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June 2, 2004

RECEIVED
JUN 1 4 2004
PUBLIC SERVICE COMMISSION

Beth O'Donnell, Executive Director
Kentucky Public Service Commission
PO Box 615
Frankfort KY 40602

RE: Nolin RECC Elizabethtown, KY - Case number 2004-00160

Dear Ms. O'Donnell:

Enclosed are supporting documents and answers to the three inquires within your letter dated May 25,2004 on Nolin RECC's 2003-2005 Construction Work Plan(CWP), which was submitted to you as Case number 2004-00160. Please accept this letter as part of the filing of the case. The information you requested is as follows:

1. (b) Copies of franchises or permits, if any, from the proper public authority for the proposed new construction or extension, if not previously filed with the commission.
   - The proposed facilities set forth in the Construction Work Plan does not require any franchises or permits from the public authorities, other than work specific construction permits for passing along road right-of-ways or railroad crossings, which will need to be applied for, if necessary, during the actual construction.

2. (e) The manner, in detail, in which it is proposed to fianace the new construction or extension.
   - The Applicant has secured a loan for the funds necessary to construct the proposed facilities from the United States of America, acting by and through the Administrator of the Rural Utilities Service("RUS").

3. (f) An estimated cost of operation after the proposed facilities are completed.

- The Applicant's estimated cost of operation after the CWP is completed is shown in the Applicant's 2000-2010 Ten Year Financial Forecast, with excerpts from it attached hereto and made a part of this letter as a supporting document.

Should you have any questions, please feel free to contact me.

Sincerely,

Roger Wilson

Roger Wilson, PE
Wilson Consulting, INC

Enclosures

III. Criteria for Long Range System Planning

A. Load Levels

The long range load criteria was established for Nolin RECC by the engineering consultant that is consistent with the most recent Load Forecast. The Long Range Plan shall be designed to support a long range peak demand of approximately 2.1 times the 146.9 MW non-coincident demand that occurred during the winter of 1999-2000. This demand level is between the "normal winter case" and "extreme weather case" (probability of occurrence is one in ten years) as projected by Nolin RECC's 1998 Power Requirement Study. When developing a long-range plan it is desirable to have a time frame and the corresponding load level such that major system improvements are necessary. This allows for various plans to be analyzed and compared on a present worth basis. The twenty-year projected load of 2.1 times the present system peak meets this criterion of stressing the system to the point in which major improvements are necessary.

To make the load projections, each individual substation area was analyzed. The historical growth and any known future expansions were considered on a substation and circuit basis. These individual substation and circuit projections were summarized and compared to the Power Requirements Study. Adjustments were made as necessary to achieve similar results contained in the Power Requirements Study. A computer model of the system was used to distribute the load projected within a substation area to the line sections. Graphs of each planning area and the total systems kW demand are included in Appendix A.

The following page contains a summary of the criteria for the System Planning Report Load Levels in MW.

B. Voltage Drops

The criteria used in determining the permissible voltage drops throughout the design phase of this study was 8 volts. The criteria allowed the use of line voltage regulators to compensate for voltage drop from the substation to the end consumer. Each substation is equipped with bus voltage regulation. Only one set of line voltage regulators is considered allowable by this planning criterion.

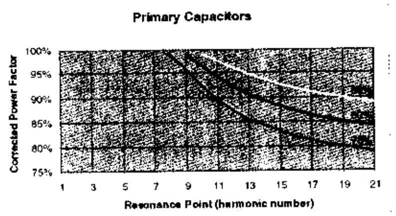
C. Single Contingency Outage

The system should be designed so that a single contingency outage can be safely isolated and the rest of the system may continue to operate based on the emergency ratings of the system components affected by the outage. This is essential, not only for maintaining high levels of reliability, but also to allow for the maintenance of specific devices and lines on the electric system. This criterion is not a hard and fast rule, but rather, is a goal for the distribution system.

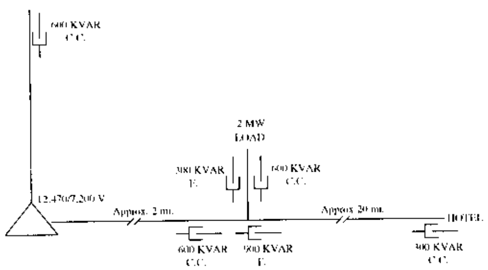
D. Capacity of System Components

The overhead conductors on the distribution system will be assigned capacity levels for both winter and summer. Any line which is required to carry more than its capacity based on its design operating temperature shall be reviewed in the field to verify its ability to carry the increase in load and still maintain the safety requirements as established by the latest revision of

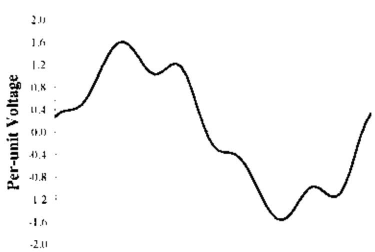
Effect of Power Factor Correction on System Resonance Point



Circuit



Utility Supply Voltage



Nolin Rural Electric Co-op Corporation
Recommended Long Range Plan
2000 System Planning Report
Proposed System Configuration

Substation	Existing Peak	Load Block A	Load Block B	Load Block C
Colesburg	2.9	3.9	4.5	6.0
Elizabethtown	9.5	14.2	17.0	23.8
Fort Knox	11.4	13.6	16.0	19.9
Glendale	6.9	8.8	10.2	13.0
Hogdenville	8.3	10.5	11.9	16.5
Kargle #1	5.9	6.2	6.2	6.2
Kargle #2	8.4	9.3	9.3	9.3
Logsden	0.0	0.0	0.0	0.0
Magnolia	6.7	8.4	9.5	10.8
Radcliffe/Logsden	16.7	19.7	23.4	31.0
Smithersville #1 & 2	12.0	21.3	25.8	34.6
Stephensburg	5.6	7.2	8.2	10.4
Tharp	9.3	14.0	15.5	18.7
Tunnel Hill	12.1	11.6	13.8	17.5
Upton	3.7	5.0	5.8	7.8
Vertrees	5.3	8.1	10.3	14.0
Vine Grove	12.0	17.0	19.7	26.9
Williams	10.3	15.5	18.5	23.2
Total	**146.9**	**194.3**	**225.6**	**289.6**

Resonance

- A resonance is a frequency at which the combination of a capacitor and an inductor have zero impedance.
- When this happens at an odd harmonic of 60 cycles, there can be tremendous magnification of the current at the resonance frequency.

How do you predict you could be creating a resonance when you add capacitors?

- If the following equation results in a value near and odd number, then you are in trouble.

$$n = \sqrt{\frac{\text{MVA sc p - n}}{\text{MVAR per phase}}}$$

Resonance, cont'd.

- In an ideal electric system, you can only have sustained currents that are odd multiples of 60 cycles. No even multiple currents and no DC.
- In a balanced three-phase system the third harmonic and its multiples cannot exist.
- No system is ideal or perfectly balanced.

the NESC and by any local standards which may apply. Specifically, the clearance of energized conductors will need to meet or exceed the clearances as established by the NESC during maximum sag conditions. The ratings will be based on the following guidelines:

Ampacity of Overhead Conductors

	Summer	Winter	Summer
Ambient Temp.	35 C	-10 C	35 C
Conductor Temp.	50 C	50 C	75 C
2 ACSR	89	210	N/A
1/0 ACSR	114	277	210
3/0 ACSR	146	364	273
4/0 ACSR	164	416	309
336 ACSR	221	578	448

These rating shall not be exceeded for the use in planning the system during normal operating conditions. All underground cable shall not be loaded beyond the normal loading recommendations of the cable manufacturers. These recommendations should take into account the installation method used, i.e., direct buried, conduit, riser pole.

It is recommended that Nolin RECC design all of their new, large overhead conductors for 75 C (167 F). For some sections of line, this may prove to be prohibitively expensive and should not be done. However, by designing, installing, and maintaining their main overhead conductors at the higher temperature level, Nolin RECC will be able to backfeed more efficiently in the event of an emergency.

E. Financial Data

One of the comparisons of alternate plans is accomplished with a present analysis. The financial data to be used in the present worth analysis can be found on the following page. The format used to calculate the fixed charge rate is recommended in RUS Bulletin 1724D-101A. Data was obtained from Nolin RECC's current Form 7s and from other financial records at the Cooperative. Other values used in present worth analysis were obtained from East Kentucky Power. A copy of this data is contained in the Appendix for reference.

Current distortion

Harmonic	%I RMS
DC	1.8
1	98.01
2	1.05
3	2.01
4	0.2
5	17.59
6	0.14
7	3.47
8	0.17
9	0.68
10	0.27
11	7.76
12	0.07
13	2.79
14	0.07
15	0.51
16	0.24
17	1.56

I_L	1805
I_{SC}	36500

I_{SC}/I_L	20

Allowed distortion compared to actual

Harmonic	%I RMS	Allowed
DC	1.8	0
1	98.01	NA
2	1.05	1
3	2.01	4
4	0.2	1
5	17.59	4
6	0.14	1
7	3.47	4
8	0.17	1
9	0.68	4
10	0.27	0.5
11	7.76	2
12	0.07	0.5
13	2.79	2
14	0.07	0.5
15	0.51	2
16	0.24	0.4
17	1.56	1.5

Power Factor Correction

Nolin Rural Electric Co-op Corporation

2000 System Planning Report

Kentucky 51

Annual Fixed Charge Rate

Net TIER

	1998	1999
Interest [Part A, line 15b]	$ 1,182,345	$ 1,254,238
Margins [Part A, line 28b]	$ 909,258	$ 1,031,197
Net TIER	1.77	1.82

Capital Structure

	1998	1999
Long Term Debt [Part C, line 41]	$ 22,601,373	$ 30,187,704
Total Marg.&Eq. [Part C, line 36]	$ 20,649,751	$ 19,569,539
Debt Ratio	52.26	60.67

Cost of Capital

	% of Debt	Interest Rate	Component
RUS	70%	5.50%	3.85%
Supplemental Lender	30%	7.00%	2.10%
Cost of Debt			5.95%

	1998	1999
Embedded Cost of Debt	5.23%	4.15%
Weighted Cost of Debt	3.11%	3.61%
Cost of Capital	5.50%	6.58%
Cost of Capital with TIER = 2.0	6.22%	7.22%

Operations & Maintenance

	1998	1999
Net Dist. Plant	$ 39,913,776	$ 42,914,899
Dist. Operations [Part A, line 5b]	$ 1,315,901	$ 1,468,719
Dist. Maintenance [Part A, line6b]	$ 1,513,726	$ 1,643,513
% O&M	7.09%	7.25%

Taxes

	1998	1999
Propert Tax [Part A, line 13b]	$ 287,919	$ 287,919
Plant [Part C, line 5+line20]	$ 43,199,871	$ 46,599,748
Tax Rate	0.67%	0.62%

Depreciation

	1998	1999
Net Depreciation of Dist Plant	5.14%	5.14%

Total Annual Fixed Charge Rate

	1998	1999
Cost of Capital with TIER = 2.0	6.22%	7.22%
% O&M	7.09%	7.25%
Tax Rate	0.67%	0.62%
Net Depreciation of Dist Plant	5.14%	5.14%
Total Annual Fixed Charge Rate	19.11%	20.23%
Fixed Charge Rate to be Used	19.67%	

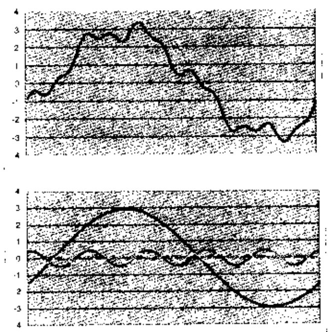
Harmonics

IEEE 519

Power Factor Correction

Harmonics

Harmonic Theory



Nolin Rural Electric Co-op Corporation

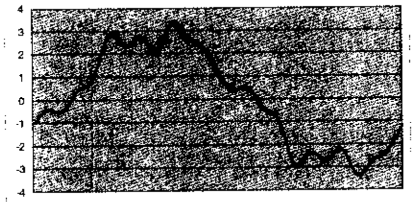
Recommended Long Range Plan

2000 System Planning Report

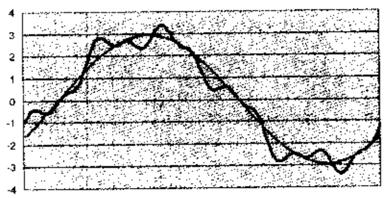
Present Worth Analysis

Calender	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Year	0	1	2	3	4	5	6	7	8	9	10
Distribution Cost											
Dollars (2000)	$0	$803,686	$803,686	$803,686	$803,686	$803,686	$561,832	$561,832	$561,832	$561,832	$561,832
Inflated Cost	$0	$822,299	$841,343	$860,829	$880,766	$901,164	$644,567	$659,495	$674,769	$690,397	$706,386
Total Annual Investment	$0	$822,299	$1,663,642	$2,524,471	$3,405,237	$4,306,401	$4,950,968	$5,610,463	$6,285,232	$6,975,629	$7,682,015
Carrying Cost Factor	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%
Carrying Cost	$0	$161,746	$327,238	$496,564	$669,810	$847,069	$973,855	$1,103,578	$1,236,305	$1,372,106	$1,511,052
Present Worth Factor	1.00	0.93	0.87	0.82	0.76	0.71	0.67	0.62	0.58	0.54	0.51
Present Worth	$0	$151,165	$285,823	$405,344	$510,995	$603,949	$648,921	$687,253	$719,541	$746,335	$768,142
Member Service											
Dollars (2000)	$0	$1,932,733	$1,932,733	$1,932,733	$1,932,733	$1,932,733	$1,925,069	$1,925,069	$1,925,069	$1,925,069	$1,925,069
Inflated Cost	$0	$1,977,495	$2,023,293	$2,070,153	$2,118,098	$2,167,153	$2,208,551	$2,259,702	$2,312,036	$2,365,583	$2,420,370
Total Annual Investment	$0	$1,977,495	$4,000,788	$6,070,941	$8,189,039	$10,356,192	$12,564,743	$14,824,445	$17,136,481	$19,502,064	$21,922,434
Carrying Cost Factor	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%	19.67%
Carrying Cost	$0	$388,973	$786,955	$1,194,154	$1,610,784	$2,037,063	$2,471,485	$2,915,968	$3,370,746	$3,836,056	$4,312,143
Present Worth Factor	1.00	0.93	0.87	0.82	0.76	0.71	0.67	0.62	0.58	0.54	0.51
Present Worth	$0	$363,526	$687,357	$974,785	$1,228,859	$1,452,398	$1,646,855	$1,815,918	$1,961,805	$2,086,560	$2,192,075
Substation Cost											
Dollars (2000)	$0	$0	$248,000	$328,000	$124,000	$894,000	$984,000	$0	$868,000	$328,000	$328,000
Inflated Cost	$0	$0	$260,987	$354,100	$137,327	$1,015,680	$1,146,828	$0	$1,064,610	$412,694	$423,363
Total Annual Investment	$0	$0	$260,987	$615,087	$752,414	$1,768,094	$2,914,922	$2,914,922	$3,979,532	$4,392,227	$4,815,589
Carrying Cost Factor	10.90%	10.90%	10.90%	10.90%	10.90%	10.90%	10.90%	10.90%	10.90%	10.90%	10.90%
Carrying Cost	$0	$0	$28,448	$67,044	$82,013	$192,722	$317,727	$317,727	$433,769	$478,753	$524,899
Present Worth Factor	1.00	0.93	0.87	0.82	0.76	0.71	0.67	0.62	0.58	0.54	0.51
Present Worth	$0	$0	$24,847	$54,728	$62,567	$137,408	$211,715	$197,864	$252,458	$260,410	$266,832
Transmission Cost											
Dollars (2000)	$0	$0	$0	$0	$0	$995,400	$0	$0	$1,128,120	$0	$0
Inflated Cost	$0	$0	$0	$0	$0	$1,130,881	$0	$0	$1,383,650	$0	$0
Total Annual Investment	$0	$0	$0	$0	$0	$1,130,881	$1,130,881	$1,130,881	$2,514,531	$2,514,531	$2,514,531
Carrying Cost Factor	12.52%	12.52%	12.52%	12.52%	12.52%	12.52%	12.52%	12.52%	12.52%	12.52%	12.52%
Carrying Cost	$0	$0	$0	$0	$0	$141,586	$141,586	$141,586	$314,819	$314,819	$314,819
Present Worth Factor	1.00	0.93	0.87	0.82	0.76	0.71	0.67	0.62	0.58	0.54	0.51
Present Worth	$0	$0	$0	$0	$0	$100,949	$94,345	$88,173	$183,228	$171,241	$160,038
Cost of Losses											
kW (Peak Month)	3079	3426.2	3773.4	4120.6	4467.8	4815	4916.8	5018.6	5120.4	5222.2	5324
kWh (Annually)	7,012,730	7,803,513	8,594,296	9,385,079	10,175,861	10,966,644	11,198,504	11,430,363	11,662,223	11,894,083	12,125,942
$/kW (2000)	$42.91	$42.91	$42.91	$42.91	$42.91	$42.91	$42.91	$42.91	$42.91	$42.91	$42.91
$/kWh (2000)	$0.02340	$0.02340	$0.02340	$0.02340	$0.02340	$0.02340	$0.02340	$0.02340	$0.02340	$0.02340	$0.02340
Cost of Losses (2000)	$296,218	$329,620	$363,023	$396,426	$429,828	$463,231	$473,025	$482,819	$492,612	$502,406	$512,200
$/kW inflated	$42.91	$43.94	$44.98	$46.05	$47.15	$48.27	$49.42	$50.60	$51.81	$53.04	$54.30
$/kWh inflated	$0.02340	$0.02425	$0.02513	$0.02605	$0.02699	$0.02797	$0.02899	$0.03004	$0.03113	$0.03226	$0.03343
Cost of Losses (Inflated)	$296,218	$339,782	$385,702	$434,235	$485,303	$539,157	$567,633	$597,309	$628,333	$660,689	$694,463
Present Worth Factor	1.00	0.93	0.87	0.82	0.76	0.71	0.67	0.62	0.58	0.54	0.51
Present Worth	$296,218	$317,554	$336,887	$354,465	$370,236	$384,412	$378,238	$371,974	$365,695	$359,371	$353,030
Total Cost											
2000 Dollars	$296,218	$3,066,039	$3,347,441	$3,460,844	$3,290,247	$5,089,049	$3,943,926	$2,969,720	$4,975,633	$3,317,307	$3,327,101
Present Worth Dollars	$296,218	$832,245	$1,334,914	$1,789,323	$2,172,657	$2,679,115	$2,980,073	$3,161,183	$3,482,726	$3,623,917	$3,740,117

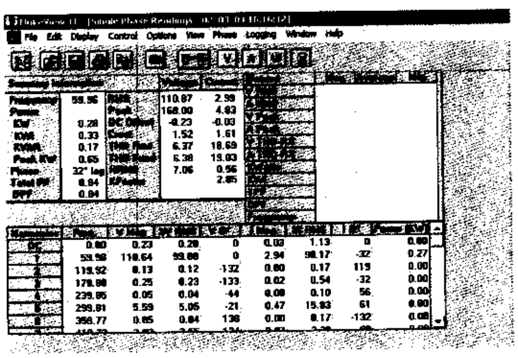
Actual vs Built from Harmonics



Total Harmonic Distortion (THD)



$$\mathrm{THD} = \frac{\sqrt{\sum_{2}^{\infty} I_h^2}}{I_1}$$



Public reporting burden for this collection of information is estimated to average 4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Agriculture, Clearance Officer, OC, OMB Control # 0572-0025, AG Box 7630, Washington, DC 20250. You are not required to respond to this collection of information unless this form displays the currently valid OMB control number.

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL UTILITIES SERVICE

REVIEW RATING SUMMARY

BORROWER DESIGNATION: KY-51

DATE PREPARED: 8/12/98

Ratings on form are:
- NA: Not Applicable
- 0: Unsatisfactory -- No Records
- 1: Corrective Action Needed
- 2: Acceptable, but Should be Improved -- See Attached Recommendations
- 3: Satisfactory -- No Additional Action Required at this Time

PART I. TRANSMISSION and DISTRIBUTION FACILITIES

1. Substations (Transmission and Distribution)	(Rating)
a. Safety, Clearance, Code Compliance	N/A
b. Physical Conditions: Structure, Major Equipment, Appearance	N/A
c. Inspection Records Each Substation	N/A
d. Oil Spill Prevention	N/A

2. Transmission Lines	(Rating)
a. Right-of-Way: Clearing, Erosion, Appearance, Intrusions	N/A
b. Physical Condition: Structure, Conductor, Guying	N/A
c. Inspection Program and Records	N/A

3. Distribution Lines - Overhead		(Rating)
a. Inspection Program and Records		3
b. Compliance with Safety Codes:	Clearances	3
	Foreign Structures	3
	Attachments	3
c. Observed Physical Condition from Field Checking:		
	Right-of-Way	2
	Other	

4. Distribution - Underground Cable	(Rating)
a. Grounding and Corrosion Control	3
b. Surface Grading, Appearance	3
c. Riser Pole: Hazards, Guying, Condition	3

5. Distribution Line Equipment: Conditions and Records		(Rating)
a. Voltage Regulators		3
b. Sectionalizing Equipment		3
c. Distribution Transformers		3
d. Pad Mounted Equipment		
	Safety: Locking, Dead Front, Barriers	3
	Appearance: Settlement, Condition	3
	Other	
e. Kilowatt-hour and Demand Meter Reading and Testing		3

PART II. OPERATIONS and MAINTENANCE

6. Line Maintenance and Work Order Procedures		(Rating)
a. Work Planning & Scheduling		3
b. Work Backlogs:	Right-of-Way Maintenance	3
	Poles	3
	Retirement of Idle Services	3
	Other	

7. Service Interruptions

a. Average Annual Hours/Consumer by Cause (Complete for each of the previous 5 years)

PREVIOUS 5 YEARS (Year)	POWER SUPPLIER a.	MAJOR STORM b.	SCHEDULED c.	ALL OTHER d.	TOTAL e.	(Rating)
1993	0.00	15.21	0.15	1.49	16.85	2
1994	0.00	45.22	0.22	1.67	47.11	2
1995	0.14	0.47	0.02	1.50	2.13	3
1996	0.03	0.44	0.04	0.61	1.12	3
1997	0.03	0.51	0.06	1.09	1.69	3

	(Rating)
b. Emergency Restoration Plan	3

8. Power Quality	(Rating)
a. General Freedom from Complaints	3

9. Loading and Load Balance	(Rating)
a. Distribution Transformer Loading	3
b. Load Control Apparatus	N/A
c. Substation and Feeder Loading	3

10. Maps and Plant Records	(Rating)
a. Operating Maps: Accurate and Up-to-Date	3
b. Circuit Diagrams	3
c. Staking Sheets	3

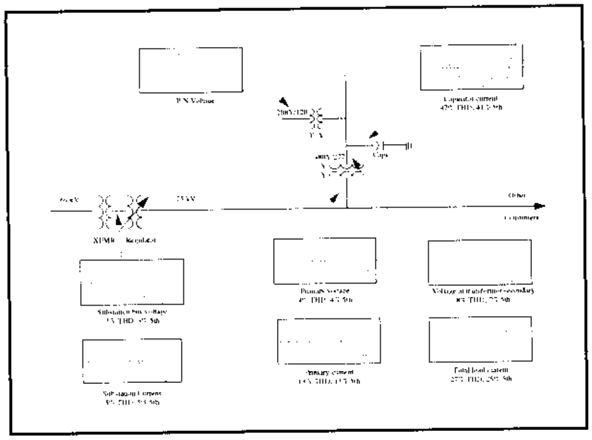
PART III. ENGINEERING

11. System Load Conditions and Losses		(Rating)
a. Annual System Losses	4.90%	3
b. Annual Load Factor	46.9%	3
c. Power Factor at Monthly Peak	98.6%	3
d. Ratios of Individual Substation Annual Peak kW to kVA		3

12. Voltage Conditions	(Rating)
a. Voltage Surveys	3
b. Substation Transformer Output Voltage Spread	3

13. Load Studies and Planning	(Rating)
a. Long Range Engineering Plan	3
b. Construction Work Plan	3
c. Sectionalizing Study	3
d. Load Data for Engineering Studies	3
e. Load Forecasting Data	3

RUS FORM 300 (2/98)


XFMR
Regulator
Caps
Other
Capacitor current
Voltage at transformer secondary
Primary current
Total load current

PART IV. OPERATION AND MAINTENANCE BUDGETS

YEAR	For Previous 2 Years		For Present Year	For Future 3 Years		
	Actual $ Thousands	Actual $ Thousands	Budget $ Thousands	Budget $ Thousands	Budget $ Thousands	Budget $ Thousands
Normal Operation	678,470	792,406	854,340	879970	906369	933560
Normal Maintenance	956,938	823,611	1,174,548	1209784	1246078	1283460
Additional (Deferred) Maintenance						
Total	$1,635,408	$1,616,017	$854,343	$2,089,755	$2,152,447	$2,217,021

14. Budgeting: Adequacy of Budgets for Needed Work 3 *(Rating)*

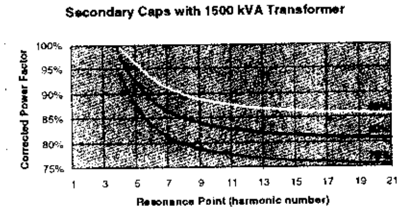
15. Date Discussed with Board of Directors 8/13/98 *(Date)*

EXPLANATORY NOTES

ITEM NO.	COMMENTS
3c	Shade trees need to be trimmed more often. Examine increasing trimming cycle in urban areas to a two year cycle.
13a & b	Studies in progress

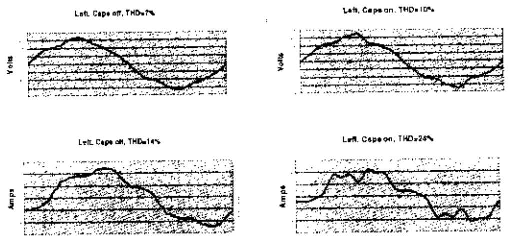
		TITLE	DATE
RATED BY:	[illegible]	ENGINEERING & OPERATIONS MANAGER	8-12-98
REVIEWED BY:	Michael L. Miller	MANAGER	8-12-98
REVIEWED BY:	[illegible]	RUS GFR	8-12-98

Effect of Power Factor Correction on System Resonance Point



- Same source as primary example
- 1,500 kVA transformer with 5.74% Z
- Results in 21 MVA sc

Results of a Resonance



A Resonance

Impedance at secondary side of transformer

	Re	Im		|Z|	Angle
Z1tot	0.8611	4.7527	pu --->	4.8301	250

Three phase bolted fault calculations

	Current	Power
Primary side of service transformer	2,439 amps	105,354 kVA
Secondary side of service transformer	24,932 amps	20,728 kVA

kVAR to Resonate

n	Pri	Sec
3	11,706	2,303
5	4,214	829
7	2,150	423
9	1,301	256
11	871	171
13	623	123
15	468	92
17	365	72