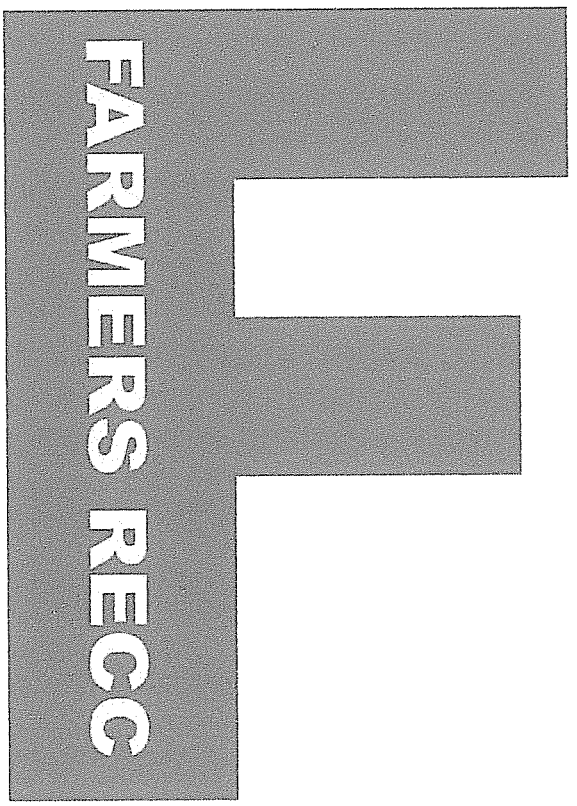
2007-00435

2007 – 2011



WORK PLAN

Kentucky 34 Barren
PO Box 1298
Glasgow KY 42142-1298

2007 - 2011 CONSTRUCTION WORK PLAN

FOR

FARMERS RURAL ELECTRIC COOPERATIVE CORPORATION

KENTUCKY - 34 - BARREN
GLASGOW, KENTUCKY

PREPARED BY:

FARMERS RURAL ELECTRIC COOPERATIVE CORPORATION

GLASGOW, KENTUCKY

MARCH, 2007

I hereby certify that this 2007 - 2011 Construction Work Plan was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of Kentucky.

3/23/2007 **By:** Chuck Bishop
(Date) **(Engineer, P.E.)**

Registration No. 22343

STATE OF KENTUCKY
CHUCK B. BISHOP
22343
LICENSED PROFESSIONAL ENGINEER

FRECC CONSTRUCTION WORK PLAN REPORT
TABLE OF CONTENTS

III. REQUIRED CONSTRUCTION ITEMS

A. Summary of Items

B. Construction Required For New Services

C. Meter Changes Required For AMR Implementation

D. Service Changes Required For Existing Services

E. Distribution Lines – Site Specific Additions and Changes

F. Substations - Additions and Changes

G. Sectionalizing Equipment - Additions and Changes

H. Line Regulators - Additions and Changes

I. Line Capacitors - Additions and Changes

J. Replacement - Poles

K. Distribution Auto-transformers - Additions and Changes

L. Other Distribution Items - Security Lights

M. Other Distribution Items - AMR

IV. APPENDIX

A. Samples of Computerized Analysis Used

1. Economical Conductor Sizes
2. Economic Analysis of Alternate Plans
3. Distribution Circuit Analysis Printout

B. System Maps - 2006 Load Levels

PURPOSE OF REPORT

This report documents the March 2007 engineering analysis of, and summarizes the proposed construction for, Farmers Rural Electric Cooperative Corporation's (FRECC) electric distribution system for the four-year planning period of 04/2007 thru 03/2011.

The report also provides engineering support, in the form of descriptions, costs and justification of required new facilities, for a loan application to RUS to finance the proposed construction program.

RESULTS OF PROPOSED CONSTRUCTION

Upon completion of construction of the facilities proposed herein, the system will provide adequate and dependable service to 23,264 residential/farm consumers using an average of 1260 kWH per consumer per month, and 1766 large power and special loads which are provided for on an individual basis. It is estimated there will be 2000 idle services.

GENERAL BASIS OF STUDY

The 2011 projected number of consumers and total peak system load was taken directly from the Cooperative's 2006 Load Forcast Report (LFR) as approved by RUS.

The Cooperative's 1996 Long-Range Plan (LRP) load projections and recommendations were followed for this four-year planning period. All of the construction proposed herein is consistent with the LRP unless otherwise noted and explained.

The Cooperative's 2005 Operations and Maintenance review, (Review Rating Summary; RUS Form 300), was used to determine construction required to replace physically deteriorated equipment and material, upgrade portions of the system to conform with code or safety requirements, and/or improve reliability or quality of service.

New distribution, transmission, and power supply construction requirements were considered simultaneously as a "one system" approach for the orderly and economical development of the total system. All of the proposed construction and recommendations herein, relative to power supply and delivery, were discussed with the cooperative's power supplier, East Kentucky Power Cooperative (EKPC).

A complete list of the lines and equipment, and their estimated cost, (all based on recent historical data), required for 2,560 new services is developed in Section III-B. A similar list and cost of necessary service upgrades to existing members is in Section III-D.

An analysis, using as a basis RUS guidelines and the design criteria herein, of thermal loading, voltages, physical conditions and reliability was performed on all of the substations, distribution lines and major equipment of the existing system. Milsoft software was used to analyze the distribution circuits during the 2006 / 2007 winter substation peak loading periods. A sample printout is in Section A of the Appendix. The exhibits in Section II form the rest of the basis of this analysis.

For each deficiency that was determined, alternate solutions were investigated and economically evaluated, so that the most cost effective construction, if required, could be proposed. A sample computer analysis used to determine the most economical alternate plans is in Section A of the Appendix.

SYSTEM DESCRIPTION: DISTRIBUTION SYSTEM AND POWER SUPPLY

Farmers Rural Electric Cooperative Corporation (FRECC), whose headquarters are in Glasgow, Kentucky, provides service in the rural areas of three counties and small portions of six counties in the south central portion of the state as shown on Map I-B-1. The 1,120 square mile service area is comprised mostly of rolling, forested hills and has two small lakes. FRECC's service area surrounds Glasgow (2000 population of 15,000). Glasgow is served by its own municipal electric system. Several of the other most populated areas are served by Kentucky utilities, a private power company.

Most of the economy of this area is based on commercial services for the tourist industry and agriculture. The Cooperative also serves several oil wells. FRECC has and will continue to serve the moderate growth of new commercial, small manufacturing and residential consumers adjacent to Glasgow.

The following data is from FRECC's 12/31/06 REA Form 7:

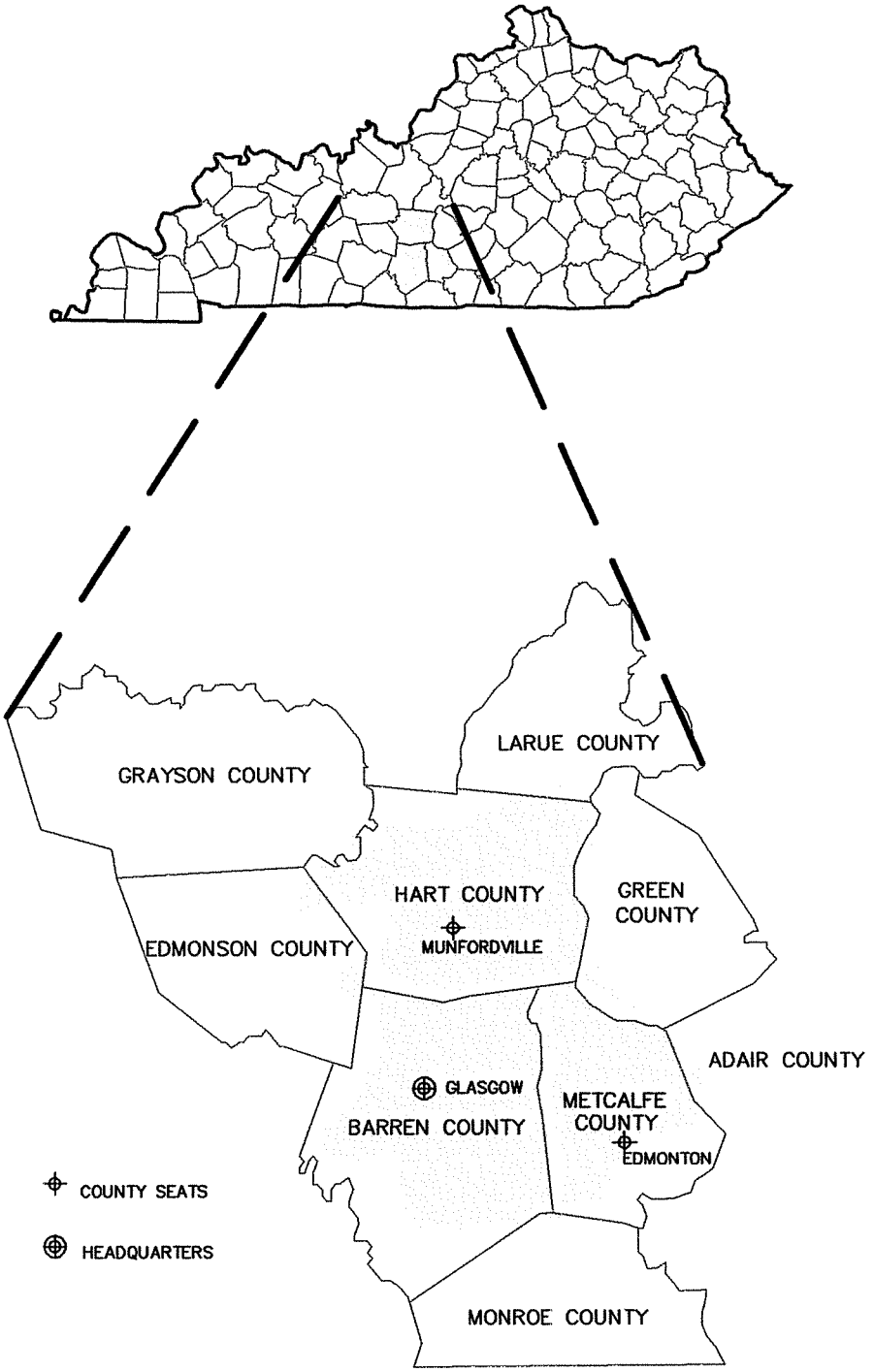
Number of Consumers:	23,537
MWH Purchased:	522,143
MWH Sold:	496,089
Maximum Non-Coincident kW Demand	120,076
Total Utility Plant:	$58,474,459 ($2,484 / member)
Consumers/mile:	6.76

There are 48 primary distribution circuits totaling 3,481 miles of line served from twelve distribution substations. Thirty-two of the circuits are partially energized at 14,400/25,000 Volts, grounded wye, the remainder are at 7,200/12,470 volts, grounded wye. All primary lines built since 1964 have been insulated for 14,400/25,000 Volts. Installed conductor sizes range from #8 copperweld to 795 MCM Aluminum. Almost all new primary construction is overhead with only a small amount of existing plant being underground primary.

East Kentucky Power Cooperative (EKPC) provides all of power and energy needs to Farmers Rural Electric Cooperative Corporation, plus 16 other distribution cooperatives, by virtue of a standard "all requirements" contract. EKPC is a RUS financed G & T cooperative with offices in Winchester, Kentucky.

EKPC constructs, owns, operates and maintains the twelve distribution substations and 69,000 Volt transmission lines which supply FRECC's distribution system. The predominant substation low-side voltage is 14,400/25,000 Volts, grounded wye.

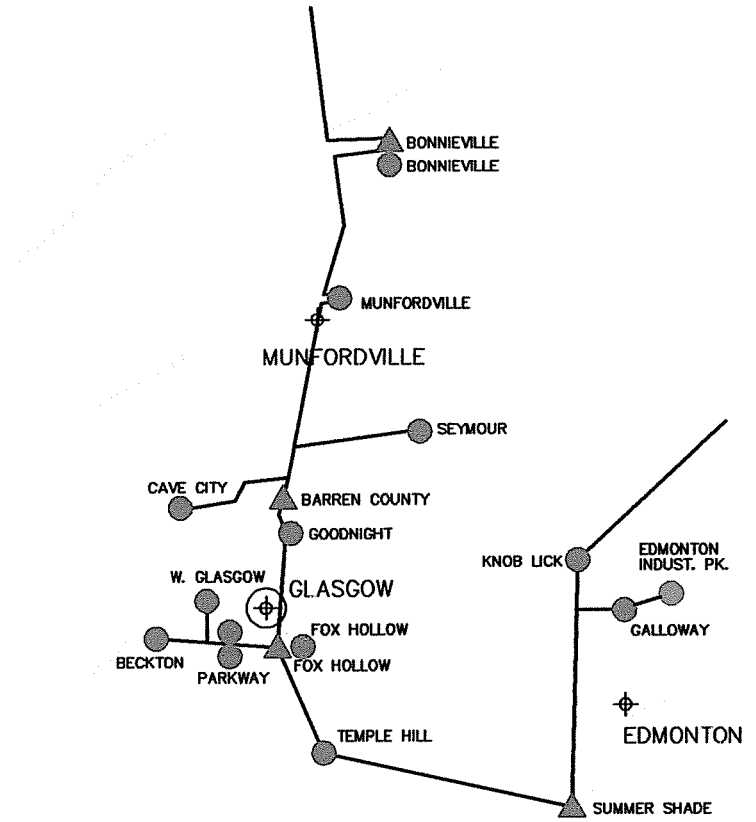
FARMERS RURAL ELECTRIC SERVICE AREA
KENTUCKY 34 BARREN



EAST KENTUCKY POWER COOPERATIVE'S SUBSTATION AND TRANSMISSION NETWORK

FOR

FARMERS RURAL ELECTRIC SERVICE AREA KENTUCKY 34 BARREN



COUNTY SEATS

HEADQUARTERS

SUBSTATIONS (69 kV)

NEW SUBSTATIONS (69 kV)

SUBSTATIONS (161 kV)

SUMMARY OF CONSTRUCTION PROGRAM AND COSTS

CODE	EXT	ITEM #	DESCRIPTION	MILES	ESTIMATED COST 1st YEAR	2nd YEAR	3rd YEAR	4th YEAR	TOTAL
101			80 - UG NEW CONSUMERS	8.4	84,547	87,506	90,569	93,739	356,362
102			2480 - OH NEW CONSUMERS	140.2	1,128,001	1,167,481	1,208,343	1,250,635	4,754,460
100			**NEW DISTRIBUTION LINES**	148.6	**1,212,548**	**1,254,988**	**1,298,912**	**1,344,374**	**5,110,823**
* 363		1-2-C	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #1/0 ACSR	0.7	32,200				32,200
374		ALL-ALL-A	CONDUCTOR REPLACEMENT	40.0	160,000	160,000	160,000	160,000	640,000
375		1-4-A	CONV 2-PH TO 3-PH, CONV 1-PH TO 3-PH, RECOND TO #1/0	0.8				36,800	36,800
376		2-5-A	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #1/0 ACSR	0.7				32,200	32,200
377		3-4-A	CONV 1-PH 7 2KV TO 14 4KV	8.8				74,500	74,500
378		4-2-A	CONV 1-PH TO 2-PH, RECOND #4 ACSR TO #1/0 ACSR	1.3				59,800	59,800
379		5-1-A	CONV 1-PH 7 2KV TO 14 4KV	7.6				67,900	67,900
380		5-2-A	CONV 3-PH 7 2KV TO 14 4KV	0.7				7,650	7,650
381		5-3-A	CONV 1-PH & 3-PH 7 2 TO 14 4KV, RECOND 3-PH #4 TO #4/0	27.5	373,000				373,000
382		5-3-B	RECOND 3-PH #4 ACSR TO #1/0 ACSR	2.5				72,500	72,500
383		5-4-A	CONV 1-PH & 3-PH 7 2 TO 14 4KV	7.7				76,800	76,800
384		5-4-B	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #4/0 ACSR	3.1		176,700			176,700
385		7-4-A	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #1/O ACSR	0.2	9,200				9,200
386		8-2-A	CONV 1-PH & 2-PH & 3-PH 7 2KV TO 14 4KV	38.8			349,850		349,850
387		8-3-A	CONV 1-PH & 3-PH 7 2KV TO 14 4KV, RECOND 3-PH TO #4/0	10.8		316,400			316,400
388		10-2-A	CONV 1-PH TO 3-PH, RECOND #4ACSR TO #1/0 ACSR	1.0				46,000	46,000
389		12-2-A	RECOND 3-PH #1/0 ACSR TO 397 ACSR	1.6	80,000				80,000
300			**LINE CONVERSIONS**	153.8	**654,400**	**653,100**	**509,850**	**634,150**	**2,451,500**
601			TRANSFORMERS - NEW SERVICES		328,830	340,339	352,251	364,580	1,385,999
			TRANSFORMERS - CONVERSIONS						476,550
			METERS - NEW SERVICES		89,600	91,840	94,136	96,489	372,065
			METERS - AMR CHANGEOUT		1,161,000	516,000	0	0	1,677,000
									3,911,614
602			SERVICE UPGRADES		90,182	93,339	96,605	99,987	**380,113**
603			SECTIONALIZING EQUIPMENT		62,925	62,925	62,925	62,925	**182,700**
604			REGULATOR STATIONS		107,400	107,400	107,400	107,400	**429,600**
605			CAPACITORS		12,500	12,500	12,500	12,500	**50,000**
606			POLE REPLACEMENTS (1360 POLES TOTAL)		465,686	481,985	498,854	516,314	**1,962,839**
609			AUTOTRANSFORMERS		62,925	62,925	62,925	62,925	**251,700**
600			**DISTRIBUTION EQUIPMENT**		**1,130,448**	**1,161,412**	**1,193,460**	**1,226,630**	**7,168,566**
701			SERCURITY LIGHTS		66,934	69,277	71,702	74,211	282,125
702			AMR COMPUTER AND COMMUNICATION HARDWAF		620,000				613,000
700			**OTHER DISTRIBUTION EQUIPMENT**		**686,934**	**69,277**	**71,702**	**74,211**	**895,125**
			Total						**15,626,014**

* CARRYOVER

SUBSTATION TRANSFORMER LOAD DATA

HISTORICAL AND PROJECTED WINTER PEAK KW DEMANDS

	SUBSTATION	TRANSFORMER #	TRANSFORMER KVA	TRANSFORMER CLASS	ACTUAL 2/16/2007	PROPOSED SYSTEM 2011 (10% WINTER)	MAX LOAD % RATING
1.	GOODNIGHT	3	6,033	F/A	8,199	10,351	57%
2.	MUNFORDVILLE	1	18,100	F/A	16,197	16,330	90%
3.	TEMPLE HILL	1	18,100	F/A	13,156	15,713	87%
4.	KNOB LICK	1	18,100	F/A	10,241	9,275	51%
5.	BECKTON**	1	18,100	F/A	15,575	16,700	92%
6.	CAVE CITY	3	6,033	F/A	8,882	11,710	65%
7.	PARKWAY I	1	18,100	F/A	10,930	13,499	75%
	PARKWAY II	1	18,100	F/A	7,824	8,700	48%
8.	GALLOWAY	1	18,100	F/A	9,679	13,129	73%
9.	BONNIEVILLE	1	8,080	F/A	4,262	5,509	68%
10.	WEST GLASGOW	1	18,100	F/A	6,042	11,461	63%
11.	SEYMOUR	1	18,100	F/A	5,437	9,863	54%
12.	FOX HOLLOW	1	18,100	F/A	9,979	14,133	78%
13.	EDM INDUST PK	1	18,100	F/A	0	4,628	26%
	TOTALS:		**207,178**		**126,403**	**161,001**	

* Under construction. Scheduled for completion during the spring 2008. This substation will relieve loading from Galloway.
** Monitoring Load in Conjunction with EKPC
F/A - Forced Air
O/A - Open Air

REQUIRED SUBSTATION CONSTRUCTION

The 2007 - 2011 CWP does include one new distribution substation. This substation is for the Edmonton Industrial Park and will relieve load from the Galloway substation. With the inclusion of the new substation, the analysis shows that no substations will become overloaded during the construction work plan period. FRECC will continue to monitor all substation loading with EKPC.

DESIGN CRITERIA

Each of the following design criteria items was reviewed by the RUS General Field Representative on November 16, 2006 and his provisional concurrence was attained.

Construction proposed herein is required to meet the following minimum standards of adequacy for voltages, thermal loading, safety and reliability on the system.

1. **Voltage levels on primary distribution lines are to fall between 118 and 126 volts on a 120 volt base.**

2. **The following equipment is not to be thermally loaded by more than the percentage shown of its nameplate rating (winter loading):**

a. Power Transformers	130% Winter ; 100% Summer
b. Regulators	130% Winter ; 100% Summer
c. Auto-Transformers	130% Winter ; 100% Summer
d. Reclosers	100% Winter ; 100% Summer
e. Line Fuses	80% Winter ; 80% Summer

3. **Primary conductors are not to be loaded over 75% of their thermal rating. A case by case limit is used for major tie lines between substations to allow for different backfeed situations.**

4. **Poles and/or crossarms are to be replaced if found to be physically deteriorated by visual inspection and/or tests.**

5. **Conductors (and associated poles and hardware as required) will be considered for replacement if found to be in poor condition, having excessive sag in need of being changed out on a systematic basis.**

6. **Primary distribution lines are to be rebuilt and/or relocated if they are found to be unsafe or fail to meet the applicable National Electrical Safety Code clearances.**

7. **New lines and line conversions to be built according to the standard primary voltage levels as determined after review of the Long Range Plan, present loading and future load growth projection.**

8. **New primary conductor sizes to be determined on a case by case basis using the Economic Conductor Sizing Computer Program and presently valid constants and variables. The final proposed conductor may be modified to conform with the cooperative's standard sizes and recommendations of the Long-Range Plan.**

9. All new primary construction to be overhead except where underground is required to comply with governmental or environmental regulations, local restrictions or favorable economics.

10. All new distribution lines to be designed and built according to RUS standard construction specifications and guidelines.

11. The fault current available at regulator or auto-transformer location should not exceed limits as set out by IEEE C37.91-1985 and in no case should it exceed 25 times normal base current at the location in question.

12. The fault current available at oil circuit recloser locations should not exceed the nameplate rating.

13. System improvements to correct voltage drop and to improve phase balance will be made on single and two-phase lines with loads exceeding 50 amps (based on Operating and Engineering practices).

14. Power factor correction is to be made when the substation power factor decreases below 97% lagging at peak load or 95% leading at minimum load. Power factor correction capacitors are to be located for maximum loss reduction with consideration given for voltage improvement.

THE PRECEEDING CRITERIA IS USED FOR DESIGN PURPOSES ONLY. IT IS NOT MEANT TO BE INCLUSIVE OF ALL CRITERIA THAT CAN OR SHOULD BE USED.

DISTRIBUTION LINE AND VOLTAGE CONVERSION COSTS

(ESTIMATED)
$ / mile

NEW CONSTRUCTION (OVERHEAD)

$ 26,000	1 - PHASE ;	# 2 ACSR
29,000	1 - PHASE ;	#1/0 ACSR
46,000	2 - PHASE ;	# 2 ACSR
51,000	2 - PHASE ;	#1/0 ACSR
49,000	3 - PHASE ;	# 2 ACSR
55,000	3 - PHASE ;	#1/0 ACSR
65,000	3 - PHASE ;	#4/0 ACSR
78,000	3 - PHASE ;	#397ACSR

RECONDUCTORING (OVERHEAD)

$ 16,000	1 - PHASE ;	# 2 ACSR *
20,000	1 - PHASE ;	#1/0 ACSR *
29,000	3 - PHASE ;	#1/0 ACSR *
35,000	3 – PHASE;	#4/0 ACSR *
50,000	3 – PHASE;	397 ACSR *

1-PHASE TO 3-PHASE LINE CONVERSION (OVERHEAD)

$ 38,000	WITH # 2 ACSR *
46,000	WITH #1/0 ACSR *
57,000	WITH #4/0 ACSR *
68,000	WITH #397ACSR *

VOLTAGE CONVERSION (12 KV TO 25 KV OVERHEAD)

COSTS WILL BE ON A JOB-BY-JOB BASIS BECAUSE EACH JOB WILL HAVE A PORTION ALREADY REINSULATED. (APPROXIMATELY $8,000 FOR SINGLE PHASE AND $10,500 FOR THREE PHASE PER MILE EXCLUDING EQUIPMENT)
ESTIMATE $100 PER SINGLE-PHASE TRANSFORMER CHANGE (THIS RELFECTS RETIREMENT OF EXISTING TRANSFORMER)

NOTES:

* A voltage conversion adder will be included in each reconductoring or line conversion job cost that includes a voltage conversion.

\- Above costs include engineering, right-of-way clearing, and overheads.

STATUS OF PREVIOUS (2002-2006) CWP ITEMS

CODE	EXT	ITEM #	DESCRIPTION	MILES	ESTIMATED COST ORIGINAL	ESTIMATED COST PRESENT	%	STATUS
101			40 - UG NEW CONSUMERS	3.0	$200,000	$207,934		
102			2960 - OH NEW CONSUMERS	172.0	$3,388,738	$4,533,931		
100			**NEW DISTRIBUTION LINES**	**175.0**	**$3,588,738**	**$4,741,865**	132%	
339 *		3-3-B	CONV 1-PH TO 3-PH, RECOND #4 ACSR T	1.9	$81,700	$61,058	75%	Complete
342 *		9-1-A	CONV 1-PH TO 3-PH, RECOND #4 ACSR T	2.0	$86,600	$81,113	94%	Complete
343 *		2-5-C	3-PH AND 1-PH, CONV 12.47 - 25 KV	14.0	$135,000	$47,244	35%	Complete
345 *		2-5-B	1-PH, CONV 7.2 - 14.4 KV	9.5	$79,500	$60,651	76%	Complete
347 *		5-4-G	CONV 1-PH TO 3-PH, #1/0 ACSR TO # 1/0 /	1.3	$55,900	$28,021	50%	Complete
349 *		7-2-D	CONV 1-PH TO 3-PH, RECOND #4 ACSR T	2.8	$120,400	$85,554	71%	Complete
351 *		8-2-B	3-PH AND 1-PH, CONV 12.47 - 25 KV	25.9	$259,450			Cancelled
361		1-2-A	3-PH, RECOND #1/0 ACSR TO #397 ACSR	0.2	$4,300			Complete
362		1-2-B	CONV 1-PH TO 3-PH, RECOND #4 ACSR T	0.2	$8,600	$21,890	255%	Complete
363		1-2-C	CONV 1-PH TO 3-PH, RECOND #4 ACSR T	0.7	$30,100			Carryover
364		2-3-A	3-PH AND 1-PH, CONV 12.47 - 25 KV	9.8	$100,150	$91,911	92%	Complete
365		2-4-A	CONV 1-PH TO 2-PH, RECOND #4 ACSR T	1.4	$60,200	$54,933	91%	Complete
366		3-4-A	1-PH, CONV 7.2 - 14.4 KV	2.8	$113,400	$6,813	6%	Complete
367		3-4-B	1-PH, CONV 7.2 - 14.4 KV	0.3	$2,650	$9,050	342%	Complete
368		4-1-A	3-PH AND 1-PH, CONV 12.47 - 25 KV	25.6	$263,800	$153,371	58%	Complete
369		10-2-A	3-PH, RECOND #4 ACSR TO #4/0 ACSR, C	5.0	$60,250	$158,975	264%	Complete
370		7-3-A	CONV 1-PH TO 3-PH, RECOND #4 ACSR T	1.0	$43,000	$42,905	100%	Complete
371		8-2-B	1-PH, CONV 7.2 - 14.4 KV	8.6	$82,550	$26,289	32%	Complete
372		9-1-A	1-PH, CONV 7.2 - 14.4 KV	1.7	$16,100	$27,562	171%	Complete
373		9-1-B	1-PH, CONV 7.2 - 14.4 KV	1.0	$9,500	$11,699	123%	Complete
374		ALL-AL	CONDUCTOR REPLACEMENT	120.0	$1,320,000	$1,011,895	77%	In-Progress
300			**LINE CONVERSIONS**	**235.7**	**$2,845,150**	**$1,980,934**	70%	
601			TRANSFORMERS & METERS (AND MISC SPECIAL EQ)		$1,970,054	$2,401,811	122%	
602			SERVICE UPGRADES		$121,074	$358,008	296%	
603			SECTIONALIZING EQUIPMENT		$50,000	$138,451	277%	
604	.1	2-3-A	3-PHASE REGULATOR BANK		$21,000			
604	.2	5-3-C	3-PHASE REGULATOR BANK		$21,000			
604	.3	5-4-H	3-PHASE REGULATOR BANK		$21,000			
604	.4	8-2-C	3-PHASE REGULATOR BANK		$21,000			
604	.5	8-2-D	1-PHASE REGULATOR BANK		$4,000			
			REGULATORS			$66,087	75%	
605			CAPACITORS		$20,000	$0	0%	
606	.0		POLE REPLACEMENTS (1800 POLES TO		$891,000			
606	.1		COPPERWELD REPLACEMENT	101.6	$934,720			Complete
606	.2*	5-3-A	COPPERWELD REPLACEMENT	1.7	$15,640			Complete
606	.3*	5-3-B	COPPERWELD REPLACEMENT	1.5	$13,800			Complete
606	.4*	5-4-A	COPPERWELD REPLACEMENT	2.4	$22,080			Complete
606	.5*	5-4-B	COPPERWELD REPLACEMENT	2.5	$23,000			Complete
606	.6*	5-4-C	COPPERWELD REPLACEMENT	1.7	$15,640			Complete
606	.7*	4-4-B	COPPERWELD REPLACEMENT	3.8	$34,960			Complete
606	.8*	3-2-A	COPPERWELD REPLACEMENT	0.8	$6,900			Complete
606	.9*	1-1-A	COPPERWELD REPLACEMENT	4.2	$38,640			Complete
606	.10*	4-4-A	COPPERWELD REPLACEMENT	4.4	$49,300			Complete
606	.11	3-4-C	COPPERWELD REPLACEMENT	11.8	$108,560			Complete
606			REPLACEMENT	136.4	$2,154,240	$2,074,814	96%	
608			CLEARANCE POLES	80	$54,000	$0	0%	
609			AUTOTRANSFORMERS		$135,500	$97,280	72%	
600			**DISTRIBUTION EQUIPMENT**		**$4,592,868**	**5,136,451**	112%	
701			SERCURITY LIGHTS		$309,000	$410,654	133%	
702			REINBURSEMENTS		$1,568,086	$4,957,181	316%	
700			**OTHER DISTRIBUTION EQUIPMENT**		**$1,877,086**	**$4,957,181**	264%	
1600			**MISCELLANEOUS PROJECTS**			$782,562		
					$12,903,842	**$17,598,993**	136%	

* Carryover Items
NOTE: This information reflects month-end dollar values through January 2007

ANALYSIS OF 1996 LONG-RANGE PLAN

Farmers Rural Electric Cooperative's 1996 Long-Range Plan (LRP) still remains current and adequate. The LRP was used as a guide in the 2007 – 2011 CWP preparation.

The study was based on the 1993-1994 winter peak loads of 83,800 KW and an average annual load growth rate of 3.0%. Three future load levels were studied: 2000 when the loads would be increased by approximately 31% (110,000 KW), 2005 when the loads would be increased by approximately 48% (124,000 KW) and 2015 when the loads would increase by approximately 80 % (151,000 KW) more than the base year.

The LRP recommends that the distribution system continue to be built as 14.4/24.9 KV but operated at the most economic level (7.2/12.47 KV or 14.4/24.9 KV) depending on the loading. Alternate plans which were developed but found not to be the most economical were: (1) conversion of the entire system to 14.4/24.9 KV and (2) building and operating new plant as 7.2/12.47 KV.

ANALYSIS OF 2005 OPERATIONS & MAINTENANCE SURVEY

In May of 2005, an Operation and Maintenance Survey (O & M Survey) of the FRECC distribution system was conducted. Line and pole inspection records, voltage and current test records, special equipment records, outage records comprised the basis for the system analysis and rating. The completed O & M Survey was reviewed by Mike Norman, RUS General Field Representative on May 19, 2005.

Transmission lines and distribution substations are owned and maintained by East Kentucky Power Cooperative (EKPC) and have been excluded from the rating process.

In general, the overhead and underground distribution facilities were found to be in satisfactory condition. With the exception of right-of-way clearing, all the operations and maintenance programs and engineering programs were found to be satisfactory. We have modified our right-of-way clearing process to address Mr. Norman's concern for vines growing on poles and yard trees.

One-half the system is inspected every year utilizing a ground patrol inspection (2 year cycle). In 1996, FRECC developed a pole inspection plan. The goal of this plan is to inspect all FRECC poles on a 7 year cycle. During the first cycle, we found approximately 8 to 10 percent were physically deteriorated and required replacement. We anticipate this rate to decrease as we continue on our second cycle.

An "Aged Conductor Survey" was performed during a previous CWP which highlighted copperweld conductor and some older 4 ACSR to be in poor physical condition. The age of these conductors were often in excess of 50 years. According to our records, all copperweld conductor has been changed. We anticipate discovering small sections in future years due to inaccuracies in our records. We are continuing to change 4 ACSR as needed.

FRECC has a program to clear the overhead distribution line rights-of-way on a 6 year cycle. This work is performed by in-house and contract tree trimming crews. The program incorporates hand-cutting, use of remote trimmers, and spray equipment. FRECC has experimented with an increased amount of high-volume followed by a low-volume spraying to decrease the amount of cutting and mowing.

Contract construction labor was utilized in the last 4-year CWP to assist FRECC's in-house construction crews. This additional assistance will be required to complete the proposed projects as submitted in the 2007-2011 CWP.

SECTIONALIZING STUDIES

A list of sectionalizing projects and costs associated with this CWP is included in Section III-F of this report. This list incorporates oil circuit reclosers (OCRs), electronic reclosers, sectionalizers, fuses, and any other needed protective equipment.

Also, FRECC will annually remove from service, inspect, and perform maintenance on approximately one-sixth of the System OCRs. The maintenance includes, but is not limited to, changing the oil, testing and certifying the device, and providing cosmetic repairs. All test reports are documented and saved. Once this is completed, the device can be returned to service.

Finally, the Engineering department of FRECC continually assesses the System with respect to any major changes not reflected in the CWP. Any changes to the protective scheme, CWP related or not, are documented and saved.

SEASONAL PEAK LOAD CURRENT MEASUREMENTS

#	SUBSTATION NAME	CKT NO.	Dec-06 A ph	B ph	C ph	% UNBAL
1.	GOODNIGHT		**267**	**263**	**429**	**34%**
		1	85	53	94	31%
		2	86	109	136	23%
		3	38	34	59	35%
		4	58	67	140	58%
		5	9	36	5	116%
2.	MUNFORDVILLE		**373**	**243**	**302**	**22%**
		1 (14.4)	44	26	76	56%
		2 (14.4)	53	13	45	65%
		3 (14.4)	35	25	45	29%
		4 (14.4)	1	1	1	0%
		5 (14.4)	81	94	67	17%
		6 (14.4)	157	80	66	55%
		7 (14.4)	2	4	2	50%
3.	TEMPLE HILL		**277**	**311**	**279**	**8%**
		1 (14.4)	97	66	115	29%
		2 (14.4)	22	21	1	93%
		3 (14.4)	45	53	49	8%
		4 (14.4)	60	105	67	36%
		5 (14.4)	24	26	29	10%
		6 (14.4)	29	40	18	38%
4.	KNOB LICK		**194**	**185**	**191**	**3%**
		1 (14.4)	52	43	39	16%
		2 (14.4)	49	88	87	34%
		3 (14.4)	30	5	15	80%
		4 (14.4)	45	45	44	1%
		5 (14.4)	18	4	6	93%
5.	BECKTON		**324**	**319**	**348**	**5%**
		1 (14.4)	11	8	33	90%
		2 (14.4)	132	129	139	4%
		3 (14.4)	78	78	44	34%
		4 (14.4)	103	104	132	17%
6.	CAVE CITY		**304**	**396**	**348**	**13%**
		1	122	140	115	11%
		2	58	60	59	2%
		3	105	187	145	28%
		4	19	9	29	53%
7.	PARKWAY I		**359**	**464**	**496**	**18%**
		1	88	88	102	10%
		2	93	90	128	23%
		3	44	71	63	26%
		4	134	215	203	27%
	PARKWAY II		**287**	**293**	**292**	**1%**
		1	192	204	192	4%

SEASONAL PEAK LOAD CURRENT MEASUREMENTS

#	SUBSTATION NAME	CKT NO.	Dec-06 A ph	B ph	C ph	% UNBAL
8.	GALLOWAY		**181**	**221**	**207**	**11%**
		1 (14.4)	134	149	149	7%
		2 (14.4)	46	72	58	23%
		3 (14.4)	1	0	0	200%
9.	BONNIEVILLE		**53**	**88**	**56**	**34%**
		1 (14.4)	30	30	22	20%
		2 (14.4)	23	58	34	51%
10.	WEST GLASGOW		**130**	**133**	**139**	**4%**
		1 (14.4)	26	26	41	32%
		2 (14.4)	104	107	98	5%
11.	SEYMOUR		**107**	**121**	**83**	**20%**
		2 (14.4)	62	72	56	14%
		3 (14.4)	6	8	5	26%
		4 (14.4)	39	41	22	35%
10.	FOX HOLLOW		**437**	**349**	**498**	**18%**
		1	196	119	183	28%
		2	241	230	315	20%

1.Unbalance is the percent difference between the current of the maximum or minimum phase and the average current of all three phases.

SUMMARY OF SERVICE INTERRUPTIONS

NUMBER

	POWER SUPPLY	SCHEDULED	MAJOR STORM	WEATHER	EQUIPMENT	ANIMAL	ACT OF MAN	R/W	OTHER	TOTAL
2002	2	17	-	296	136	68	22	82	262	885
2003	3	13	21	306	85	63	25	83	208	807
2004	5	17	335	302	51	62	50	55	314	1,191
2005	4	11	-	179	41	25	57	74	225	616
2006	8	15	-	396	43	49	55	109	325	1,000
TOTAL:	22	73	356	1,479	356	267	209	403	1,334	4,499
5 YR AVG:	4	15	71	296	71	53	42	81	267	900

HOURS

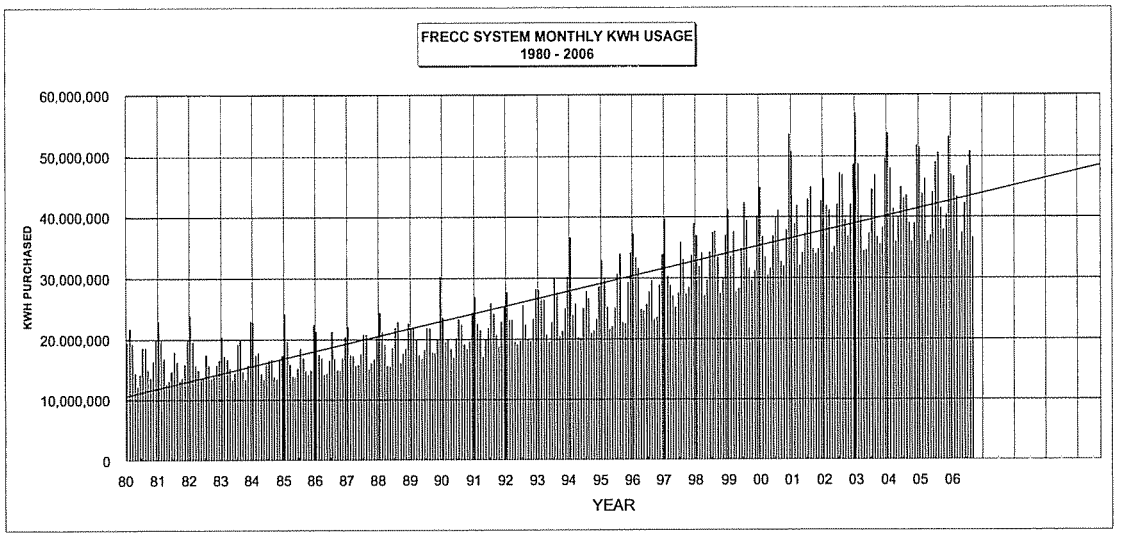
2002	5,799	1,746	-	26,007	26,920	1,335	2,624	14,559	11,774	90,763
2003	4,416	1,133	6,102	13,335	15,584	1,817	3,113	10,523	5,812	61,833
2004	7,193	887	317,530	28,196	9,057	1,252	6,179	5,279	13,288	388,861
2005	16,582	475	-	28,871	15,371	343	2,283	8,177	10,622	82,725
2006	15,448	1,116	-	36,309	8,035	11,016	3,265	20,066	13,618	108,873
TOTAL:	49,437	5,357	323,632	132,719	74,966	15,762	17,463	58,604	55,114	733,055
5 YR AVG:	9,887	1,071	64,726	26,544	14,993	3,152	3,493	11,721	11,023	146,611

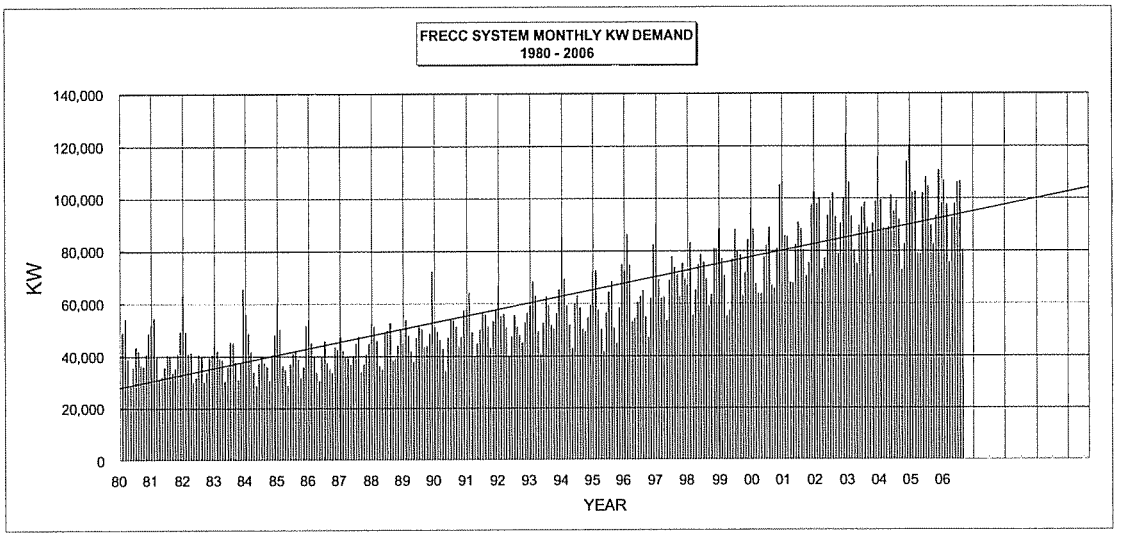
MEMBERS EFFECTED

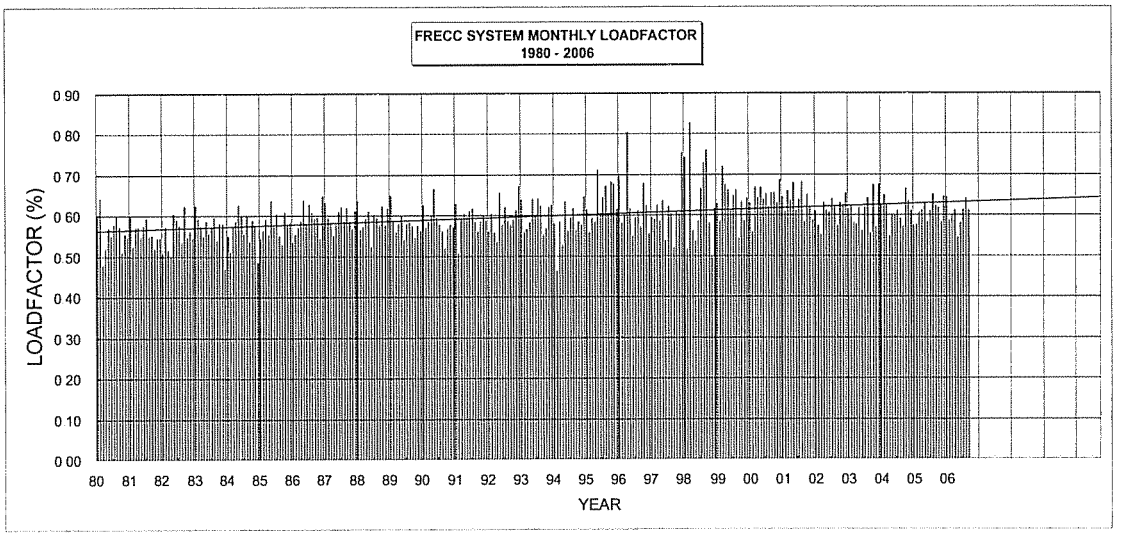
2002	7,728	2,046	-	9,817	13,313	982	598	5,870	7,515	47,869
2003	11,884	1,472	1,235	5,442	6,018	1,317	1,057	3,774	4,936	37,135
2004	6,562	1,537	17,426	10,316	5,140	866	3,918	1,755	8,496	56,016
2005	13,124	1,102		9,013	6,022	252	1,189	3,054	5,640	39,396
2006	22,864	1,354	-	11,708	3,548	5,502	1,802	5,313	9,550	61,641
TOTAL:	62,162	7,511	18,661	46,296	34,041	8,919	8,564	19,766	36,137	242,057
5 YR AVG:	12,432	1,502	3,732	9,259	6,808	1,784	1,713	3,953	7,227	48,411

AVERAGE HOURS OUTAGE PER MEMBER

2002	0.291	0.088	-	1.307	1.353	0.067	0.132	0.732	0.592	4.562
2003	0.216	0.055	0.298	0.652	0.762	0.089	0.152	0.514	0.284	3.023
2004	0.342	0.042	15.088	1.340	0.430	0.059	0.294	0.251	0.631	18.478
2005	0.767	0.022	-	1.335	0.711	0.016	0.106	0.378	0.491	3.826
2006	0.661	0.048	-	1.553	0.344	0.471	0.140	0.858	0.583	4.657
TOTAL:	2.277	0.255	15.386	6.188	3.600	0.703	0.823	2.734	2.581	34.546
5 YR AVG:	0.455	0.051	3.077	1.238	0.720	0.141	0.165	0.547	0.516	6.909


FRECC SYSTEM MONTHLY KWH USAGE
1980 - 2006
KWH PURCHASED
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06
YEAR


FRECC SYSTEM MONTHLY KW DEMAND
1980 - 2006
KW
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06
YEAR


FRECC SYSTEM MONTHLY LOADFACTOR
1980 - 2006
LOADFACTOR (%)
0 90
0 80
0 70
0 60
0 50
0 40
0 30
0 20
0 10
0 00
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06
YEAR

SUMMARY OF CONSTRUCTION PROGRAM AND COSTS

	CODE EXT	ITEM #	DESCRIPTION	MILES	ESTIMATED COST 1st YEAR	2nd YEAR	3rd YEAR	4th YEAR	TOTAL
	101		80 - UG NEW CONSUMERS	8.4	84,547	87,506	90,569	93,739	356,362
	102		2480 - OH NEW CONSUMERS	140.2	1,128,001	1,167,481	1,208,343	1,250,635	4,754,460
	100		**NEW DISTRIBUTION LINES**	148.6	**1,212,548**	**1,254,988**	**1,298,912**	**1,344,374**	**5,110,823**
*	363	1-2-C	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #1/0 ACSR	0.7	32,200				32,200
	374	ALL-ALL-A	CONDUCTOR REPLACEMENT	40.0	160,000	160,000	160,000	160,000	640,000
	375	1-4-A	CONV 2-PH TO 3-PH, CONV 1-PH TO 3-PH, RECOND TO #1/0	0.8				36,800	36,800
	376	2-5-A	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #1/0 ACSR	0.7				32,200	32,200
	377	3-4-A	CONV 1-PH 7.2KV TO 14.4KV	8.8				74,500	74,500
	378	4-2-A	CONV 1-PH TO 2-PH, RECOND #4 ACSR TO #1/0 ACSR	1.3				59,800	59,800
	379	5-1-A	CONV 1-PH 7.2KV TO 14.4KV	7.6				67,900	67,900
	380	5-2-A	CONV 3-PH 7.2KV TO 14.4KV	0.7				7,650	7,650
	381	5-3-A	CONV 1-PH & 3-PH 7.2 TO 14.4KV, RECOND 3-PH #4 TO #4/0	27.5	373,000				373,000
	382	5-3-B	RECOND 3-PH #4 ACSR TO #1/0 ACSR	2.5				72,500	72,500
	383	5-4-A	CONV 1-PH & 3-PH 7.2 TO 14.4KV	7.7				76,800	76,800
	384	5-4-B	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #4/0 ACSR	3.1		176,700			176,700
	385	7-4-A	CONV 1-PH TO 3-PH, RECOND #4 ACSR TO #1/O ACSR	0.2	9,200				9,200
	386	8-2-A	CONV 1-PH & 2-PH & 3-PH 7.2KV TO 14.4KV	38.8			349,850		349,850
	387	8-3-A	CONV 1-PH & 3-PH 7.2KV TO 14.4KV, RECOND 3-PH TO #4/0	10.8		316,400			316,400
	388	10-2-A	CONV 1-PH TO 3-PH, RECOND #4ACSR TO #1/0 ACSR	1.0				46,000	46,000
	389	12-2-A	RECOND 3-PH #1/0 ACSR TO 397 ACSR	1.6	80,000				80,000
	300		**LINE CONVERSIONS**	153.8	**654,400**	**653,100**	**509,850**	**634,150**	**2,451,500**
	601		TRANSFORMERS - NEW SERVICES		328,830	340,339	352,251	364,580	1,385,999
			TRANSFORMERS - CONVERSIONS						476,550
			METERS - NEW SERVICES		89,600	91,840	94,136	96,489	372,065
			METERS - AMR CHANGEOUT		1,161,000	516,000	0	0	1,677,000
									3,911,614
	602		SERVICE UPGRADES		90,182	93,339	96,605	99,987	**380,113**
	603		SECTIONALIZING EQUIPMENT		62,925	62,925	62,925	62,925	**182,700**
	604		REGULATOR STATIONS		107,400	107,400	107,400	107,400	**429,600**
	605		CAPACITORS		12,500	12,500	12,500	12,500	**50,000**
	606		POLE REPLACEMENTS (1360 POLES TOTAL)		465,686	481,985	498,854	516,314	**1,962,839**
	609		AUTOTRANSFORMERS		62,925	62,925	62,925	62,925	**251,700**
	600		**DISTRIBUTION EQUIPMENT**		**1,130,448**	**1,161,412**	**1,193,460**	**1,226,630**	**7,168,566**
	701		SERCURITY LIGHTS		66,934	69,277	71,702	74,211	282,125
	702		AMR COMPUTER AND COMMUNICATION HARDWAR		620,000				613,000
	700		**OTHER DISTRIBUTION EQUIPMENT**		**686,934**	**69,277**	**71,702**	**74,211**	**895,125**
			Total						**15,626,014**

* CARR

CONSTRUCTION REQUIRED FOR NEW SERVICES

NEW MEMBERS - SYSTEM WIDE	24 MONTH HISTORY 10/04 - 9/05	24 MONTH HISTORY 10/05 - 9/06	ESTIMATED 48-MONTH WORK PLAN PERIOD 1/07 - 3/08		4/08 - 3/09		4/09 - 3/10		4/10 - 3/11		TOTAL
NUMBER OF NEW SERVICES											
Underground	16	17	20		20		20		20		80
Overhead	593	633	620		620		620		620		2,480
TOTAL NEW MEMBERS	609	650	640		640		640		640		2,560
LINEAL FEET OF NEW LINE											
Underground (UG)											
Primary	2,458	9,277	8,000		8,000		8,000		8,000		32,000 ft
Secondary	0	895	800		800		800		800		3,200 ft
Service Drop	2,297	2,395	2,300		2,300		2,300		2,300		9,200 ft
	4,755	12,567	11,100		11,100		11,100		11,100		44,400 ft
											8.4 mi
AVERAGE (UG)	297	739									
Overhead (OH)											
Primary	96,315	105,578	100,000		100,000		100,000		100,000		400,000 ft
Secondary	24,095	25,050	25,000		25,000		25,000		25,000		100,000 ft
Service Drop	60,350	62,862	60,000		60,000		60,000		60,000		240,000 ft
	180,760	193,490	185,000		185,000		185,000		185,000		740,000 ft
											140.2 mi
AVERAGE (OH)	305	306									
TOTAL LENGTH IN FEET	185,515	206,057	196,100		196,100		196,100		196,100		784,400 ft
											148.6 mi
COST OF NEW SERVICES											
Underground	$62,751	$69,435	$84,547		$87,506		$90,569		$93,739		$356,362
AVERAGE (UG)	$3,922	$4,084	$4,227	*	$4,375	*	$4,528	*	$4,687	*	$17,818
Overhead	$979,906	$1,112,708	$1,128,001		$1,167,481		$1,208,343		$1,250,635		$4,754,460
AVERAGE (OH)	$1,652	$1,758	$1,819	*	$1,883	*	$1,949	*	$2,017	*	$7,668
TOTAL COST OF NEW LINE	**$1,042,657**	**$1,182,143**	**$1,212,548**		**$1,254,988**		**$1,298,912**		**$1,344,374**		**$5,110,823**
COST OF NEW TRANSFORMERS											
Number of UG Transformers	10	10	10		10		10		10		40
Number of OH Transformers	504	503	500		500		500		500		2,000
	514	513	510		510		510		510		2,040
Avg Inst UG Cost	$1,094	$1,171	$1,212	*	$1,254	*	$1,298	*	$1,344	*	
Avg Inst OH Cost	$573	$612	$633	*	$656	*	$679	*	$702	*	
Cost of UG Transformers	$7,456	$9,453	12,120		12,544		12,983		13,437		$51,084
Cost of OH Transformers	$198,645	$344,196	316,710		327,795		339,268		351,142		$1,334,915
TOTAL COST OF NEW TRANS	**$206,101**	**$353,649**	**$328,830**		**$340,339**		**$352,251**		**$364,580**		**$1,385,999**
COST OF NEW METERS											
Number of Meters	532	516	640		640		640		640		2,560
Average Installed Cost of Meters	$59	$57	$140	**	$144	**	$147	**	$151	**	
TOTAL COST OF NEW METERS	**$31,388**	**$29,412**	**$89,600**		**$91,840**		**$94,136**		**$96,489**		**$372,065**
TOTAL COST OF NEW SERVICES	**$1,280,146**	**$1,565,204**	**$1,630,978**		**$1,687,167**		**$1,745,299**		**$1,805,443**		**$6,868,887**

* Inflated by 3 5%
** Inflated by 2 5%

METER CHANGES REQUIRED FOR AMR IMPLEMENTATION

METER CHANGES - SYSTEM WIDE	2006	ESTIMATED 48-MONTH WORK PLAN PERIOD				
		4/07 - 3/08	4/08 - 3/09	4/09 - 3/10	4/10 - 3/11	TOTAL
AMR METER CHANGES						
Number of Meter Changes	11,000	9,000	4,000			13,000
AVERAGE COST	129	$129	$129			
Total Cost of Service Changes		$1,161,000	$516,000	$0	$0	$1,677,000

SERVICE CHANGES FOR EXISTING SERVICES

SERVICE CHANGES - SYSTEM WIDE	24 MONTH HISTORY 10/04 - 9/05	24 MONTH HISTORY 10/05 - 9/06	ESTIMATED 48-MONTH WORK PLAN PERIOD 4/07 - 3/08	4/08 - 3/09	4/09 - 3/10	4/10 - 3/11	TOTAL
SERVICE CHANGES							
Number of Service Changes	134	132	130	130	130	130	520
AVERAGE COST	$640	$670	$694 *	$718 *	$743 *	$769 *	
Total Cost of Service Changes	$85,825	$88,473	**$90,182**	**$93,339**	**$96,605**	**$99,987**	**$380,113**

* Inflated by 3.5%

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 363*

CWP ITEM NUMBER: 1_2_C
ESTIMATED COST: $32,200

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert and re-conductor 0.7 miles of single phase, # 4 ACSR to three phase # 1/0 ACSR, from line section 23015 to location 43-77-075. Replace poles and equipment and relocate portions of line as required. Carried over from previous construction work plan due to pending road move.

REASON FOR PROPOSED CONSTRUCTION

The current level in section 23007 exceeds design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the current level will meet design criteria #13, allowing better sectionalizing, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

***Carryover**

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 374

CWP ITEM NUMBER: ALL_ALL_A
ESTIMATED COST: $640,000

DESCRIPTION OF PROPOSED CONSTRUCTION

Re-conductor 40 miles of single phase, #6, #8 Copperweld and # 4ACSR to #2 ACSR. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The conductor is aged and deteriorated needing replacement.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work aged conductor will be replaced by new conductor, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 375

CWP ITEM NUMBER: 1_4_A
ESTIMATED COST: $36,800

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 0.4 miles of two phase, # 4 ACSR to three phase # 1/0 ACSR, from line section 12699 to line section 23541. Convert 0.4 miles of single phase, #4 ACSR to three phase #1/0 ACSR, from line section 20851 to 11814. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections fed by the above area fall below design criteria #1. The current in sections starting with 20851 exceed design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1 and current will be improved to within limits set in design criteria #13, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 376

CWP ITEM NUMBER: 2_5_A
ESTIMATED COST: $32,200

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 0.7 miles of single phase #4 ACSR to Three Phase #1/0 ACSR start line section 12767 to line section 12945. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections fed by the above area fall below design criteria #1. The current in section 10262 exceed design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1 and current will be improved to within limits set in design criteria #13, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

Conversion of 3.7 miles of 7.2 kV single phase to 14.4 kV single phase would be required to meet design criteria at a cost of $30,000. The cost is similar with the three phase conversion providing better voltage drop and reliability.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 377

CWP ITEM NUMBER: 3_4_A
ESTIMATED COST: $74,500

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 8.8 miles of single phase 7.2 kV to 14.4 kV. Convert from line section 24883 and ending section 8637. 41 transformers will be replaced. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections served by the above described area fall below design criteria #1. The current in sections starting with section 24833 and ending in section 5437 exceed design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1 and current will be improved to within limits set in design criteria #13, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

Single phase 7.2 kV to three phase 12.47 kV was considered but was abandoned due to cost.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 378

CWP ITEM NUMBER: 4_2_A
ESTIMATED COST: $59,800

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 1.3 miles of single phase, # 4 ACSR to two phase # 1/0 ACSR, in line sections starting with 4606 and ending with 4613. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The current level in section 4606 exceeds design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the current level will meet design criteria #13, allowing better sectionalizing, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

Voltage conversion was considered but was abandoned due to cost.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 379

CWP ITEM NUMBER: 5_1_A
ESTIMATED COST: $67,900

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 7.6 miles of single phase 7.2 kV to 14.4 kV. Convert from all line sections served by ocr 06-19-R01. 71 transformers will be replaced. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The current level in single phase tap exceeds design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 380

CWP ITEM NUMBER: 5_2_A
ESTIMATED COST: $7,650

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 0.7 miles of three phase 12.47 kV to three phase 24.9 kV in line section 5775. 3 transformers will be replaced. Replace poles and equipment and relocate portions of line as required

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections served by the above described area fall below design criteria #1.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 381

CWP ITEM NUMBER: 5_3_A
ESTIMATED COST: $373,000

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 5.2 miles of three phase 12.47 kV to three phase 24.9 kV ending with line section 19829. Convert 22.3 miles of single phase 7.2 kV to single phase 14.4 kV. 210 transformers will be replaced. Replace poles and equipment and relocate portions of line as required. Reconductor 3.4 miles of three phase from #4 ACSR three phase to #4/0 ACSR three phase, starting in line section 20435 and ending with section 19829, due to condition and age.

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections served by the above described area fall below design criteria #1. Equipment loading on stepdowns exceed design criteria #2.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1 and equipment loading will be within limits, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 382

CWP ITEM NUMBER: 5_3_B
ESTIMATED COST: $72,500

DESCRIPTION OF PROPOSED CONSTRUCTION

Reconductor 2.5 miles of three phase from #4 ACSR three phase to #1/0 ACSR three phase, starting in line section 5778 and ending in section 7886, due to condition and age.

REASON FOR PROPOSED CONSTRUCTION

Design criteria #5.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this aged conductor will be systematically removed, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 383

CWP ITEM NUMBER: 5_4_A
ESTIMATED COST: $76,800

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 2.6 miles of three phase 12.47 kV to three phase 24.9 kV, adding stepdown to line section 19633 and adding stepdown to line section 15815. Convert 5.1 miles of single phase 7.2 kV to single phase 7.2 kV associated with 3 phase conversion. 87 transformers will be replaced. Replace poles and equipment and relocate portions of line as required

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections served by the above described area fall below design criteria #1.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 384

CWP ITEM NUMBER: 5_4_B
ESTIMATED COST: $176,700

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 3.1 miles of single phase, # 4 ACSR to three phase # 4/0 ACSR, from line section 23877 to line section 3036. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections fed by the above area fall below design criteria #1, and serve three phase customers in area.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 385

CWP ITEM NUMBER: 7_4_A
ESTIMATED COST: $9,200

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 0.2 miles of single phase, # 4 ACSR to three phase # 1/0 ACSR, line sections 20516, 23334. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The current level in section 20516 and 23334 exceeds design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the current level will meet design criteria #13, allowing better sectionalizing, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 386

CWP ITEM NUMBER: 8_2_A
ESTIMATED COST: $349,850

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 6.6 miles of three phase 12.47 kV to three phase 24.9 kV. Convert 0.5 miles of two phase 12.47 kV to two phase 24.9 kV. Convert 31.7 miles of single phase 7.2 kV to single phase 14.4 kV in line section. 217 transformers will be replaced. Replace poles and equipment and relocate portions of line as required.

SECTIONS AFFECTED

Relocate Stepdown to line section 4695.

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections served by the above described area fall below design criteria #1.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 387

CWP ITEM NUMBER: 8_3_A
ESTIMATED COST: $316,400

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert and reconductor 3.9 miles of single phase #4 ACSR 7.2 kV to three phase #4/0 ACSR 24.9 kV and convert 6.9 miles of single phase 7.2 kV to 14.4 kV. 77 transformers will be replaced. Replace poles and equipment and relocate portions of line as required.

SECTIONS AFFECTED

Beginning section 3526 to ending section 5226.

REASON FOR PROPOSED CONSTRUCTION

The current level in section 24567 and multiple sections starting at 5137 exceeds design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the current levels will meet design criteria #13, allowing better sectionalizing, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 388

CWP ITEM NUMBER: 10_2_A
ESTIMATED COST: $46,000

DESCRIPTION OF PROPOSED CONSTRUCTION

Convert 1.0 miles of single phase, # 4 ACSR to three phase # 1/0 ACSR, in line sections starting with 8350 and ending with 4150. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The current level in section 8350 exceeds design criteria #13.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the current level will meet design criteria #13, allowing better sectionalizing, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

CONSTRUCTION ITEM - LINE CONVERSION

CFR CODE: 389

CWP ITEM NUMBER: 12_2_A
ESTIMATED COST: $80,000

DESCRIPTION OF PROPOSED CONSTRUCTION

Reconductor 1.6 miles of three phase from #1/0 ACSR three phase to #397 ACSR three phase. Replace poles and equipment and relocate portions of line as required.

REASON FOR PROPOSED CONSTRUCTION

The voltage levels in sections served by the above described area fall below design criteria #1. Equipment loading on Conductor exceed design criteria #3.

RESULTS OF PROPOSED CONSTRUCTION

As a result of this work the voltage levels will meet design criteria #1 and equipment loading will be within limits, improving voltage drop and increasing reliability.

ALTERNATIVE CORRECTIVE PLANS INVESTIGATED

No alternative plans available.

SUBSTATIONS
(Additions and Changes)

During this Construction Work Plan, a new substation will be added in Metcalfe County. This new substation will serve all the existing load in the Edmonton Industrial Park, relieving load off our Galloway Substation.

NEW DISTRIBUTION CONSTRUCTION ITEM – SECTIONALIZING EQUIP.
(Additions and Changes)

CFR CODE: 603

ESTIMATED COST: $182,700

THREE PHASE ELECTRONIC RECLOSERS

STATION	FEEDER		EQUIPMENT COST
01-36-R02	12-02	$	20,300.00
43-83-R02	10-02	$	20,300.00
44-97-R01	08-02	$	20,300.00
37-82-R01	06-01	$	20,300.00
43-03-R05	06-03	$	20,300.00
38-88-R02	04-04	$	20,300.00
38-54-R03	11-04	$	20,300.00
38-12-R01	11-02	$	20,300.00
36-57-R01	02-06	$	20,300.00
		$	182,700.00

NEW DISTRIBUTION CONSTRUCTION ITEM - REGULATORS (Additions and Changes)

CFR CODE: 604

ESTIMATED COST: $429,600

SECTION (END OF)	FEEDER	SIZE (AMP)	ADD (#)	REMOVE (#)	MAT. & LABOR COST	EQUIPMENT COST	TOTAL COST
10112	01-01	50	1		$ 2,500.00		$ 2,500.00
14576	02-02	100	3		$ 12,600.00	$ 24,000.00	$ 36,600.00
13098	02-03	100	3		$ 12,600.00	$ 24,000.00	$ 36,600.00
13135	02-06	50	1		$ 2,500.00		$ 2,500.00
9896	03-01	150	3		$ 12,600.00		$ 12,600.00
4204	03-04	100	3		$ 12,600.00	$ 31,500.00	$ 44,100.00
13260	04-04	100	3		$ 12,600.00	$ 24,000.00	$ 36,600.00
3043	05-04	100	3		$ 12,600.00	$ 31,500.00	$ 44,100.00
20576	07-04	219	3		$ 12,600.00	$ 28,500.00	$ 41,100.00
4396	08-01	50	1		$ 2,500.00		$ 2,500.00
22460	11-02	100	3		$ 12,600.00	$ 31,500.00	$ 44,100.00
14028	11-02	100	3		$ 12,600.00	$ 31,500.00	$ 44,100.00
18812	12-01	219	3		$ 12,600.00	$ 28,500.00	$ 41,100.00
12836	12-02	219	3		$ 12,600.00	$ 28,500.00	$ 41,100.00
							$ 429,600.00

26-65-VR1	02-05	50		1
03-08-VR1	04-02	50		1
06-16-VR1	05-03	150		3
06-15-VR1	05-03	150		3
38-42-VR1	11-03	50		1

50 Amp Regulators	3	3
100 Amp Regulators	21	0
150 Amp Regulators	3	6
219 Amp Regulators	9	0

NEW DISTRIBUTION CONSTRUCTION ITEM - CAPACITORS

YEAR: 2007
CFR CODE: 605

CWP ITEM NUMBER:
ESTIMATED COST: $50,000*

DESCRIPTION OF PROPOSED CONSTRUCTION

Capacitors used for power factor correction.

REASON FOR PROPOSED CONSTRUCTION

To correct power factor by use of fixed and switched banks, allowing the system to operate as efficiently as possible.

*** EKPC furnishes capacitors**

REPLACEMENT - POLES

CFR CODE: 606 **ESTIMATED COST: $1,962,839**

DESCRIPTION OF PROPOSED CONSTRUCTION

Replace all poles found to be physically deteriorated by FRECC's personnel throughout the system. It is estimated that approximately 340 poles per year will need to be replaced.

REASON FOR PROPOSED CONSTRUCTION

FRECC inspects approximately 4,500 cooperatives poles each year. Historically, approximately 8.0% of these poles need to be replaced because of their poor physical condition.

	24 MONTH HISTORY		ESTIMATED 48-MONTH WORK PLAN PERIOD				
POLE REPLACEMENTS - SYSTEM WIDE	10/04 - 9/05	10/05 - 9/06	4/07 - 3/08	4/08 - 3/09	4/09 - 3/10	4/10 - 3/11	TOTAL
POLE REPLACEMENTS							
Number of Pole Replacements	321	351	340	340	340	340	1,360
AVERAGE COST	$970	$1,234	1,370	1,418	1,467	1,519	
Total Cost of Pole Replacements	$311,247	$433,110	$465,686	$481,985	$498,854	$516,314	$1,962,839

NEW DISTRIBUTION CONSTRUCTION ITEM – AUTO TRANSF.
(Additions and Changes)

CFR CODE: 609 **ESTIMATED COST: $251,700**

SECTION (END OF)	FEEDER	SIZE (KVA)	ADD (#)	REMOVE (#)	RACK (Y)	MAT. & LABOR COST	EQUIPMENT COST	TOTAL COST
5775	05-02	500	3			$ 4,800.00	$ 21,600.00	$ 26,400.00
19633	05-04	500	3			$ 4,800.00	$ 21,600.00	$ 26,400.00
15815	05-04	1000	3		Y	$ 10,000.00	$ 46,500.00	$ 56,500.00
19829	05-03	1000	3		Y	$ 10,000.00	$ 46,500.00	$ 56,500.00
5226	08-03	500	3			$ 4,800.00	$ 21,600.00	$ 26,400.00
4696	08-02	1000	3		Y	$ 10,000.00	$ 46,500.00	$ 56,500.00
10925	09-02	500	1			$ 1,500.00		$ 1,500.00
5437	03-04	500	1			$ 1,500.00		$ 1,500.00
38-54-SD1	11-04	1000	3		Y	$ -		$ -
02-43-SD1	03-03	500	1			$ -		$ -
01-77-SD1	03-05	500	1			$ -		$ -
								$ 251,700.00

07-66-SD1	03-04	500		1	
06-77-SD1	05-02	333		3	
06-18-SD1	05-03	1000		3	EKPC
06-19-SD1	05-01	500		3	
48-87-SD1	05-04	1000		3	
44-97-SD1	08-02	333		3	
38-54-SD1	11-04	500		3	
02-43-SD1	03-03	333		1	
01-77-SD1	03-05	333		1	
333 KVA Autos			0	8	
500 KVA Autos			13	7	
1000 KVA Autos			12	6	EKPC OWNS (3) OF THESE UNITS

OTHER DISTRIBUTION ITEMS - SECURITY LIGHTS

CFR CODE: 701

ESTIMATED COST: $282,125

DESCRIPTION OF PROPOSED CONSTRUCTION

Install approximately 290 outdoor security lights and associated poles per year as requested by consumer - members.

REASON FOR PROPOSED CONSTRUCTION

This work is necessary because of FRECC's outdoor lighting program.

SECURITY LIGHTS - SYSTEM WIDE	24 MONTH HISTORY 10/04 - 9/05	24 MONTH HISTORY 10/05 - 9/06	ESTIMATED 48-MONTH WORK PLAN PERIOD 4/07 - 3/08		4/08 - 3/09		4/09 - 3/10		4/10 - 3/11		TOTAL
SECURITY LIGHTS											
Number of Security Lights	301	287	290		290		290		290		1,160
AVERAGE COST	$330	$223	231	*	239	*	247	*	256	*	
Total Cost of Security Lights	$99,249	$64,002	$66,934		$69,277		$71,702		$74,211		$282,125

*** Inflated by 3.5%

OTHER DISTRIBUTION ITEMS - AMR

CFR CODE: 702 **ESTIMATED COST: $613,000**

DESCRIPTION OF PROPOSED CONSTRUCTION

In the 2002 – 2006 CWP, a cost justification study was prepared and AMR proved to be the most economical and efficient method of reading customer meters. The TWACS system was chosen due to better communication pathways to the meter, which holds additional potential benefits when compared to other systems, including some load management features. The AMR system will be completed in this CWP.

REASON FOR PROPOSED CONSTRUCTION

This work is necessary to provide better meter reading information from the customer, improve workflow throughout the month, improve customer service and reduce customer complaints.

ESTIMATED COST – COMPUTER AND COMMUNICATION HARDWARE

TWACS HARDWARE FOR 10 SUBSTATIONS	$470,000
MODULATION TRANSFORMERS	$130,000
COMMUNICATION TO SUBSTATIONS	$ 13,000
TOTAL	$613,000

*** 13,000 meters with modules will be included in code 601 (See section III-C)**

Economic Conductor Analysis

1 Phase Construction

7.6 kV	Operating Voltage (Phase to Ground)
1 phases	Number of Phases (1, 2, or 3)
100 kW	Initial Load in kW (this value should remain at 100 kW)
3 %	Annual Load Growth
95 %	Power Factor (residential = 90% unless capacitors are used)
57 %	Load Factor (annual value in %)
3 %	Annual Inflation Rate of Construction Costs
13.45 %	Carrying Charge Rate
$0.0300 $/kWh	Wholesale Energy Cost ($/kWh)
$5.22 $/kW	Wholesale Demand Cost ($/kW)
5 %	Inflation Rate of Wholesale Power Costs (annual inflation rate)
30 years	Period (number of years of the analysis)
6 %	Interest Rate (to be used as the discount rate in the present worth analysis)

Description of the Conductor	4 ACSR	2 ACSR	1/0 ACSR	4/0 ACSR	397 ACSR	795 ACSR
Initial Construction Cost Per Mile	$0	$16,000	$20,000	$0	$0	$0
Resistance in Ohms Per Mile	2.459	1.583	1.034	0.573	0.257	0.131
Present Worth of Construction Costs	$0	$29,622	$37,027	$0	$0	$0

Initial Load (AMPS)	Initial Load (kW)	Total Annual Cost Per Mile	
14	100	$29,796	$37,141
28	200	$30,317	$37,481
42	300	$31,185	$38,049
55	400	$32,401	$38,843
69	500	$33,964	$39,864
83	600	$35,875	$41,112
97	700	$38,133	$42,587
111	800	$40,739	$44,289
125	900	$43,691	$46,218
139	1000	$46,992	$48,373
152	1100	$50,639	$50,756
166	1200	$54,635	$53,365
180	1300	$58,977	$56,202
194	1400	$63,667	$59,265
208	1500	$68,704	$62,555
222	1600	$74,089	$66,073
235	1700	$79,821	$69,817
249	1800	$85,900	$73,788
263	1900	$92,327	$77,986
277	2000	$99,101	$82,411
291	2100	$106,223	$87,062
305	2200	$113,692	$91,941
319	2300	$121,508	$97,047
332	2400	$129,672	$102,379
346	2500	$138,184	$107,939
360	2600	$147,042	$113,725
374	2700	$156,248	$119,738
388	2800	$165,802	$125,979
402	2900	$175,702	$132,446
416	3000	$185,951	$139,140
429	3100	$196,546	$146,061
443	3200	$207,489	$153,209
457	3300	$218,780	$160,583
471	3400	$230,417	$168,185
485	3500	$242,403	$176,014

Economic Conductor Analysis

1 Phase Construction

15.2 kV	Operating Voltage (Phase to Ground)
1 phases	Number of Phases (1, 2, or 3)
100 kW	Initial Load in kW (this value should remain at 100 kW)
3 %	Annual Load Growth
95 %	Power Factor (residential = 90% unless capacitors are used)
57 %	Load Factor (annual value in %)
3 %	Annual Inflation Rate of Construction Costs
13.45 %	Carrying Charge Rate
$0.0300 $/kWh	Wholesale Energy Cost ($/kWh)
$5.22 $/kW	Wholesale Demand Cost ($/kW)
5 %	Inflation Rate of Wholesale Power Costs (annual inflation rate)
30 years	Period (number of years of the analysis)
6 %	Interest Rate (to be used as the discount rate in the present worth analysis)

Description of the Conductor	4 ACSR	2 ACSR	1/0 ACSR	4/0 ACSR	397 ACSR	795 ACSR
Initial Construction Cost Per Mile	$0	$16,000	$20,000	$0	$0	$0
Resistance in Ohms Per Mile	2.459	1.583	1.034	0.573	0.257	0.131
Present Worth of Construction Costs	$0	$29,622	$37,027	$0	$0	$0

Initial Load (AMPS)	Initial Load (kW)	Total Annual Cost Per Mile	
7	100	$29,665	$37,056
14	200	$29,796	$37,141
21	300	$30,013	$37,283
28	400	$30,317	$37,481
35	500	$30,708	$37,737
42	600	$31,185	$38,049
48	700	$31,750	$38,417
55	800	$32,401	$38,843
62	900	$33,139	$39,325
69	1000	$33,964	$39,864
76	1100	$34,876	$40,460
83	1200	$35,875	$41,112
90	1300	$36,961	$41,821
97	1400	$38,133	$42,587
104	1500	$39,392	$43,409
111	1600	$40,739	$44,289
118	1700	$42,172	$45,225
125	1800	$43,691	$46,218
132	1900	$45,298	$47,267
139	2000	$46,992	$48,373
145	2100	$48,772	$49,536
152	2200	$50,639	$50,756
159	2300	$52,594	$52,032
166	2400	$54,635	$53,365
173	2500	$56,762	$54,755
180	2600	$58,977	$56,202
187	2700	$61,278	$57,705
194	2800	$63,667	$59,265
201	2900	$66,142	$60,882
208	3000	$68,704	$62,555
215	3100	$71,353	$64,286
222	3200	$74,089	$66,073
229	3300	$76,911	$67,916
235	3400	$79,821	$69,817
242	3500	$82,817	$71,774

Economic Conductor Analysis

3 Phase Construction

7.6 kV	Operating Voltage (Phase to Ground)
3 phases	Number of Phases (1, 2, or 3)
100 kW	Initial Load in kW (this value should remain at 100 kW)
3 %	Annual Load Growth
95 %	Power Factor (residential = 90% unless capacitors are used)
57 %	Load Factor (annual value in %)
3 %	Annual Inflation Rate of Construction Costs
13.45 %	Carrying Charge Rate
$0.0300 $/kWh	Wholesale Energy Cost ($/kWh)
$5.22 $/kW	Wholesale Demand Cost ($/kW)
5 %	Inflation Rate of Wholesale Power Costs (annual inflation rate)
30 years	Period (number of years of the analysis)
6 %	Interest Rate (to be used as the discount rate in the present worth analysis)

Description of the Conductor	4 ACSR	2 ACSR	1/0 ACSR	4/0 ACSR	397 ACSR	795 ACSR
Initial Construction Cost Per Mile	$0	$0	$29,000	$35,000	$50,000	$0
Resistance in Ohms Per Mile	2.459	1.583	1.034	0.573	0.257	0.131
Present Worth of Construction Costs	$0	$0	$53,690	$64,798	$92,568	$0

Initial Load (AMPS)	Initial Load (kW)	Total Annual Cost Per Mile		
5	100	$54,030	$64,987	$92,653
9	200	$55,051	$65,552	$92,906
14	300	$56,753	$66,496	$93,328
18	400	$59,136	$67,816	$93,919
23	500	$62,199	$69,513	$94,679
28	600	$65,943	$71,588	$95,608
32	700	$70,368	$74,040	$96,706
37	800	$75,474	$76,870	$97,972
42	900	$81,260	$80,076	$99,408
46	1000	$87,727	$83,660	$101,012
51	1100	$94,875	$87,621	$102,785
55	1200	$102,704	$91,959	$104,727
60	1300	$111,213	$96,675	$106,838
65	1400	$120,403	$101,768	$109,118
69	1500	$130,274	$107,238	$111,566
74	1600	$140,826	$113,085	$114,184
78	1700	$152,058	$119,310	$116,970
83	1800	$163,971	$125,911	$119,926
88	1900	$176,565	$132,890	$123,050
92	2000	$189,840	$140,247	$126,343
97	2100	$203,795	$147,980	$129,804
102	2200	$218,431	$156,091	$133,435
106	2300	$233,748	$164,579	$137,235
111	2400	$249,745	$173,444	$141,203
115	2500	$266,424	$182,686	$145,341
120	2600	$283,783	$192,306	$149,647
125	2700	$301,823	$202,303	$154,122
129	2800	$320,543	$212,677	$158,766
134	2900	$339,945	$223,429	$163,579
139	3000	$360,027	$234,557	$168,560
143	3100	$380,790	$246,063	$173,711
148	3200	$402,233	$257,946	$179,030
152	3300	$424,358	$270,207	$184,518
157	3400	$447,163	$282,844	$190,176
162	3500	$470,649	$295,859	$196,002

Economic Conductor Analysis

3 Phase Construction

15.2 kV	Operating Voltage (Phase to Ground)
3 phases	Number of Phases (1, 2, or 3)
100 kW	Initial Load in kW (this value should remain at 100 kW)
3 %	Annual Load Growth
95 %	Power Factor (residential = 90% unless capacitors are used)
57 %	Load Factor (annual value in %)
3 %	Annual Inflation Rate of Construction Costs
13.45 %	Carrying Charge Rate
$0.0300 $/kWh	Wholesale Energy Cost ($/kWh)
$5.22 $/kW	Wholesale Demand Cost ($/kW)
5 %	Inflation Rate of Wholesale Power Costs (annual inflation rate)
30 years	Period (number of years of the analysis)
6 %	Interest Rate (to be used as the discount rate in the present worth analysis)

Description of the Conductor	4 ACSR	2 ACSR	1/0 ACSR	4/0 ACSR	397 ACSR	795 ACSR
Initial Construction Cost Per Mile	$0	$0	$29,000	$35,000	$50,000	$0
Resistance in Ohms Per Mile	2.459	1.583	1.034	0.573	0.257	0.131
Present Worth of Construction Costs	$0	$0	$53,690	$64,798	$92,568	$0

Initial Load (AMPS)	Initial Load (kW)	Total Annual Cost Per Mile		
2	100	$53,775	$64,845	$92,590
5	200	$54,030	$64,987	$92,653
7	300	$54,456	$65,222	$92,758
9	400	$55,051	$65,552	$92,906
12	500	$55,817	$65,977	$93,096
14	600	$56,753	$66,496	$93,328
16	700	$57,859	$67,109	$93,603
18	800	$59,136	$67,816	$93,919
21	900	$60,582	$68,618	$94,278
23	1000	$62,199	$69,513	$94,679
25	1100	$63,986	$70,504	$95,123
28	1200	$65,943	$71,588	$95,608
30	1300	$68,071	$72,767	$96,136
32	1400	$70,368	$74,040	$96,706
35	1500	$72,836	$75,408	$97,318
37	1600	$75,474	$76,870	$97,972
39	1700	$78,282	$78,426	$98,669
42	1800	$81,260	$80,076	$99,408
44	1900	$84,409	$81,821	$100,189
46	2000	$87,727	$83,660	$101,012
48	2100	$91,216	$85,593	$101,877
51	2200	$94,875	$87,621	$102,785
53	2300	$98,704	$89,743	$103,735
55	2400	$102,704	$91,959	$104,727
58	2500	$106,873	$94,270	$105,761
60	2600	$111,213	$96,675	$106,838
62	2700	$115,723	$99,174	$107,957
65	2800	$120,403	$101,768	$109,118
67	2900	$125,253	$104,456	$110,321
69	3000	$130,274	$107,238	$111,566
72	3100	$135,465	$110,114	$112,854
74	3200	$140,826	$113,085	$114,184
76	3300	$146,357	$116,150	$115,556
78	3400	$152,058	$119,310	$116,970
81	3500	$157,929	$122,563	$118,427

COMPARISON OF TOTAL ACCUMULATED COST and kWH LOSSES OF PLAN 1 vs PLAN 2

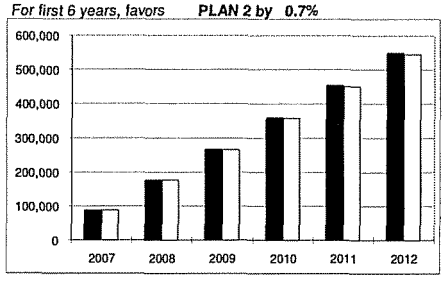
(All costs are the the accumulated present worth of the inflated cost)

TOTAL COSTS ($)

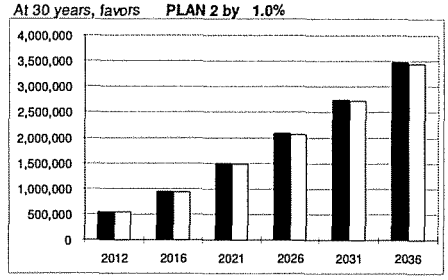
(Capitalized Costs + Losses)

	PLAN 1	PLAN 2
2007	87,800	87,300
2008	177,100	175,900
2009	267,900	266,000
2010	360,100	357,500
2011	454,000	450,700
2012	549,500	545,400
2016	949,100	941,300
2021	1,491,700	1,478,400
2026	2,088,700	2,068,900
2031	2,747,100	2,719,900
2036	3,474,500	3,438,800

For first 6 years, favors **PLAN 2 by 0.7%**



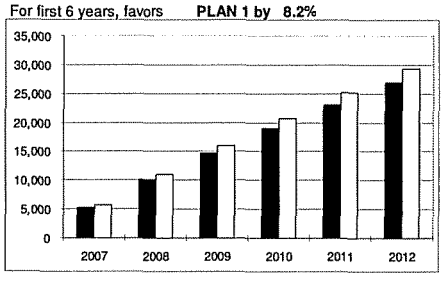
At 30 years, favors **PLAN 2 by 1.0%**



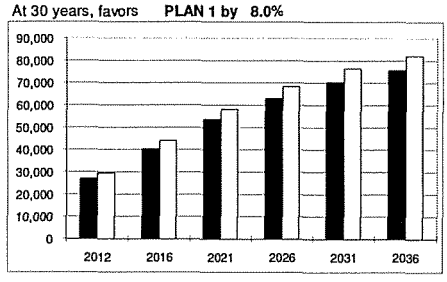
TOTAL CAPITALIZED COSTS ($)

	PLAN 1	PLAN 2
2007	5,200	5,600
2008	10,100	11,000
2009	14,700	16,000
2010	19,000	20,700
2011	23,100	25,200
2012	27,000	29,400
2016	40,400	44,000
2021	53,400	58,000
2026	63,000	68,500
2031	70,300	76,400
2036	75,600	82,200

For first 6 years, favors **PLAN 1 by 8.2%**



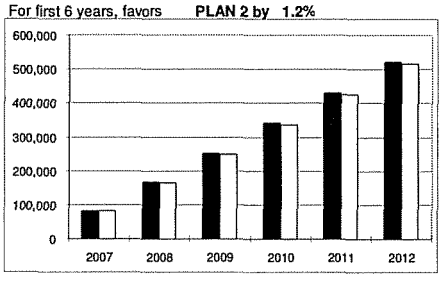
At 30 years, favors **PLAN 1 by 8.0%**



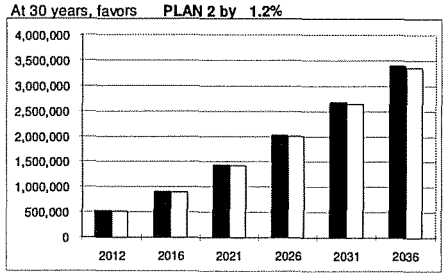
TOTAL COST OF LOSSES ($)

	PLAN 1	PLAN 2
2007	82,700	81,600
2008	167,000	164,900
2009	253,200	250,000
2010	341,100	336,800
2011	430,900	425,500
2012	522,500	516,000
2016	908,600	897,300
2021	1,438,300	1,420,400
2026	2,025,600	2,000,400
2031	2,676,800	2,643,500
2036	3,398,900	3,356,500

For first 6 years, favors **PLAN 2 by 1.2%**



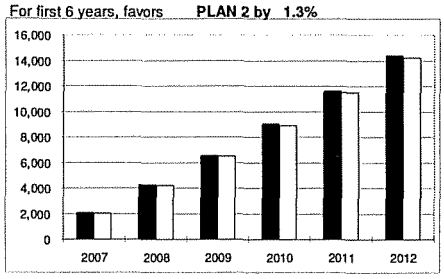
At 30 years, favors **PLAN 2 by 1.2%**



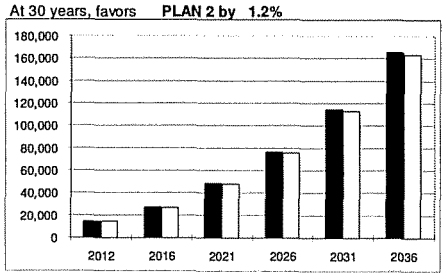
TOTAL ACCUMULATED LOSSES (MWh)

	PLAN 1	PLAN 2
2007	2,060	2,030
2008	4,240	4,190
2009	6,560	6,480
2010	9,020	8,910
2011	11,630	11,490
2012	14,400	14,220
2016	27,260	26,920
2021	48,270	47,670
2026	76,510	75,550
2031	114,450	113,020
2036	165,440	163,380

For first 6 years, favors **PLAN 2 by 1.3%**



At 30 years, favors **PLAN 2 by 1.2%**



16.10% *Fixed Charge Rate*
3.50% *Annual cost inflation rate - Construction*
6.00% *Annual present worth rate - Cost of construction*
3.00% *Annual growth rate - kW demand*
2.00% *Annual cost inflation rate of engergy - kWh*
6.00% *Annual present worth rate - Cost of kWh losses*

PLAN 1 0
PLAN 2 0

Summary

Unbalanced Voltage Drop Report
Source: BECKTON(5)

Database: C:\MILSOFT\DATA\2011LOADALLOC_1-07.WM\
Title:
Case:
Page 1

03/20/2007 08:46

Units Displayed In Volts
-Base Voltage:120.0-

Element Name	Parent Name	Cnf	Type/ Conductor	Pri kV	Base Volt	Element Drop	Accum Drop	Thru Amps	% Cap	Thru KW	KVAR	% PF	kW Loss	% Loss	mi From Src	Element Length (mi)	KW	KVAR	Cons Cons On Thru
BECKTON(5)		A	BECKTON	15.12Y	126.0	0.00	0.00	431.33	0	6493	610	100	0.00	0.0	0.000	0.000	0	0	0 1133
		B		15.12Y	126.0	0.00	0.00	323.13	0	4875	321	100					0	0	0 795
		C		15.12Y	126.0	0.00	0.00	396.94	0	5976	554	100					0	0	0 1025
---------- Feeder No. 0 (CKT05-02) Beginning with Device 05-02 ----------																			
06-49-R01	4901	A	REC-70-L	7.53Y	125.5	0.00	0.48	46.03	66	346	27	100	0.00	0.0	5.921	0.000	0	0	0 71
		B		7.47Y	124.4	0.00	1.56	65.74	94	489	43	100					0	0	0 78
		C		7.44Y	124.0	0.00	2.03	71.74	102	531	48	100					0	0	C 0 99 C
P 6987	7588	C	1/0 Strd -	14.69Y	122.5	-0.00	3.54	-0.07	0	0	-1	0	0.00	0.0	6.218	0.055	0	0	0 0 P
P 6984	7578	C	#1/0 ACSR	14.70Y	122.5	-0.00	3.54	-0.26	0	0	-4	0	0.00	0.0	5.419	0.045	0	0	0 0 P
P 23997	06-57-F01	C	1/0 Strd -	14.70Y	122.5	-0.00	3.54	-0.26	0	0	-4	0	0.00	0.0	5.616	0.197	0	0	0 0 P
P 7149	7897	A	1/0 Strd -	7.43Y	123.8	-0.00	2.20	-0.05	0	0	0	0	0.00	0.0	8.398	0.081	0	0	0 0 P
P 7148	7897	A	1/0 Strd -	7.43Y	123.8	-0.00	2.20	0.36	0	0	-3	-4	0.00	0.0	8.414	0.097	0	0	0 1 P
P 6944	7148	A	1/0 Strd -	7.43Y	123.8	-0.00	2.20	0.30	0	0	-2	-5	0.00	0.0	8.760	0.346	0	0	1 1 P
P 23222	06-74-F02	A	1/0 Strd -	7.43Y	123.8	-0.00	2.20	-0.07	0	0	-1	0	0.00	0.0	8.872	0.112	0	0	0 0 P
P 7885	8192	A	1/0 Strd -	7.37Y	122.8	0.00	3.21	0.08	0	0	-1	-21	0.00	0.0	9.811	0.127	0	0	1 1 P
P 06-87-CP1	24930	A	Capacitor	7.20Y	120.0	0.00	5.98	-27.78	0	0	-200	0	0.00	0.0	9.952	0.000	0	0	0 0 P
P		B		7.42Y	123.7	0.00	2.27	-28.64	0	0	-213	0					0	0	0 0 P
P		C		7.25Y	120.8	0.00	5.19	-27.96	0	0	-203	0					0	0	0 0 P
P 06-77-CP1	8124	A	Capacitor	14.49Y	120.7	0.00	5.27	-6.99	0	0	-101	0	0.00	0.0	8.573	0.000	0	0	0 0 P
P		B		14.87Y	123.9	0.00	2.09	-7.17	0	0	-107	0					0	0	0 0 P
P		C		14.53Y	121.1	0.00	4.91	-7.01	0	0	-102	0					0	0	0 0 P
P 5776	23998	A	1/0 Strd -	7.20Y	120.0	-0.00	5.98	-0.09	0	0	-1	0	0.00	0.0	9.199	0.085	0	0	0 1 P
P 8212	5776	A	1/0 Strd -	7.20Y	120.0	-0.00	5.98	-0.04	0	0	0	0	0.00	0.0	9.257	0.058	0	0	1 1 P
P 7912	8213	A	1/0 Strd -	7.20Y	120.0	-0.00	6.01	-0.05	0	0	0	0	0.00	0.0	9.298	0.079	0	0	1 1 P
P 6962	3068	A	1/0 Strd -	7.20Y	120.0	-0.00	6.04	-0.04	0	0	0	0	0.00	0.0	9.412	0.059	0	0	1 1 P
---------- Feeder No. 0 (CKT05-01) Beginning with Device 05-01 ----------																			
---------- Feeder No. 0 (CKT05-04) Beginning with Device 05-04 ----------																			

KEY-> L = Low Voltage H = High Voltage C = Capacity Over Limit (%capacity or load amps) G = Generator Out of kvar Limits P = Power Factor Low

Summary

Unbalanced Voltage Drop Report
Source: BECKTON(5)

Database: C:\MILSOFT\DATA\2011LOADALLOC_1-07.WM\
Title:
Case:
Page 2

03/20/2007 08:46

Units Displayed In Volts
-Base Voltage:120.0-

Cons Element Name	Cons Thru	Parent Name	Cnf	Type/ Conductor	Pri kV	Base Volt	Element Drop	Accum Drop	Thru Amps	% Cap	Thru KW	Thru KVAR	% PF	kW Loss	% Loss	mi From Src	Element Length (mi)	Element KW	Element KVAR	On
48-74-R01	6	9028	A	REC-35-H	7.45Y	124.1	0.00	1.90	5.21	15	39	3	100	0.00	0.0	7.032	0.000	0	0	
	30		B		7.43Y	123.9	0.00	2.14	23.41	67	173	14	100					0	0	
	62 C		C		7.29Y	121.5	0.00	4.52	47.86	137	343	62	98					0	0	
P 48-67-CP1	0 P	15816	A	Capacitor	7.43Y	123.8	0.00	2.15	-14.33	0	0	-107	0	0.00	0.0	4.950	0.000	0	0	
P	0 P		B		7.42Y	123.6	0.00	2.36	-14.31	0	0	-106	0					0	0	
P	0 P		C		7.37Y	122.9	0.00	3.12	-14.22	0	0	-105	0					0	0	
C 48-66-R01	49 C	6848	B	REC-35-E	7.38Y	123.0	0.00	3.03	45.30	129	333	30	100	0.00	0.0	5.279	0.000	0	0	
C 48-47-R01	87 C	2982	A	REC-35-H	7.53Y	125.5	0.00	0.46	65.63	188	475	136	96	0.00	0.0	7.862	0.000	0	0	
	9		B		7.55Y	125.8	0.00	0.21	30.32	87	202	108	88					0	0	
	0		C		7.52Y	125.3	0.00	0.74	26.48	76	169	104	85					0	0	
C 48-25-R01	30 C	2990	A	REC-25-H	7.36Y	122.6	0.00	3.41	36.54	146	245	110	91	0.00	0.0	10.350	0.000	0	0	
C	1 C		B		7.50Y	125.0	0.00	0.96	26.49	106	170	104	85					0	0	
C	0 C		C		7.42Y	123.7	0.00	2.34	26.48	106	167	103	85					0	0	
---------- Feeder No. 0 (CKT05-03) Beginning with Device 05-03 ----------																				
06-26-CP1	0	20426	A	Capacitor	14.94Y	124.5	0.00	1.47	-2.38	0	0	-36	0	0.00	0.0	2.914	0.000	0	0	
	0		B		14.99Y	125.0	0.00	1.05	-2.39	0	0	-36	0					0	0	
P	0 P		C		15.05Y	125.4	0.00	0.56	-2.40	0	0	-36	0					0	0	
C 06-42-R01	37 C	7625	B	REC-15-H	7.26Y	121.0	0.00	5.00	21.94	146	159	12	100	0.00	0.0	8.821	0.000	0	0	

KEY-> L = Low Voltage H = High Voltage C = Capacity Over Limit (%capacity or load amps) G = Generator Out of kvar Limits P = Power Factor Low

	Load	Adjustment	Capacitance	Charging	Gen&Motors	Loops&Metas	Losses	No Load Losses	Total
KW	16806	0	0	0	0	0	538	0.00	17344
KVAR	2204	0	-1669	-24	0	0	973		1485

	Lowest Voltage	Highest Accumulated Voltage Drop	Highest Element Voltage Drop
A-Phase ->	117.87 volts on 6661	8.13 volts on 6661	1.51 volts on 06-46-SD1
B-Phase ->	118.49 volts on 8489	7.51 volts on 8489	0.96 volts on 6866
C-Phase ->	118.10 volts on 3043	7.90 volts on 3043	1.41 volts on 4905

FARMERS RECC

2007 - 2011 CWP

Proposed System Map
2011 Load Level

1 inch = 2 miles