN
"IMPROVE THE RELIABILITY
OF ELECTRIC SERVICE IN
THE SOUTHERN DIVISION"

THE CHARACTERISTIC USED BY FLORIDA POWER & LIGHT
COMPANY TO MEASURE RELIABILITY OF ELECTRIC SERVICE
IS SERVICE UNAVAILABILITY (SU)

$$SU = \text{FREQUENCY} * \text{DURATION}$$

TO IMPROVE THE RELIABILITY OF ELECTRIC SERVICE IN THE
NORTH DADE DISTRICT WE MUST INVESTIGATE EITHER
OR BOTH FREQUENCY AND DURATION

DURATION

$$\text{DURATION} = \frac{\sum \text{INTERRUPTED CUSTOMER MINUTES}}{\sum \text{INTERRUPTED CUSTOMER}}$$

WHEN WE REVIEWED DURATION
WE FOUND A DIVISION TASK
TEAM HAD BEEN IDENTIFIED
TO WORK ON THIS ASPECT

FREQUENCY

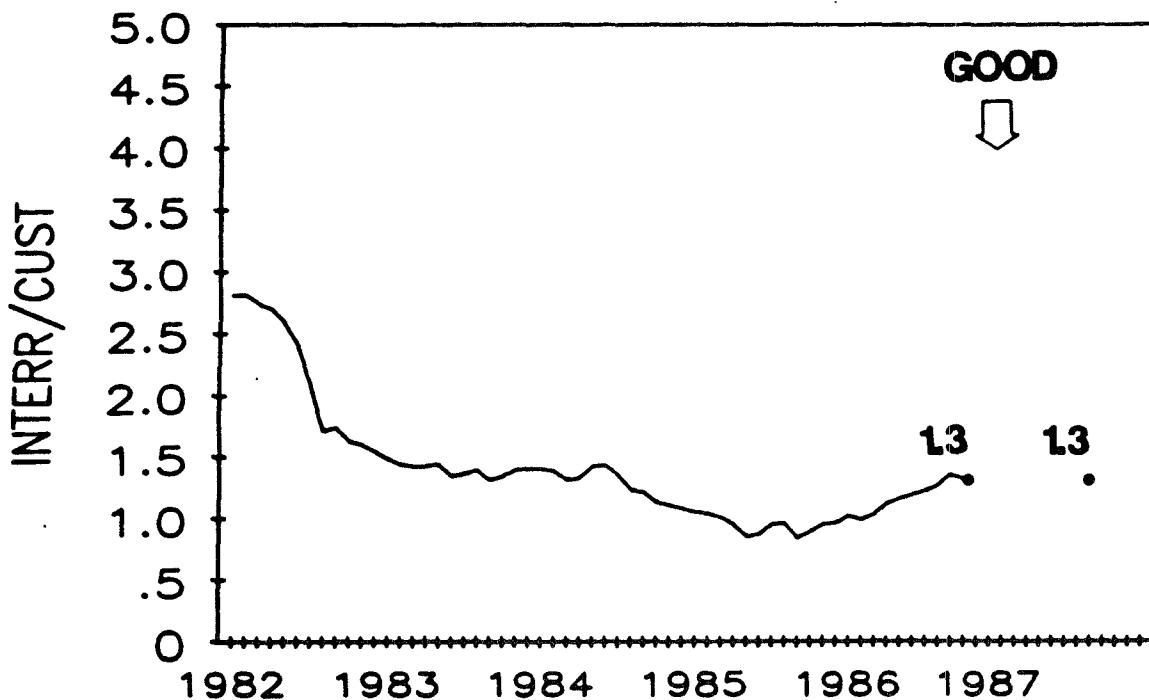
$$\text{FREQUENCY} = \frac{\sum \text{INTERRUPTED CUSTOMERS} + 12}{\text{CUSTOMER BASE}}$$

BY WORKING ON FREQUENCY
WE CAN UTILIZE PREVENTION
BY PREDICTION ALLOWING FOR
US TO SINGLE OUT REPEAT
OCCURRENCES.

REASON FOR IMPROVEMENT

AS WE EXAMINE FREQUENCY OF INTERRUPTIONS IN THE NORTH DADE DISTRICT WE SEE A STEADY INCREASE AND WE KNOW THAT OUR 1987 YEAR END TARGET IS TO MAINTAIN OUR CURRENT 1986 FREQUENCY LEVEL.

FREQUENCY NORTH DADE DISTRICT 12 MOS ENDING



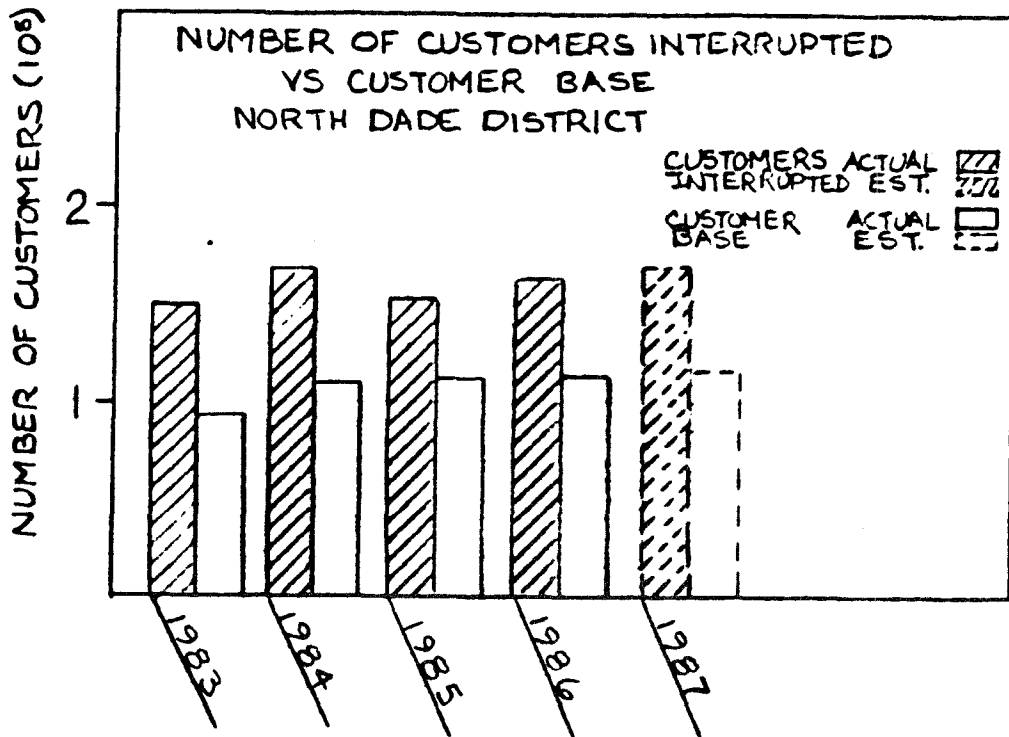
IF WE MAINTAIN THE CURRENT 1986 FREQUENCY LEVEL IN 1987 AND OUR CUSTOMER BASE INCREASES AS WE HAVE PROJECTED ... THEN WE MUST ASSUME THAT THE ACTUAL NUMBER OF CUSTOMER INTERRUPTIONS WILL INCREASE!

REASON FOR IMPROVEMENT

LOOKING AT OUR PAST PERFORMANCE, WE FOUND THAT OUR CUSTOMER INTERRUPTIONS HAVE FOR THE PAST FOUR (4) YEARS EXCEEDED OUR CUSTOMER BASE AND WE PROJECT 1987 TO FOLLOW THIS SAME PATTERN.

WE ALSO KNOW FROM A 1986 CUSTOMER SATISFACTION SURVEY THAT 68% OF OUR CUSTOMERS PLACE A HIGH PRIORITY ON MINIMIZING INTERRUPTIONS.

TO BETTER SERVICE OUR CUSTOMERS, WE MUST INVESTIGATE THE NUMBER OF CUSTOMER INTERRUPTIONS



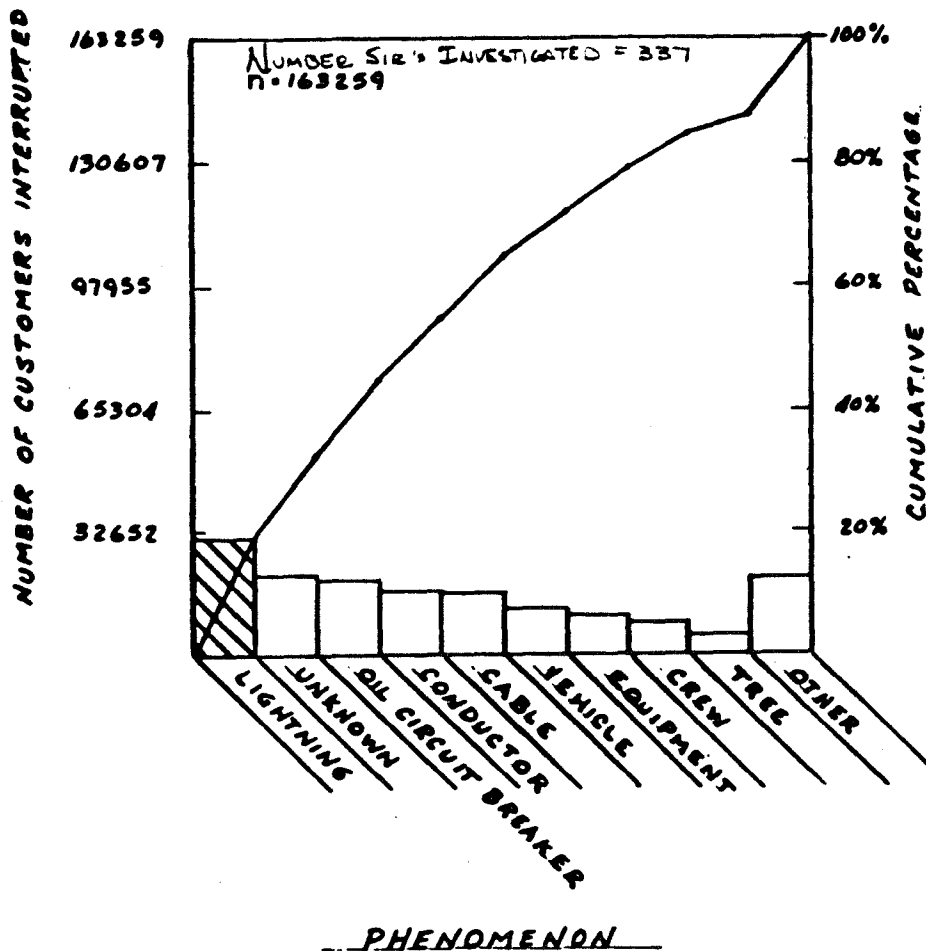
THEME

"REDUCE THE NUMBER OF CUSTOMER INTERRUPTIONS IN THE NORTH DADE DISTRICT"

CURRENT SITUATION

PARETO DIAGRAM BY PHENOMENON

JAN. 1, 1986 — DEC. 31, 1986
NORTH DADE DISTRICT



WE THEN REVIEWED ALL 1986 *SERVICE INTERRUPTION REPORTS BY PHENOMENON TO SEE WHICH ONE MADE THE GREATEST CONTRIBUTION TO THE NUMBER OF INTERRUPTIONS EXPERIENCED BY OUR CUSTOMERS.

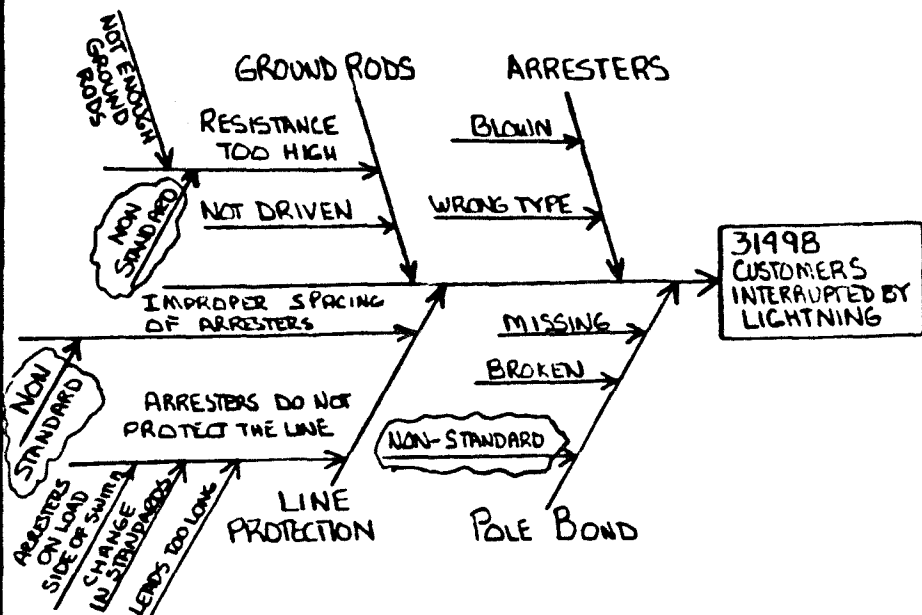
* NOTE:
A SERVICE INTERRUPTION REPORT (SIR) IS ISSUED EACH TIME A PRIMARY INTERRUPTION EXCEEDING ONE (1) MINUTE OCCURS.

WE FOUND THAT LIGHTNING CONTRIBUTED TO THE INTERRUPTION OF 19.2% OR 31,498 OF OUR CUSTOMERS. IF WE COULD SUCCESSFULLY ELIMINATE 1/2 OF THESE INTERRUPTIONS, THE TOTAL IMPACT WOULD BE A 12.6% REDUCTION OR 15,749 FEWER INTERRUPTIONS IN 1987

OBJECTIVE

TO ELIMINATE 50% OF CUSTOMER INTERRUPTIONS CONTRIBUTABLE TO THE PHENOMENON OF LIGHTNING FROM 31,498 TO 15,749 RESULTING IN A TOTAL FREQUENCY REDUCTION FROM 1.3 TO 1.13.

ANALYSIS



WE BEGAN ANALYZING OUR DATA AND FOUND IT DIFFICULT IN ALL CASES TO TRACE THE EFFECT OF LIGHTNING BACK TO THE ACTUAL STROKE. HOWEVER WE DID FIND 13 CASES OF DAMAGED EQUIPMENT. WE REVIEWED THESE 13 LOCATIONS

QUESTION: WHAT ARE OUR STANDARDS??

SIGNIFICANT FACTOR CHECK SHEET
FOR ADEQUATE LIGHTNING PROTECTION
(FROM DISTRIBUTION STANDARDS G-2, G-3, AND D.E.R.M.)

1. ARRESTER SPACING (D.E.R.M. 2.9.1)

SPECIFICATION

TYPE	CONSTRUCTION	TYPE POLE	MAXIMUM SPACING	SPACING FROM DEAD-END
3#	TRIANGULAR	WOOD	1200'	300'
3#	TRIANGULAR	CONC.	400'	200'
3#	VERTICAL	WOOD	1200'	300'
3#	VERTICAL	CONC.	400'	200'
3#	CROSSARM	WOOD	500'	150'
3#	SALT SPRAY(ANY)	(ANY)	400'	200'
1#	(ANY)	WOOD	600'	150'
1#	(ANY)	CONC.	200'	150'
1#	SALT SPRAY(ANY)	(ANY)	200'	150'

SPACING ON 2# LINES ARE THE SAME AS SHOWN FOR 3# LINES.

ACTUAL

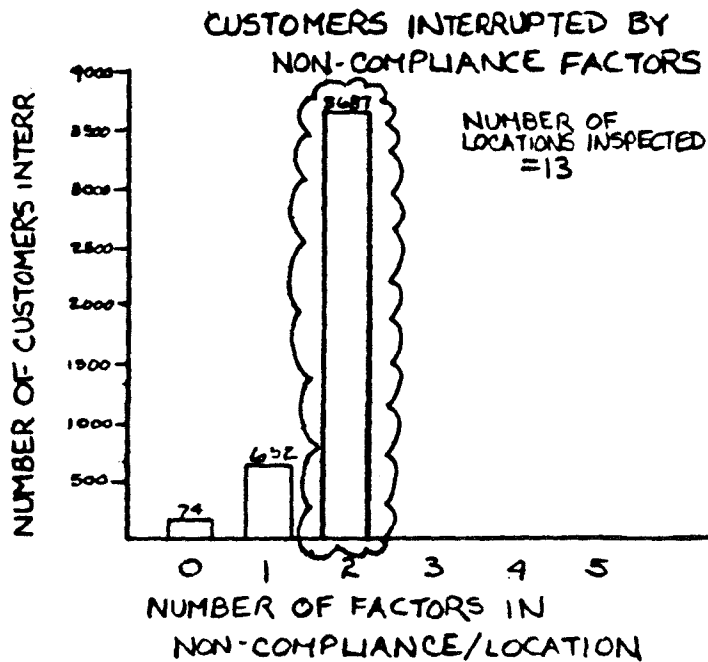
PASS	FAIL
8(TAN)	1(DE)
4(TAN)	2(TAN)2(DE)
2(TAN)	1(TAN)3(DE)

WE STUDIED OUR PROCEDURES MANUAL AND DETERMINED "5" SIGNIFICANT FACTORS THAT SUMMARIZED OUR STANDARDS FOR ADEQUATE LIGHTNING PROTECTION. WE THEN ASSEMBLED THESE FACTORS IN A CHECKSHEET.

FACTOR	STANDARD & PRACTICE	ACTUAL	
		PASS	FAIL
2. RESISTANCE	25 OHMS OR LESS (D.S. G-2 342)	2	28
3. POLE BOND	4 6 CU (D.S. G-3)	30	0
4. ARRESTER LINE LEAD LENGTH	3' OR LESS (D.S. G-2 341)	30	0
5. ARRESTER GROUND LEAD LENGTH	3' OR LESS (D.S. G-2 341)	30	0

FOR OUR ANALYSIS A LOCATION IS CONSIDERED TO BE IN NON-COMPLIANCE IF IT FAILS TO COMPLY WITH ANY ONE OF THE SIGNIFICANT FACTORS

ANALYSIS



FURTHER ANALYSIS OF THE SIGNIFICANT FACTOR CHECKSHEET DATA ALLOWED US TO DETERMINE THAT THE NUMBER OF FACTORS IN NON-COMPLIANCE AT EACH LOCATION HAD A SIGNIFICANT IMPACT ON THE NUMBER OF CUSTOMERS AFFECTED.

WHICH LED US TO CONDUCT AN IN-DEPTH INVESTIGATION OF THE LOCATIONS IN NON COMPLIANCE WITH 2 FACTORS

EVALUATION MATRIX BY LOCATION						
LOC	TYPE CONSTRUCTION			SPACING FAILURE		GROUNDING FAILURE
	X-ARM	TRIANG	POLE TOP	SPACING TO DE	TRIANG SPACING	RESIST > 25 Ω
13			X	X	X	X
10	X			X	X	X
7			X	X		X
4		X		X		X
2			X	X		X
1	X			X	X	X

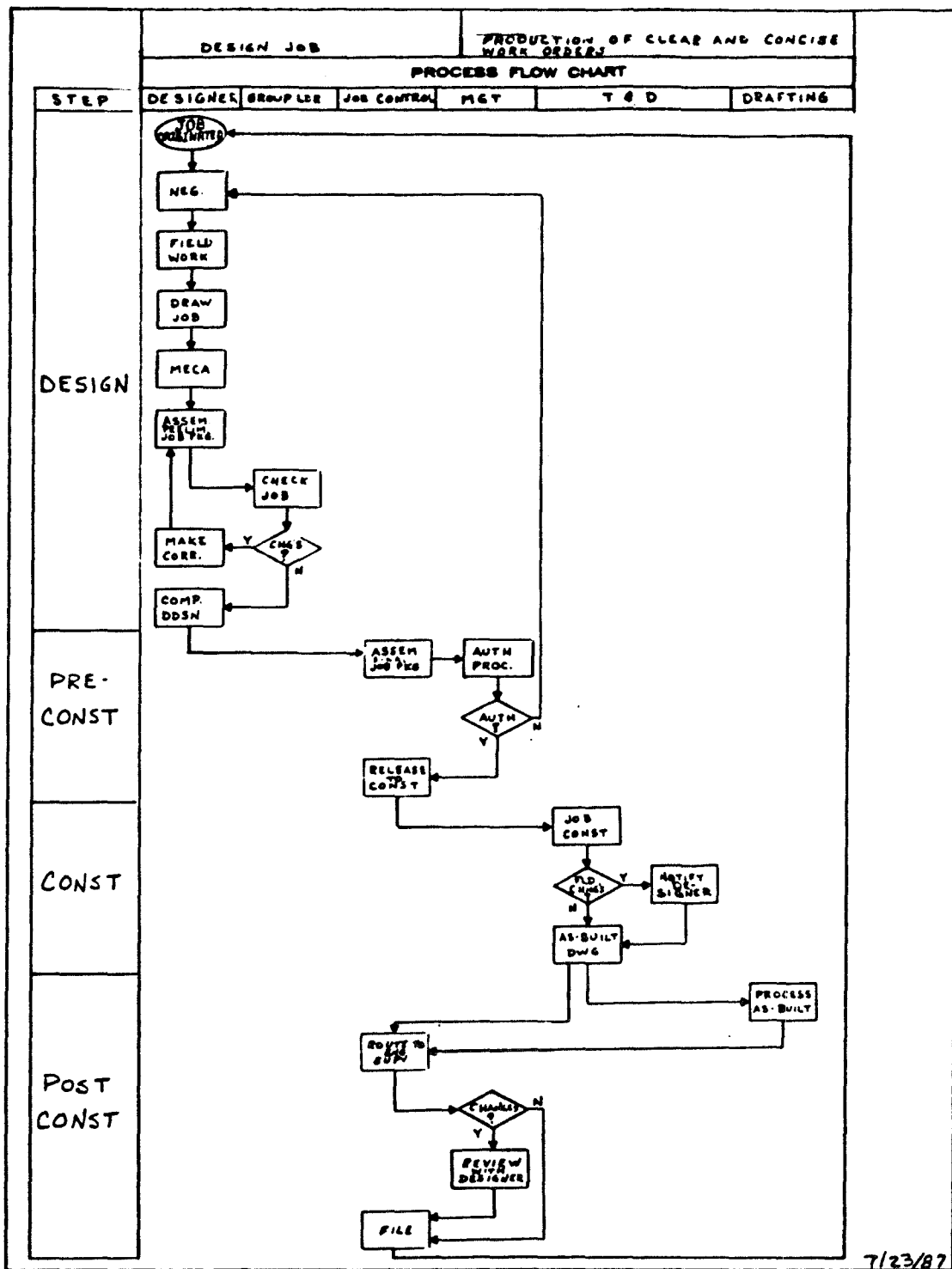
INDICATING THAT ALL LOCATIONS WITH MULTIPLE NON-COMPLIANCES INVOLVED NON STANDARD ARRESTER SPACING TO DEAD-ENDS (DE) AND AVAILABLE GROUNDING RESISTANCE EXCEEDED 25 Ω (OHMS) MAKING BOTH POTENTIAL ROOT CAUSES.

COUNTERMEASURES

WE THEN DEVELOPED A MATRIX TO ASSIST US IN ADDRESSING THE POTENTIAL ROOT CAUSES.

	OBJECTIVE	WHAT	WHO	WHEN	COST	BARRIERS	AIDS
IMMEDIATE ACTIONS	BRING ARRESTER SPACING AND GROUNDING RESISTANCE TO STANDARD	ORIGINATE SIX (6) JOBS TO CORRECT SPACING AND GROUNDING	NORTHEAST OPERATIONS (NEO)	SIX (6) JOBS ENGR. BY 7/24/87 ALL JOBS COMPLETED BY 8/24/87	\$3845 MECA EST.-ALL JOBS	CONFLICT WITH OTHER SCHEDULED WORK	LOCATIONS UP TO STANDARD
		USE PRE-MADE GROUNDING VERIFICATION STAMP ON ALL JOB PRINTS	NEO ENGINEERING AND SERVICE PLANNING FOREMEN @ NEC	IMMEDIATE	\$10.00	STAMP MAY BE LOST STAMP MAY BE OMITTED ON RUSH JOBS.	HELPS VERIFICATION EFFORTS ESTABLISHES RESPONSIBILITY
PREVENTIVE	AVOID FUTURE OCCURRENCE OF NON-STANDARD CONSTRUCTION FOR LIGHTNING PROTECTION	DEVELOP A "DESIGN JOB" FLOWCHART	NEO-ENGR. TO ANALYZE PROCESS, DETERMINE CHECKPOINTS AND RESPONSIBILITIES AND DISPLAY GRAPHICALLY	By 7/14/87			-ESTABLISH FLOW OF EVENTS -IDENTIFIES CHECKPTS. -ESTABLISHES RESPONSIBILITIES.
		INSPECTION OF EXISTING FACILITIES FOR COMPLIANCE TO GROUNDING RESISTANCE STANDARD	NEO	JUNE 1987		PRESENT EQUIPMENT USED FOR MEASUREMENT	ALLOW US TO GRADUALLY AS PART OF DAILY WORK-BRING FACILITIES TO STANDARDS

COUNTERMEASURES



THE PROCESS OF INSURING DESIGN TO STANDARD IS PART OF THE ENGINEER'S/DESIGNER'S JOB. THIS ASPECT IS NOW BEING ADDRESSED BY A ENGINEERING QIDW TEAM.

FUTURE PLANS

COUNSELOR'S ADVICE

DURING A RECENT COUNSELING CLINIC DIVISIONS WERE ADVISED TO USE MORE "HORIZONTAL CORRELATION/COMMUNICATION"

THE SOUTHERN DIVISION
RELIABILITY STEERING COMMITTEE
WAS FORMED AS A VEHICLE TO
ASSIGN, COORDINATE,
AND MONITOR THE DIVISION'S
EFFORTS TO:
"IMPROVE THE RELIABILITY
OF ELECTRIC SERVICE"
(SHORT-TERM PLAN 1.1)

QUALITY
STEERING
COMMITTEE
(DIVISION)

SERVICE
RELIABILITY
COORDINATING
MANAGER

RELIABILITY
STEERING
COMMITTEE

THIS COMMITTEE THEN ESTABLISHED PROJECTS BASED ON A DISTRICT'S RANKING WITHIN A MATRIX COMPARING CUSTOMER MINUTES INTERRUPTED AND SERVICE UNAVAILABILITY.

DISTRICT RANKING BY CHI & 1986 SU BY PHENOMENON												
MAJOR CAUSE	CG		HL		DS		PDN 2		HL		MB	
	CHI	SU	CHI	SU	CHI	SU	CHI	SU	CHI	SU	CHI	SU
NATURAL	2	3	4	5	3	1	3	4	1	2	6	6
ON EQUIP	3	4	2	1	5	2	4	5	1	3	6	6
UG EQUIP	1	1	2	2	4	3	3	4	5	6	6	5
ACCIDENT	1	2	2	1	4	3	5	6	3	4	6	5
PROTECTIVE DEVICE	2	4	4	5	6	6	3	3	1	2	5	1
REMARKS												
HL ALREADY WORKING IN THIS AREA												
MOST 1986 CHI OLDEST ON SYSTEM												
LARGE URG AREA IN CG PAPER LEAD TO BE ANALYZED BY MB												
3rd WORST IN SU												

LEGEND:

RANKING
1 - WORST 6 - BEST
RESPONSIBLE DGM
TEAM PARTICIPATION
CUSTOMER MIN. INTERRUPTED
SERVICE UNAVAILABILITY

OUR TEAM WILL NOW FOCUS ATTENTION ON PROTECTIVE DEVICES AND REPLICATE THE COUNTERMEASURES IDENTIFIED BY THE OTHER 5 DISTRICTS.

THE JOURNEY CONTINUES...