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**FIRST
ANNUAL EVALUATION REPORT
OF
PHASE III
AREA COVERAGE RURAL ELECTRIFICATION
1 JANUARY 1988 THROUGH 31 DECEMBER 1988**

TO

**RURAL ELECTRIFICATION BOARD
DHAKA, BANGLADESH**

Prepared By

**Rural Electrification Consultants to REB
NRECA International Ltd.
Gilbert Commonwealth II
Lee Wan Associates, Inc.**

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I. GENERAL

Summary - The First Annual Evaluation Report of Phase III of The Area Coverage Rural Electrification Project of the Peoples Republic of Bangladesh (GOB), the Rural Electrification Board (REB), the Palli Bidyut Samities, and their respective Members-Consumers is submitted with a great amount of respect for their participants, past and present. Outstanding accomplishments have been achieved by The Project during the past few years since the establishment of The Rural Electrification Board by Government Ordinance LI of 1977.

Some central features of the Project goals and the accomplishment of those were amply exemplified in 1988 during which the Country experienced the worst flooding of the past 40-50 years. The true characteristics of a solid Soci-Economic Infrastructure Development Project were witnessed as the ACRE Project continued to expand its electrical coverage and service to the member-consumers in spite of catastrophic floods, cyclones, and the ensuing GOB budget cuts. Further, and perhaps one of the most salient facts that can be mentioned in this report, pertains to an element which is at the very core of the Palli Bidyut Samity (Rural Electric Society) Concept, "People banded together to provide a service that they could not attain individually and to provide that service equally to all, regardless of status". This social activity was prevalent and visible to everyone during the 1988 floods as the PBS became the focal point of many communities for life saving activities, help, and even food & water distribution to consumer-members as well as the general public in several of the flood affected PBS service areas. Of course, these PBS activities were coordinated with or in conjunction with those of the Bangladesh Government, local Governments, and other relief organizations.

More specific summary accomplishments of 1988, challenges for the Project, and recommendations will be covered in the following sections of this evaluation; however, some of those should be presented in this General Section.

The continuity of Foreign Consultancy to the Rural Electrification Board, a key element of the Project success, was perpetuated with the 1 January, 1988, execution of a new Technical Assistance Contract between the Rural Electrification Board and NRECA International Ltd. for RE Phase III, 1988 - 1991. NRECA International Ltd. will serve as the Prime Contractor, Gilbert Commonwealth II will serve as a Sub-contractor, and Lee Wan Associates, Inc.

will serve as a Sub-sub-contractor. Additional areas of expertise were also provided in the new contract to meet the increasing needs and complexity of the growing as well as operational maturing RE Project. Two of the new advisor posts were filled during 1988, a third is expected to be filled during the first quarter of 1989, and at least one of the short-term advisors is expected to be on the Project during the first half of 1989.

The Technical Assistance Contractor sponsored U. S. training of REB and PBS personnel continued with six week training periods for four REB and four PBS personnel. In addition, a twenty day advanced level training course for Rural Electrification CEOs was attended by the Chairman of REB in November, 1988.

Donor support continued for RE Phase III with commitments from U.S. AID, IDA, FINNIDA, CIDA and SFD. Toward RE Phase IV, REB prepared the initial Draft FR and received approval from GOB for additional RE coverage in 110 new Uplazallas.

An in-depth study of the Financial Viability of the PBSs and REB, initiated in 1987 by U.S. AID, was finalized during the year by Coopers & Lybrand following many, many, hours of dedicated work and cooperation between REB, NRECA, and Coopers & Lybrand. The Final Report should prove to be a useful management and planning tool for GOB, REB, and the PBSs if it is taken seriously and used properly.

Select summary areas of growth of the RE Project during 1988 are as follows, supported by detail throughout the Evaluation.

	EOY	
	<u>1987</u>	<u>1988</u>
No. PBSs delivering electricity	32	33
No. PBSs in development	5	6
No. of Meters Installed (000's)	298.3	360.3
Kilometers-Energized Line (000's)	22.7	28.4
Giga-Watt Hours Billed	260.6	313.8
Taka Revenue (000,000's)	551.3	767.7

The RE Project is not without various challenges or problem areas which need to be met by REB and the RE Project in order to sustain the rather unprecedented growth exhibited above and to continue to meet the goals &

objectives envisioned at the start of the Project. This Evaluation would rather offer possible recommendations for the RE Project instead of highlighting problems. Further, the recommendations will show the trend emphasis of the Consultant toward qualifying Project results in addition to quantifying those results.

RECOMMENDATIONS

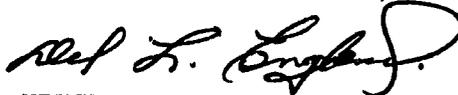
- A. Improved power supply, both quantity & reliability, including improved transmission grid and voltage.
- B. GOB needs to enforce the RE Ordinance LI 1977 with the hand-over of PDB lines to REB & PBSs.
- C. GOB should, as a minimum, fulfill the REB local currency budget request in order to provide the matching portion to Donor commodity values flowing into the Project.
- D. Improvement must be accomplished in the selection and training process of REB & PBS officers and employees with emphasis upon quality, professional expertise, modern management techniques, RE Concept knowledge or the desire to learn same, and a sincere dedication for service to the Project.
- E. Thorough utility analysis & planning, i.e. Long-Range, Medium-Range, and Short-Term Work & Financial Plans, must become a part of the SOPs.
- F. A REB Headquarters complex must be started in 1989 to prevent a further decline in overall efficiency, most specifically in the training requirements.
- G. Increased emphasis must be placed upon Member Services/Power Use/Public Relations. Member education and understanding of the RE Concept must be increased to ensure the practice of the Democratic Principles at the PBS grass roots.
- H. Improved accountability via "Current Day" record keeping practices and reconciliations in all spheres of the Project via what ever means necessary including but not limited to computerized data processing.
- I. All Project personnel must realize the Project has grown and matured beyond the rather simple construction mode of the past and is now a large operating utility with new and more complex conditions.

J. As a large operating utility, advanced management skills, communications, policies, and procedures must be learned, practiced, and/or updated so that management may "Act" rather than "Re-Act".

In conclusion, we must state that the above recommendations are meant to Constructive Recommendations. We believe the Rural Electrification Board and the RE Project has attained unprecedented accomplishment and success in Bangladesh. We feel honored to have been a part of that success and will assist in every way possible to the continued success of Area Coverage Rural Electrification (ACRE).

We must also state our appreciation to GOB, REB, PBSs, and all Donors for their support of the Consultant during 1988.

Respectfully submitted,



NRECA International Ltd.

Del L. England, Team Leader

II. INSTITUTIONAL DEVELOPMENT

Summary - There were 720 additional villages electrified during 1988 bringing the total number of villages electrified to 6,342. A village averages approximately 45 domestic consumers and 56 total consumers. There are thirty three (33) Paili Bidyut Samities (PBSs) operating with six (6) additional in various stages of construction.

System losses continue to increase with a total of 76,127 MWH hours in total system losses in 1988 compared with 62,216 MWH losses in 1987. The average percentage of system losses increased from 18.0% in 1987 to 20.3% 1988. During 1988 total consumption increased by 20.4%. Consumption by class of consumer increased during 1988 as follow:

Irrigation	34.0%
Domestic	21.4%
Ind/Com.	16.4%

Consumption by class of consumer was as follows:

	<u>MWH</u>	<u>Percentage</u>
Ind/Com.	Tk. 175,101	55.8%
Domestic	86,244	27.5%
Irrigation	52,413	16.7%
	<hr/>	<hr/>
	Tk. 313,758	100.%
	=====	=====

The total revenue increased by 39.3% during 1988 while total costs of electric services increased by 23.4%. There was an overall deficit of Tk.20,116,295 for 1988 compared with Tk. 87,268,695 for 1987.

Administration & General Expense, Consumer Billing and sales expense, and Operation and Maintenance Expense were setup in quartiles to determine the highs and lows of per consumer expenses and per kilometer expenses. In most cases the older more mature PBSs showed the lower cost; the newer PBSs showed the higher per consumer and per kilometer cost. This indicates the economy of scale.

Recommendations - A uniform numbering system should be used by all Directorates that is easily understood and expandable. Divisions in Bangladesh should be used in the numbering scheme. The Donor Agency must also be included in the number for easy identification. Dhaka PBS will be identified thus: "1U01". Dhaka Division is numbered "1", the Donor is "U" for USAID and "01" is to identify Dhaka PBS as the "first" Samity created.

Lakshmipur PBS is identified as "2139". It is located in Chittagong Division "2" the Donor is International Development Agency (IDA) "I" and the "39" is to sequence the PBS as the 39th to be created. Further utilization of this scheme can easily be continued with substations, feeders out of the substation and even the phases of the feeder.

Three (3) PBSs, Pirojpur, Jamalpur and Chittagong II should be reviewed to determine if they have reported no new villages electrified properly or if they simply are not growing as a newer PRS would normally because of other problems.

Key Performance Targets must be developed for the PBSs for a more effective cost control. Revenue requirements can hardly be developed before costs are controlled.

Emphasis should be placed on the monitoring of Mymensingh, Rangpur-I and Chandpur PBSs as they are among those that show deteriorating margins or increased net losses this quarter. Tangail and Satkhira also show worsening conditions, corrective action has been initiated and needs to be continued.

Continued emphasis must be placed on the high percentage of system losses. Industrial meters must be constantly monitored. Illegal connections and by-passed meters simply must not be tolerated. A monitoring of Natore II and Rangpur II should be made immediately, as they are among the PBSs that have system losses increasing with no obvious explanation.

The many changes in leadership at the PBSs should be more closely monitored for better training opportunities. A GM or AGM should not be placed at a PBS without a follow-up visit frequently.

The many changes in Deputy or Assistant Director positions should also be monitored to see if proper training and orientation is available and used.

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Annual Workplans must be developed in the Directorates in order that all Samities are given the attention needed for a smoother operating Rural Electric coverage of Bangladesh.

Regular meetings must be scheduled in the Directorates to review, correct and plan better.

A. Graph Analysis

In this first evaluation report of Area Coverage Rural Electrification, Phase III, we are presenting graphs and analyses that show the growth patterns and key performances or problem areas on an annual basis. We have shown similar graphs and analyses in the quarterly reports on a quarterly basis.

The data for the graphs are taken from the REB Form 550, Financial and Statistical Report. The charts are prepared from the data tables shown below the charts or on the subsequent pages.

1. Number of Villages Electrified

During the calendar year 1988, the 33 Palli Bidyut Samities (PBSs) electrified an additional 720 villages bringing the total number of villages electrified to 6,342. A village averages approximately 45 domestic consumers and 56 total consumers. PBSs having the largest number of villages electrified are Habiganj, Comilla, Dhaka, and Chandpur. These PBSs quite naturally have the largest number of total consumers. Chittagong I and II have the fewest number of villages electrified, but it should be noted that their total of 49 villages average approximately 200 consumers which, on the average are larger than the villages in the other PBSs.

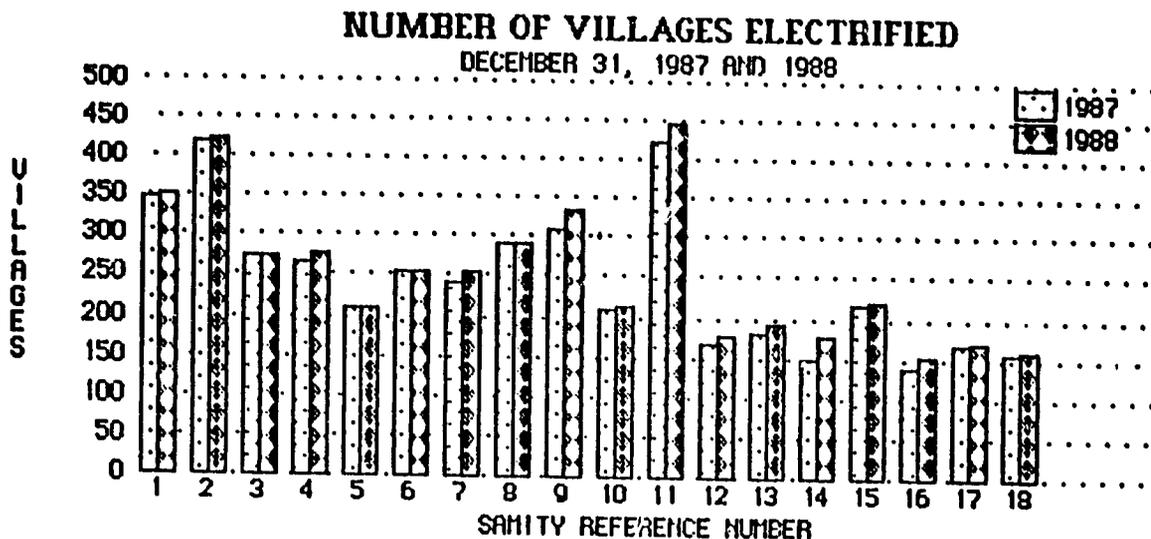
Bogra PBS had the largest increase of 86 percent from 123 to 229 villages during the year.

The accompanying table with this graph provides much more consumer data and could be used by the reader in examining other graphs.

2. Mega-Watt-Hours Purchased, Billed and System MWH Losses

The significance of showing these three charts is that the difference between MWH purchased and MWH billed provides the MWH system loss. During 1988 389,885 MWH were purchased and 313,758 MWH were billed leaving a 76,127 MWH

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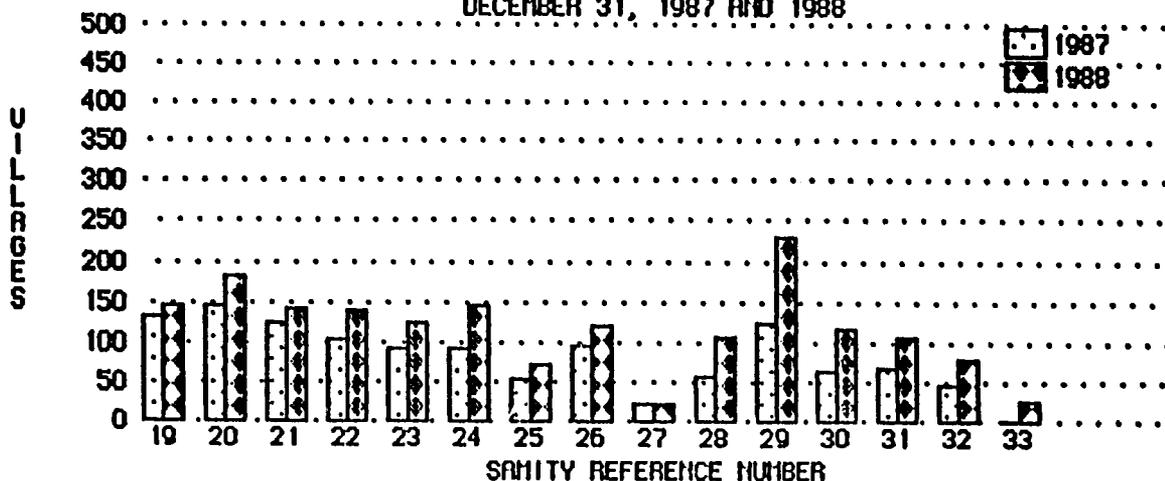


REF. NO.	SAMITY	NUMBER OF CONNECTIONS BY CLASS OF CONSUMER								TOTAL	KM LINE	CON /KM	12/87	12/88
		DCM	COM'L	DTW	STW	LLP	GP-A	GP-B	ST.LT.				ELEC VLGs	ELEC VLGs
1	DHAKA	19,820	1,902	276	313	182	643	38	145	23,319	1,162	20	347	352
2	COMILLA	17,490	4,249	126	247	225	707	12	164	23,220	1,304	18	417	423
3	JESSORE II	11,558	3,789	42	486	29	248	9	171	16,332	926	18	272	273
4	NATORE I	11,207	1,842	103	880	92	323	3	152	14,602	966	15	265	278
5	SIRAJGONJ	10,668	2,535	120	830	101	368	20	215	14,857	831	18	209	209
6	MOULVIBAZAR	12,169	2,320	0	18	0	280	32	208	15,027	742	20	256	256
7	JESSORE I	11,234	4,360	180	422	42	277	8	129	16,652	727	23	241	254
8	TANGAIL	13,182	1,716	280	1,141	59	392	11	71	16,852	1,342	13	292	292
9	CHANDPUR	14,471	3,996	28	8	190	346	10	103	19,152	967	20	308	334
10	NATORE II	12,770	2,596	59	492	15	304	15	146	16,397	941	17	209	214
11	HABIGONJ	12,981	2,656	47	71	20	268	9	178	16,230	816	20	423	447
12	PAENA II	9,463	2,011	25	253	11	170	10	132	12,075	650	19	167	178
13	PAENA I	7,906	1,689	72	567	9	157	19	198	10,617	689	15	180	190
14	SATKHIRA	7,835	2,046	51	313	0	201	0	128	10,574	663	16	148	178
15	FENI	11,256	2,716	20	91	134	233	4	126	14,580	801	18	217	220
16	MYMENSINGH	6,821	960	179	9	0	146	5	82	8,202	997	8	138	152
17	RANGPUR I	5,888	2,328	109	197	23	276	13	62	8,896	690	13	167	171
18	DINAJPUR	6,857	1,130	92	267	19	287	14	54	8,720	702	12	156	161

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NUMBER OF VILLAGES ELECTRIFIED

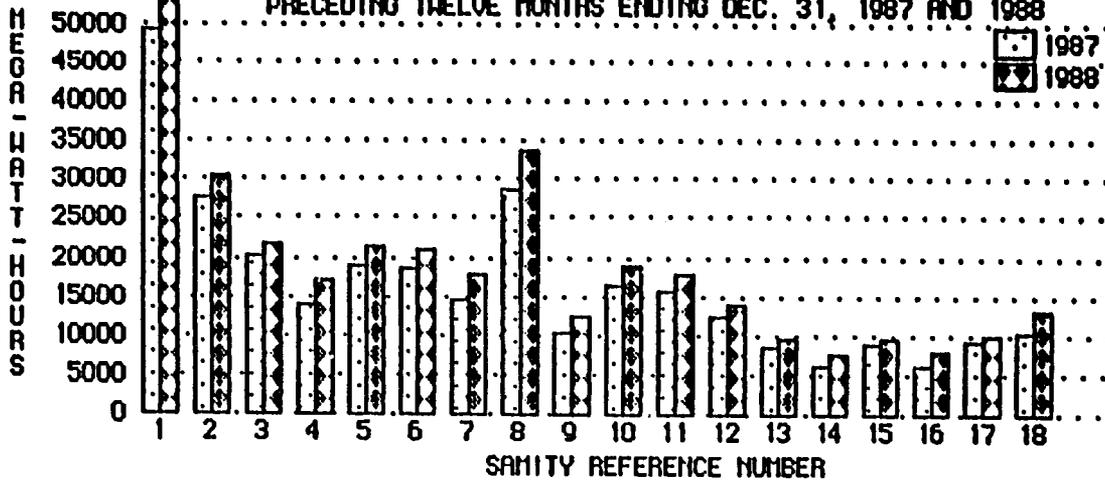
DECEMBER 31, 1987 AND 1988



REF. NO.	SANITARY	NUMBER OF CONNECTIONS BY CLASS OF CONSUMER								TOTAL	KM LINE	CON /KM	12/87	12/88
		DGM	COM'L	DTW	STW	LLP	GP-A	GP-B	ST.LT.				ELEC VLGs	ELEC VLGs
19	KUSHTIA	7,473	630	9	41	83	145	3	41	8,425	507	17	130	146
20	MADARIPUR	6,546	1,066	1	195	73	160	5	118	8,164	465	18	144	181
21	BARISAL I	5,628	1,236	0	0	11	93	4	72	7,044	584	12	123	141
22	JOYPURHAT	4,697	292	65	108	0	114	1	0	5,277	455	12	102	139
23	BAGERHAT	5,307	792	0	0	2	85	10	32	6,228	530	12	91	124
24	RANGPUR II	6,377	746	14	25	36	155	3	23	7,379	893	8	93	147
25	PIROJPUR	2,688	383	0	0	1	69	2	39	3,182	261	12	53	72
26	JAMALPUR	4,677	441	30	211	3	79	0	21	5,462	586	9	95	121
27	CHITTAGONG II	6,409	497	1	1	2	1	4	7	6,922	316	22	22	23
28	THAKURGADN	3,713	292	44	14	3	55	2	2	4,125	778	5	57	108
29	BOGRA	9,241	241	78	286	0	146	0	8	10,000	727	14	123	229
30	NARSINGDI I	3,972	400	20	35	3	26	2	11	4,469	270	17	64	118
31	NOAKHALI	7,876	597	2	2	2	51	0	21	8,551	553	15	68	108
32	MEHERPUR	5,600	160	23	15	6	43	1	8	5,856	477	12	45	77
33	CHITTAGONG I	2,659	192	0	0	0	12	0	6	2,869	334	9	0	26
TOTALS		286,439	52,806	2,096	7,538	1,376	6,860	269	2,873	360,257	23,652	15	5,622	6,342
ARITHMETIC MEAN 12/31/87		8,680	1,600	64	228	42	208	8	87	10,917	717	15	170	192
TOTAL		235,132	45,821	1,698	5,591	1,206	6,175		2,674	298,297				
PERCENTAGE INCREASE		21.8%	15.2%	23.4%	34.8%	14.1%	18.4%		7.4%	20.8%				

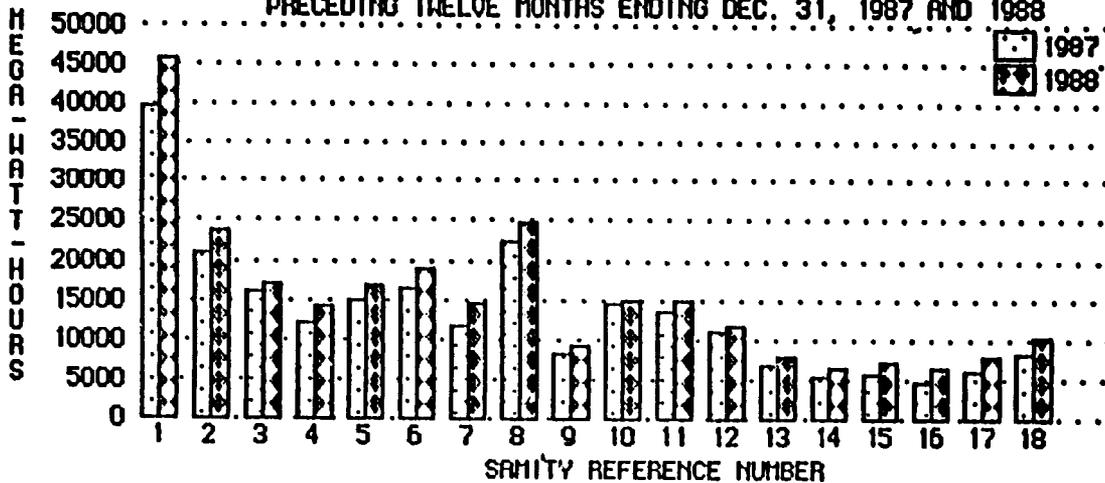
MEGA-WATT-HOURS PURCHASED

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



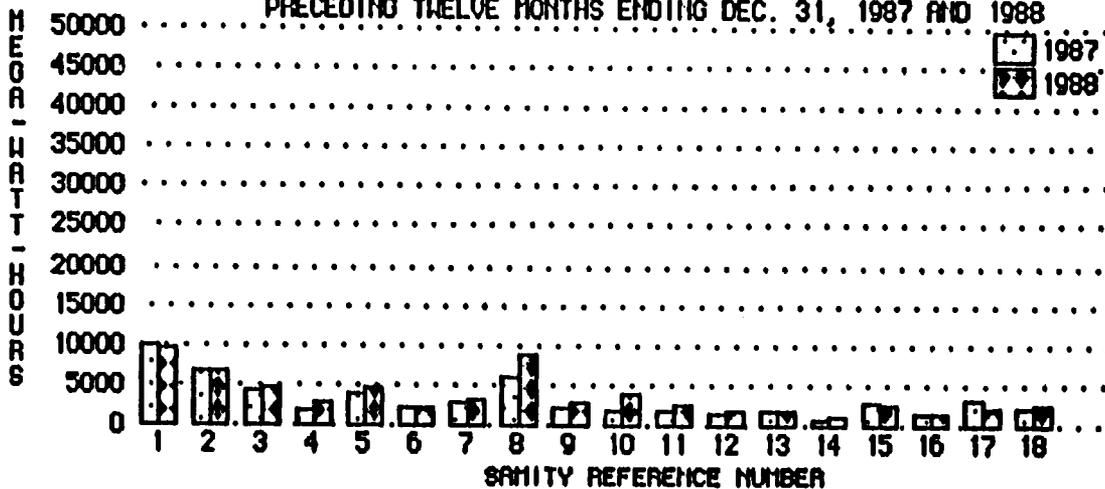
MEGA-WATT-HOURS BILLED

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



MEGA-WATT-HOURS SYSTEM LOSS

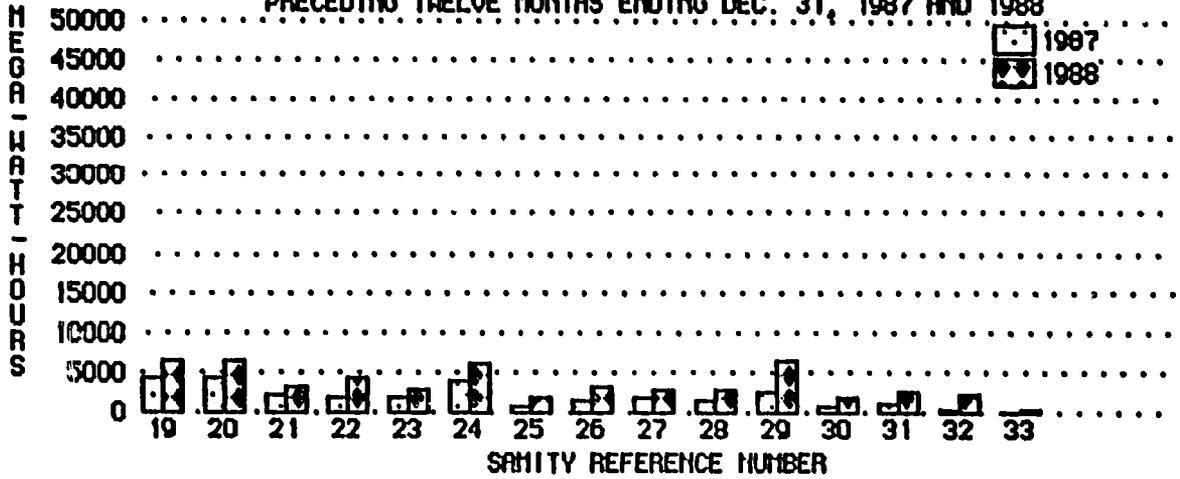
PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



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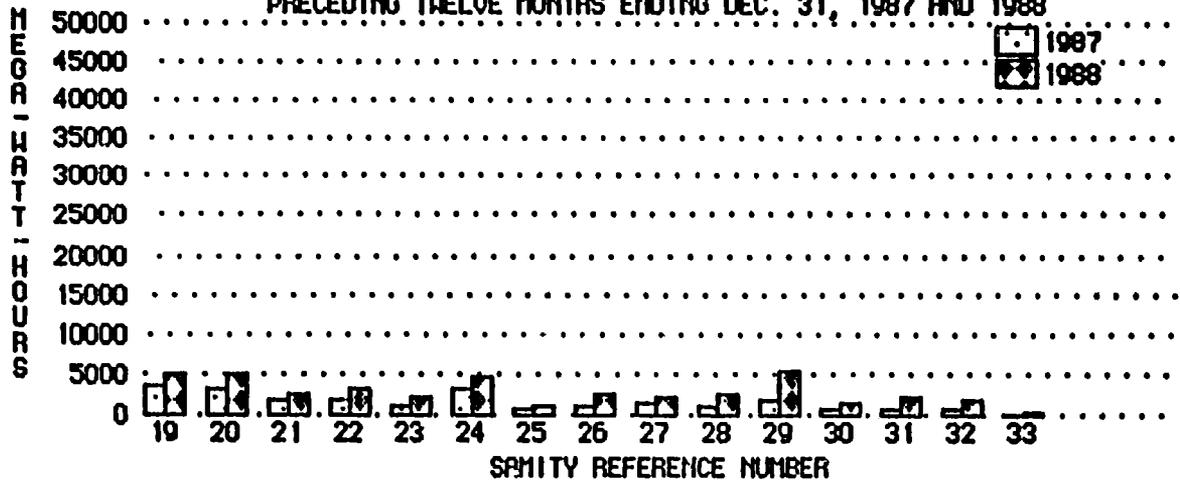
MEGA-WATT-HOURS PURCHASED

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



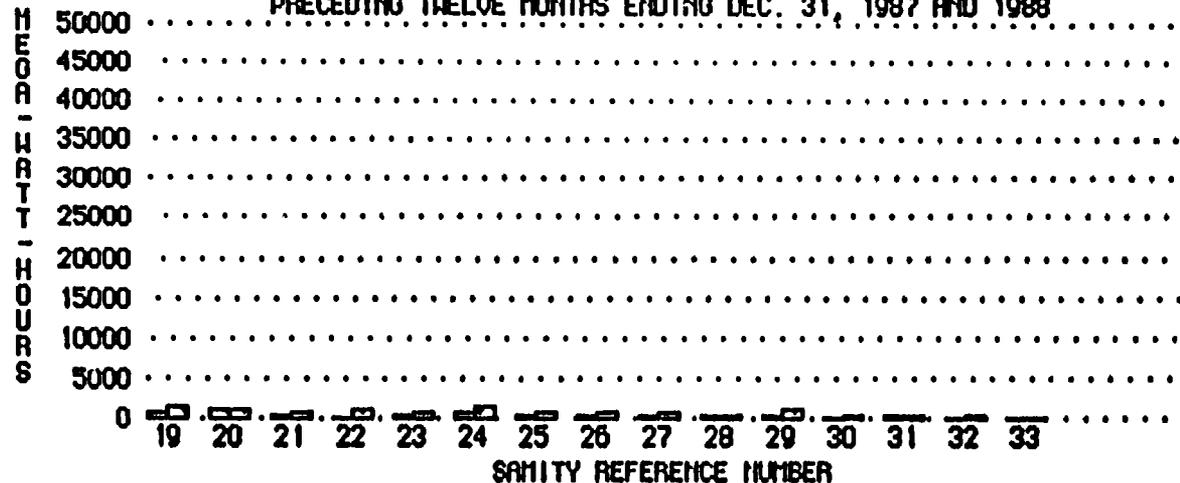
MEGA-WATT-HOURS BILLED

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



MEGA-WATT-HOURS SYSTEM LOSS

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



13

REF. NO.	SAMITY	1987 MJH PURCHASED	1988 MJH PURCHASED	1987 MJH BILLED	1988 MJH BILLED	1987 MJH LOSS	1988 MJH LOSS	1987 SYS LOSS	1988 SYS LOSS
1U01	DHAKA	49,449	55,099	39594	45,635	9,855	9,464	19.9%	17.2%
2U02	COMILLA	27,672	30,544	20854	23,788	6,818	6,756	24.6%	22.1%
3U03	JESSORE II	20,312	21,665	16017	17,099	4,295	4,566	21.1%	21.1%
4U04	NATORE I	13,787	16,924	11958	14,008	1,829	2,916	13.3%	17.2%
4U05	SIRAJGANJ	18,733	21,174	14868	16,739	3,865	4,435	20.6%	20.9%
2U06	MOULVIBAZAR	18,388	21,098	16345	18,835	2,043	2,263	11.1%	10.7%
3U07	JESSORE I	14,478	17,621	11684	14,506	2,794	3,115	19.3%	17.7%
1U08	TANGAIL	28,674	33,592	22497	24,803	6,177	8,789	21.5%	26.2%
2U09	CHANDPUR	10,302	12,244	8286	9,358	2,016	2,886	19.6%	23.6%
4U10	NATORE II	16,254	18,857	14580	15,068	1,674	3,789	10.3%	20.1%
2U11	HABIGANJ	15,567	17,642	13621	15,057	1,946	2,585	12.5%	14.7%
4U12	PAENA II	12,298	13,678	10835	11,858	1,463	1,820	11.9%	13.3%
4U13	PAENA I	8,577	9,415	6733	7,675	1,844	1,740	21.5%	18.5%
3K14	SATHKIRA	5,885	7,541	5244	6,412	641	1,129	10.9%	15.0%
2K15	FENI	8,728	9,476	5848	7,074	2,880	2,402	33.0%	25.3%
1K16	MYMENSINGH	6,015	7,692	4523	6,206	1,492	1,486	24.8%	19.3%
4K17	RANGPUR I	9,265	9,832	6160	7,738	3,105	2,094	33.5%	21.3%
4K18	DINAJPUR	10,409	12,964	8220	10,368	2,189	2,596	21.0%	20.0%
3K19	KUSHTIA	4,352	6,309	3550	4,810	802	1,499	18.4%	23.8%
3I20	MADARIPUR	4,380	6,277	3367	5,082	1,013	1,195	23.1%	19.0%
3I21	BARISAL	2,157	3,087	1809	2,507	348	580	16.1%	18.8%
4K22	JOYPURHAT	1,876	4,129	1832	3,092	44	1,037	2.3%	25.1%
3I23	BAGERHAT	1,644	2,995	1223	2,246	421	749	25.6%	25.0%
4U24	RANGPUR II	3,862	5,940	3197	4,466	665	1,474	17.2%	24.8%
3K25	PIROJPUR	848	1,635	570	1,028	278	607	32.8%	37.1%
1U26	JAMALPUR	1,399	3,289	1057	2,652	342	637	24.4%	19.4%
2I27	CHITTAGONG II	1,625	3,000	1255	2,295	370	705	22.8%	23.5%
4F28	THAKURGAON	1,332	2,837	1046	2,473	286	364	21.5%	12.8%
4U29	BOGRA	2,409	6,363	1933	5,182	476	1,181	19.8%	18.6%
1I30	NARSINGDI I	708	1,889	565	1,587	143	302	20.2%	16.0%
2I31	NOAKHALI	937	2,341	717	1,958	220	383	23.5%	16.4%
3I32	MEHERPUR	510	2,249	628	1,788	(118)	461	-23.1%	20.5%
3U33	CHITTAGONG I	0	487	0	365	0	122		25.1%
TOTALS		322,832	389,885	260,616	313,758	62,216	76,127	19.3%	19.5%
ARITHMETIC MEAN		10,088	11,815	8,144	9,508	1,944	2,307	18.0%	20.3%

loss or 19.5 percent total system loss. This compares to 1987 with 322,832, 260,616, 62,216 and 19.3 percent respectively.

Tangail was the highest of the total MWH loss and Moulvibazar was the lowest.

In addition to the charts showing the total MWH loss, there is a chart entitled "Annual Percent System Loss"; this chart will be discussed later in this section on graph analysis.

3. Mega-Watt Hours Billed By Consumer Class

There are three charts showing the total MWH billed by consumer class. These are shown by, (1) Domestic Consumers, (2) Irrigation Consumers, and (3) Industrial/Commercial Consumers.

As would be expected, the Industrial/Commercial loads represent the largest class of MWH consumption. For 1988 the Industrial/Commercial load represents 55.8 percent of the total consumption. Most of the PBSs showed an increase in MWH billed to Industrial/Commercial consumers during 1988. For all of the PBSs there was a 16 percent increase over 1987 in this class.

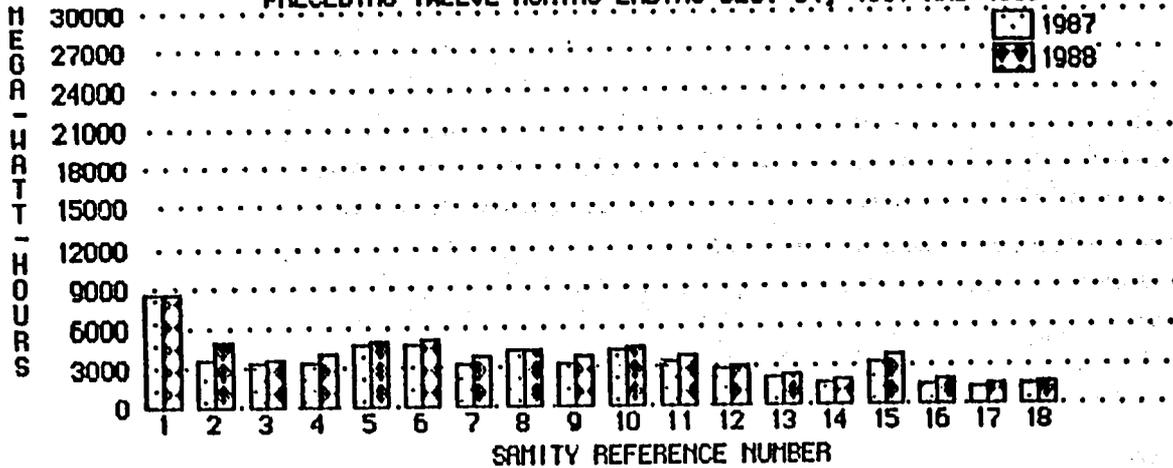
Dhaka PBS had a 27 percent increase during 1988. The top five Industrial loads are, (1) Dhaka, (2) Comilla, (3) Moulvibazar, (4) Tangail, and (5) Jessore II. These PBSs lead in sales because of the Industrial/Commercial loads.

The Domestic MWH billed during 1988 represented 27.5 percent of total sales of all PBSs. This was a slight increase over 1987. It is possible that the flood and extreme wind in late November, both of which caused damage, contributed to the very slight increase in sales in spite of consumer growth.

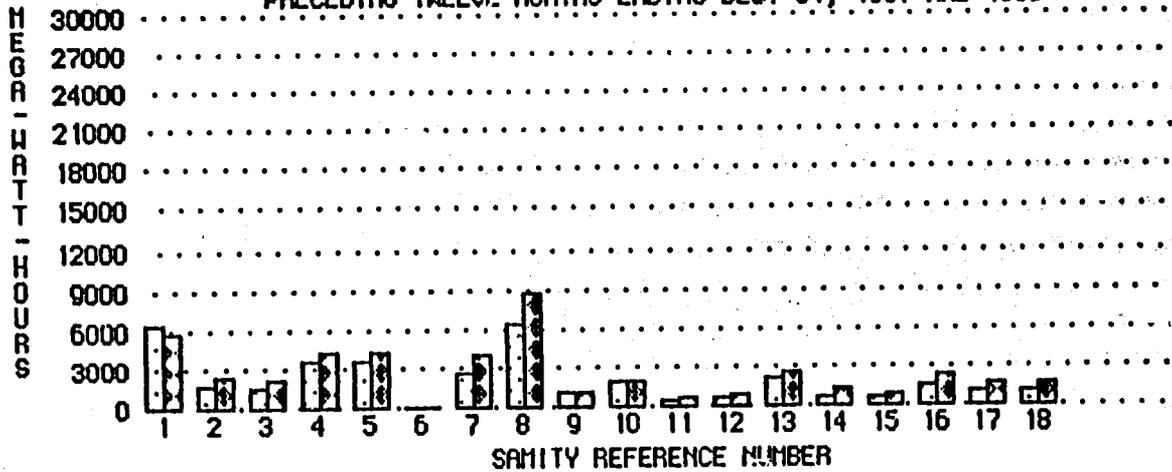
Irrigation sales accounted for 16.7 percent of total sales during 1988. Irrigation sales increased 38 percent at Tangail during 1988 over 1987. This class consumer is the second largest class of for Tangail falling shortly behind Industrial/Commercial which is first. Only 15 PBSs have irrigation sales exceeding 1000 MWH of sales during 1988.

Irrigation sales are a seasonal type load and peak during the dry winter months. This class of sale increased in total during 1988 by 34 percent over the sales in 1987.

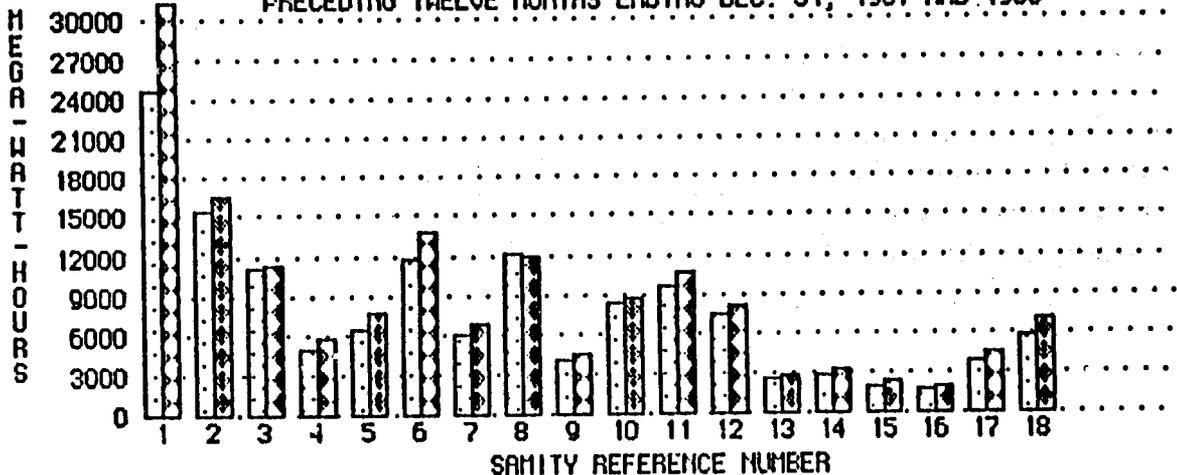
MEGA-WATT-HOURS BILLED TO DOMESTIC CONSUMERS
 PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



MEGA-WATT-HOURS BILLED TO IRRIGATION CONSUMERS
 PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



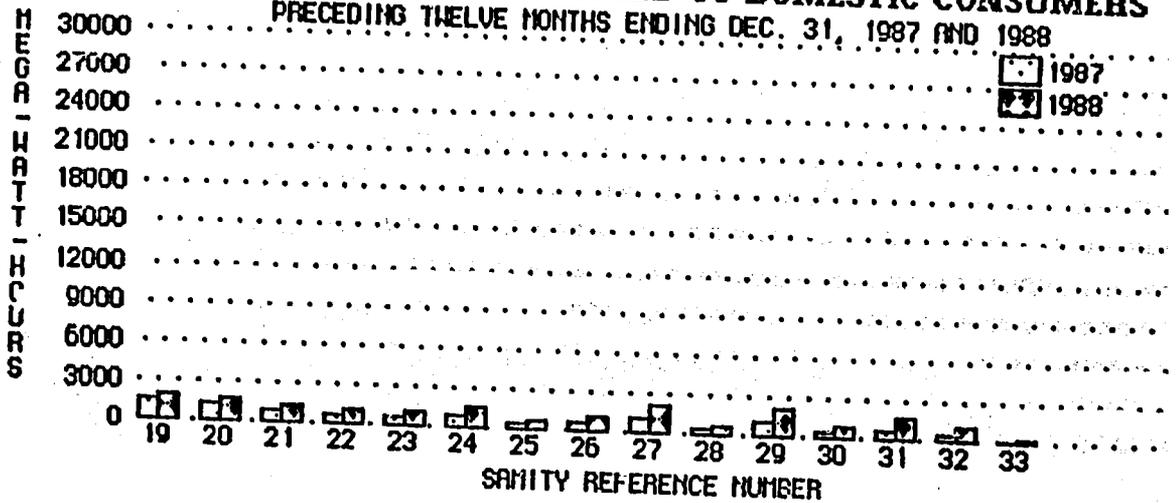
MEGA-WATT-HOURS BILLED TO IND/COMMERCIAL CONSUMERS
 PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



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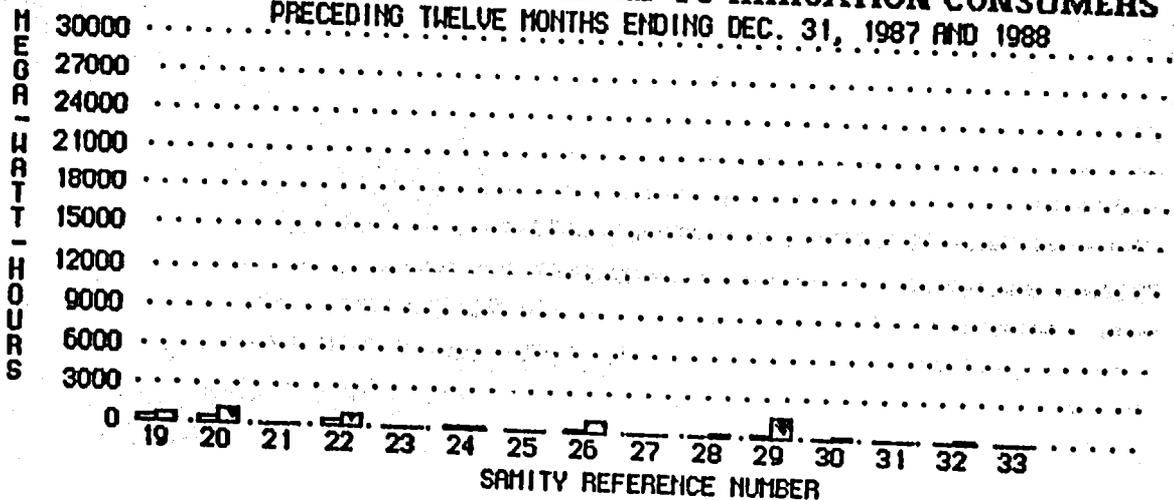
MEGA-WATT-HOURS BILLED TO DOMESTIC CONSUMERS

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



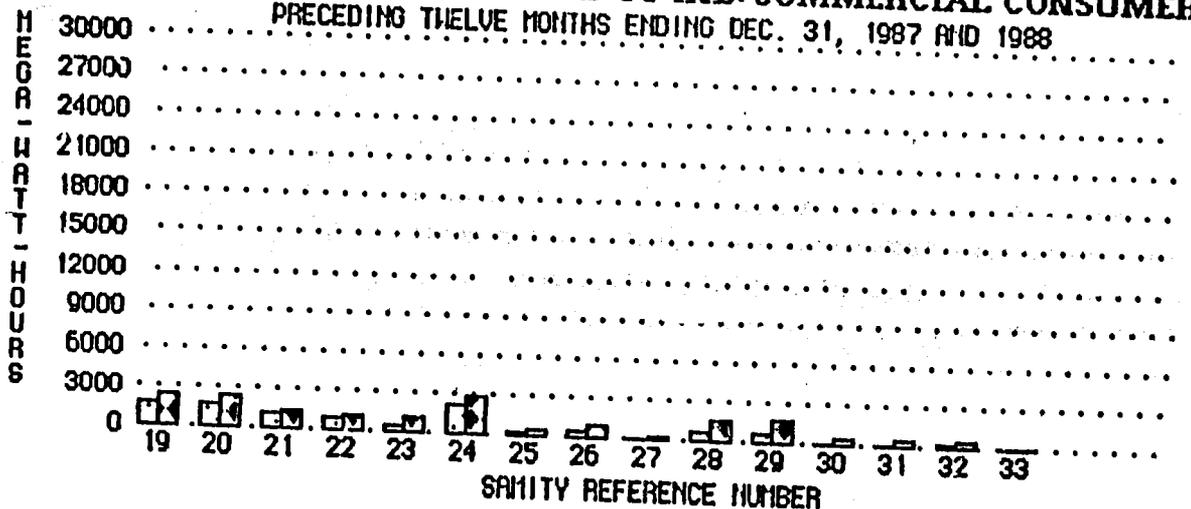
MEGA-WATT-HOURS BILLED TO IRRIGATION CONSUMERS

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



MEGA-WATT-HOURS BILLED TO IND/COMMERCIAL CONSUMERS

PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



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REF NO.	SAMITY	1987 DMESTIC	1988 DMESTIC	1987 IRRIG	1988 IRRIG	1987 IND/COM	1988 IND/COM	1987 TOTAL	1988 TOTAL
1	DHAKA	8,311	8,501	6,469	5,815	24,594	31,319	39,594	45,635
2	COMILLA	3,099	4,948	1,672	2,338	15,563	16,502	20,854	23,788
3	JESSORE II	3,012	3,694	1,519	2,120	11,016	11,285	16,017	17,099
4	NATORE I	3,356	4,080	3,701	4,218	4,901	5,710	11,958	14,008
5	SIRAJGANJ	4,751	4,865	3,715	4,208	6,402	7,666	14,868	16,739
6	MOULVIBAZAR	4,606	5,010	2	10	11,737	13,815	16,345	18,835
7	JESSORE I	3,138	3,748	2,606	4,031	5,940	6,727	11,684	14,506
8	TANGAIL	4,158	4,255	6,288	8,676	12,051	11,872	22,497	24,803
9	CHANDPUR	3,146	3,850	1,043	1,097	4,097	4,411	8,286	9,358
10	NATORE II	4,212	4,445	2,015	2,000	8,353	8,623	14,580	15,068
11	HABIGANJ	3,463	3,798	487	629	9,671	10,630	13,621	15,057
12	PABNA II	2,813	2,982	625	882	7,397	7,994	10,835	11,858
13	PABNA I	2,130	2,271	2,026	2,654	2,577	2,750	6,733	7,675
14	SATHKIRA	1,697	1,919	744	1,243	2,803	3,250	5,244	6,412
15	FENI	3,268	3,821	613	855	1,967	2,398	5,848	7,074
16	MYMENSINGH	1,474	1,853	1,402	2,377	1,647	1,976	4,523	6,206
17	RANGPUR I	1,345	1,526	1,007	1,802	3,808	4,410	6,160	7,738
18	DINAJPUR	1,457	1,753	1,043	1,610	5,720	7,005	8,220	10,368
19	KUSHTIA	1,429	1,941	473	572	1,648	2,297	3,550	4,810
20	MADARIPUR	1,214	1,746	368	981	1,786	2,355	3,368	5,082
21	BARISAL	766	1,223	9	29	1,034	1,255	1,809	2,507
22	JOYPURHAT	641	1,035	409	912	783	1,145	1,833	3,092
23	BAGERHAT	715	1,108	0	1	508	1,137	1,223	2,246
24	RANGPUR II	888	1,505	167	292	2,142	2,669	3,197	4,466
25	PIROJPUR	339	570	1	0	229	458	569	1,028
26	JAMALPUR	569	978	143	906	345	768	1,057	2,652
27	CHITTAGONG II	1,145	2,123	4	17	106	155	1,255	2,295
28	THAKURGAON	323	712	98	241	624	1,520	1,045	2,473
29	BOGRA	989	2,054	316	1,417	628	1,711	1,933	5,182
30	NARSINGDI I	380	952	86	252	99	383	565	1,587
31	NOAKHALI	638	1,627	0	9	79	322	717	1,958
32	MEHERPUR	385	1,060	73	219	171	509	629	1,788
33	CHITTAGONG I	0	291	0	0	0	74	0	365
TOTALS		71,067	86,244	39,124	52,413	150,426	175,101	260,617	313,758
ARITHMETIC MEAN		2,221	2,613	1,223	1,588	4,701	5,306	8,144	9,508
PERCENT INC FROM DEC 1987			21.4%		34.0%		16.4%		20.4%
PERCENTAGE OF CONSUMPTION		27.3%	27.5%	15.0%	16.7%	57.7%	55.8%	100.0%	100.0%

4. Total Cost of Electric Service and Total Revenue

These bar charts provide us with a comparison of total cost of electric service, total revenue and total margins (losses) for the years 1988 and 1987.

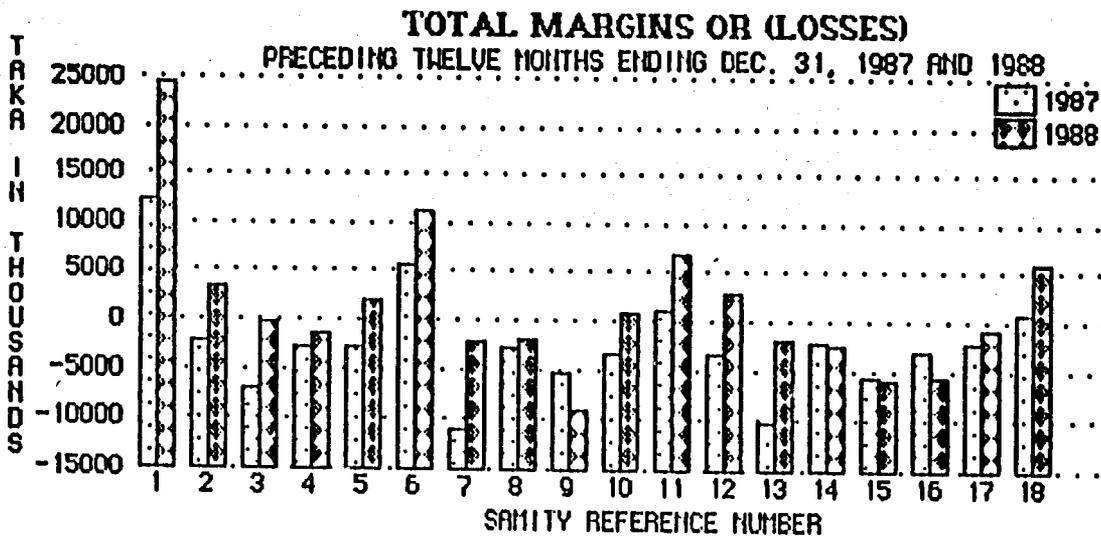
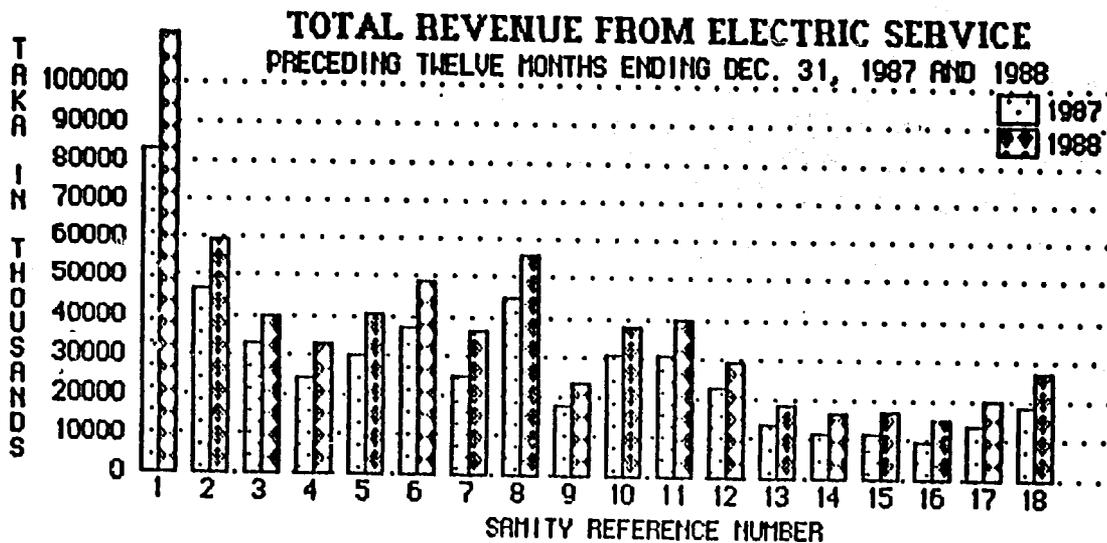
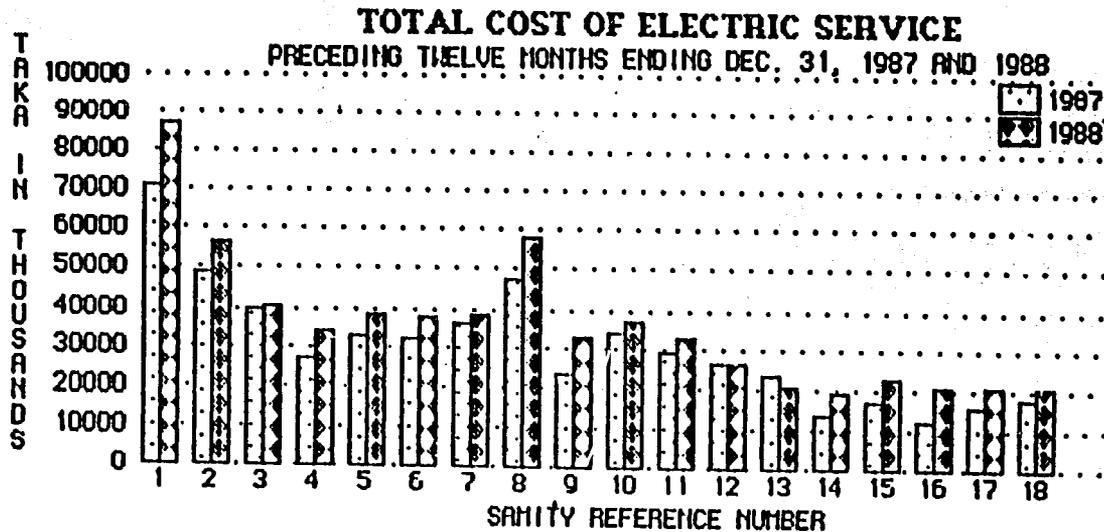
While the amount of margins produced by a PBS is not always the best indicator of the type of operation it has, it is a good analytical tool in evaluating the overall management efficiency. There are two ways of increasing margins. These are, (1) increase in revenue and, (2) decrease in expense. As a general rule, the efficiency of scale in a PBS means that the cost per consumer goes down as more consumers are added and revenue per consumer goes up. The first five PBSs to increase their margins during 1988 were, (1) Dhaka, Tk. 12,374,222; (2) Jessore I, Tk. 8,918,560; (3) Pabna I, Tk. 8,096,430; (4) Jessore II, Tk. 6,828,845; and (5) Pabna II, Tk. 6,322,077. These PBSs increased margins by increasing revenue and holding expenses in check. Two of these actually had a decrease in total electric expenses, Pabna I, by Tk. 2,834,413 and Pabna II by Tk 27,523.

Tangail increased revenue by Tk. 11,285,959 or 25.3 percent, but they also increased total electric costs by Tk. 10,534,773 or 43.4 percent. Their margins increased by Tk. 751,186 or 27.3 percent which was the lowest increase for the older established PBSs.

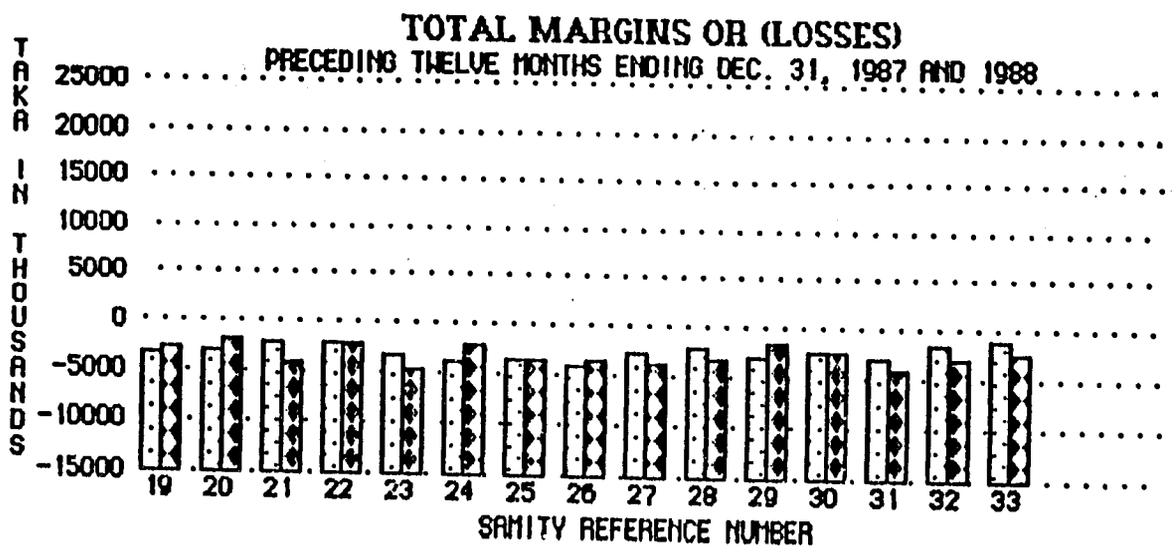
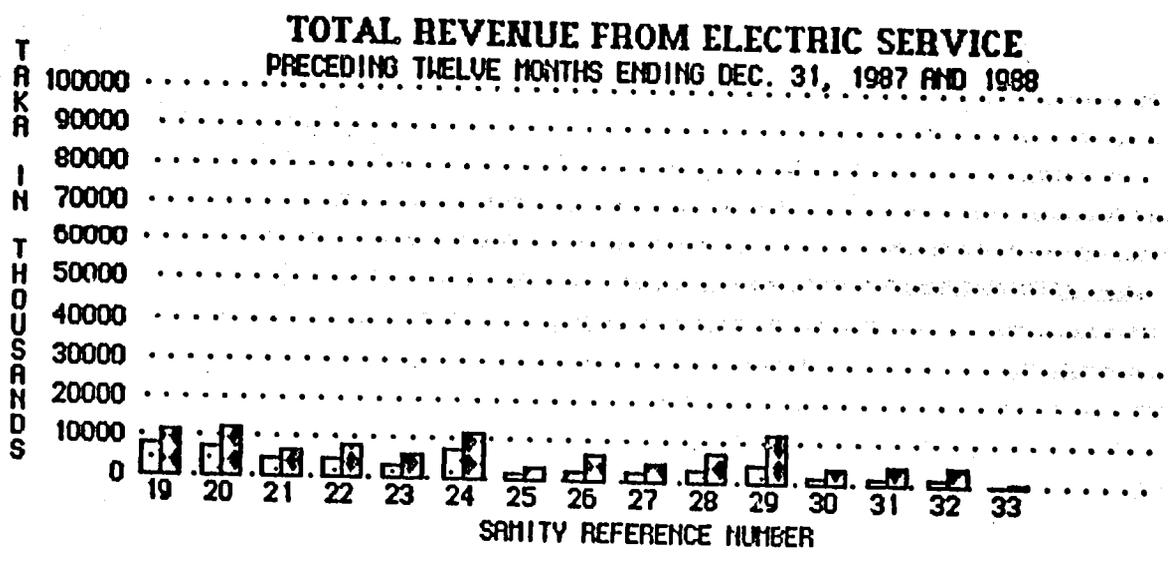
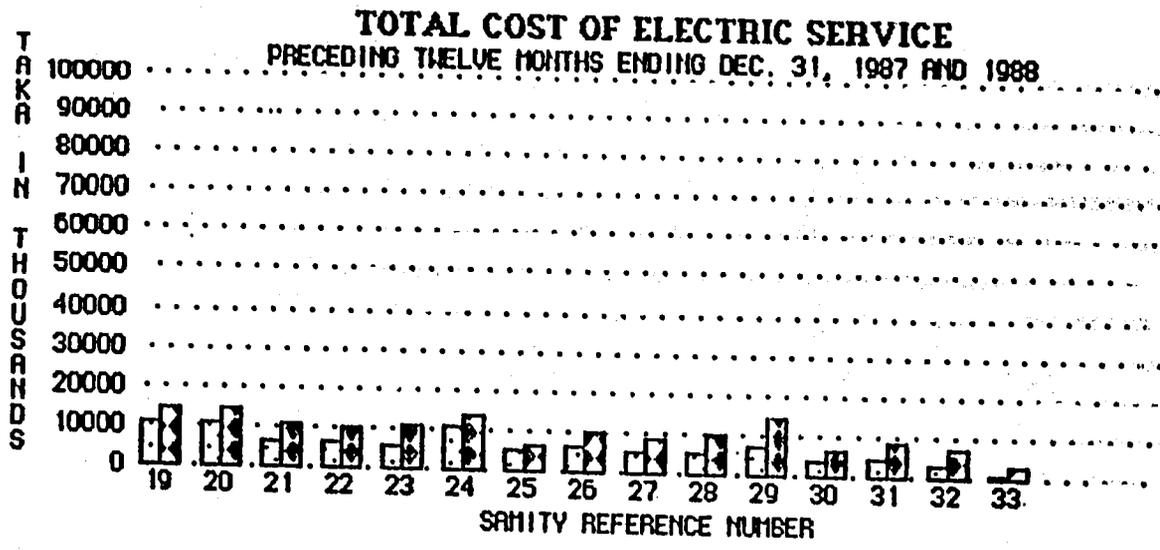
The total of all of the PBSs had an increase in revenue of Tk. 216,413,750: an increase in cost of electric service of Tk. 149,261,350, leaving a net increase in total margins of Tk. 67,152,400. During 1988, many of the PBSs were effected by the flood in August and September and by the cyclone in November. These natural disasters decreased revenue by causing outages and increased costs by requiring service to be restored. We do not have the total figures of the actual costs of these disasters but believe them to have had a substantial impact on net margins for 1988.

5. Annual Percent System Losses

This chart shows the PBSs' percentage system losses from the lowest to the highest in 1988. The chart, also, shows comparisons of percentage of system losses in 1987. Moulvibazar had the lowest percentage loss during 1988, 10.7 percent while Pirojpur had the highest percent of system loss of 37.1 percent.



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REF. NO.	SAMITY	1987 COST	1988 COST	1987 REVENUE	1988 REVENUE	1987 MAR(LOS)	1988 MAR(LOS)
1	DHAKA	70,818,301	87,362,639	82,927,385	111,845,950	12,109,084	24,483,311
2	COMILLA	48,802,309	56,437,227	46,703,512	59,778,314	(2,098,797)	3,341,087
3	JESSORE II	39,815,133	40,141,721	32,865,518	40,020,951	(6,949,615)	(120,770)
4	NATORE I	27,016,367	34,116,593	24,116,771	32,672,602	(2,899,596)	(1,443,991)
5	SIRAJGANJ	32,915,255	38,143,348	30,007,933	40,283,487	(2,907,322)	2,140,139
6	MOULVIBAZAR	31,569,322	37,478,140	37,223,177	48,627,710	5,653,855	11,149,570
7	JESSORE I	35,912,153	38,553,730	24,786,287	36,346,424	(11,125,866)	(2,207,306)
8	TANGAIL	47,294,979	57,829,752	44,545,558	55,831,517	(2,749,421)	(1,998,235)
9	CHANDPUR	23,445,592	32,505,480	17,998,667	23,361,698	(5,446,925)	(9,143,782)
10	NATORE II	33,822,897	36,812,007	30,402,576	37,649,434	(3,420,321)	837,427
11	HABIGANJ	29,133,521	32,541,772	30,341,347	39,483,846	1,207,826	6,942,074
12	PABNA II	26,390,531	26,363,008	23,004,896	29,299,450	(3,385,635)	2,936,442
13	PABNA I	23,436,021	20,601,608	13,361,648	18,623,665	(10,074,373)	(1,977,943)
14	SATHKIRA	13,687,051	19,150,243	11,324,592	16,572,354	(2,362,459)	(2,577,889)
15	FENI	17,357,046	22,609,948	11,584,227	16,677,250	(5,772,819)	(5,932,698)
16	MYMENSINGH	12,325,677	20,630,212	9,266,676	14,858,999	(3,059,001)	(5,771,213)
17	RANGPUR I	15,842,719	20,343,346	13,576,463	19,624,365	(2,266,256)	(718,981)
18	DINAJPUR	17,675,454	20,787,209	18,475,988	26,917,243	800,534	6,130,034
19	KUSHTIA	10,881,601	14,029,628	7,598,606	11,315,229	(3,282,995)	(2,714,399)
20	MADARIPUR	10,380,379	13,941,868	7,218,605	12,109,410	(3,161,774)	(1,832,458)
21	BARISAL	6,290,620	10,427,436	4,181,793	6,342,435	(2,108,827)	(4,085,001)
22	JOYPURHAT	6,548,693	9,724,749	4,289,163	7,497,827	(2,259,530)	(2,226,922)
23	BAGERHAT	5,982,420	10,394,629	2,698,804	5,680,109	(3,283,616)	(4,714,520)
24	RANGPUR II	10,778,793	13,631,644	6,954,420	11,502,287	(3,824,373)	(2,129,357)
25	PIROJPUR	4,963,532	6,362,496	1,180,363	2,589,100	(3,783,169)	(3,773,396)
26	JAMALPUR	6,327,170	9,798,440	2,170,458	6,281,807	(4,156,712)	(3,516,633)
27	CHITTAGONG II	4,963,532	8,255,907	2,152,052	4,289,975	(2,811,480)	(3,965,932)
28	THAKURGAON	4,931,473	10,077,062	2,561,656	6,759,490	(2,369,817)	(3,317,572)
29	BOGRA	6,992,163	13,869,510	3,953,233	12,252,492	(3,038,930)	(1,617,018)
30	NARSINGDI I	3,651,471	6,260,064	1,190,113	3,676,124	(2,461,358)	(2,583,940)
31	NOAKHALI	4,488,391	8,285,771	1,331,664	4,126,301	(3,156,727)	(4,159,470)
32	MEHERPUR	3,050,472	7,157,721	1,282,020	4,049,046	(1,768,452)	(3,108,675)
33	CHITTAGONG I	1,053,828	3,181,311	0	743,033	(1,053,828)	(2,438,278)
TOTALS		638,544,866	787,806,219	551,276,171	767,689,924	(87,268,695)	(20,116,295)
ARITHMETIC MEAN		19,349,844	23,872,916	16,705,339	23,263,331	4,942,825	7,245,010
CHANGE FROM DEC 1987			23.4%		39.3%	(3,691,034)	(3,123,055)
							-76.9%

While we are concerned with the higher percentage system losses, those with the smaller quantities of MWH losses provide lesser concern than the systems with higher system losses with larger quantities of MWH. One reason for this is that with the smaller quantities of MWH, a small fluctuation will cause a larger percentage change. The apparent worst trouble spot during 1988 was Tangall PBS with a 26.2 percent system loss and an increase of 4.7 percent over the previous year. Certain problems were identified at Tangall and hopefully more positive results will be observed during 1989.

System losses continue to be a problem for most PBSs and NRECA, along with REB, is giving attention to trying to reduce these system losses. A substantial reduction in system losses could improve the financial picture appreciably.

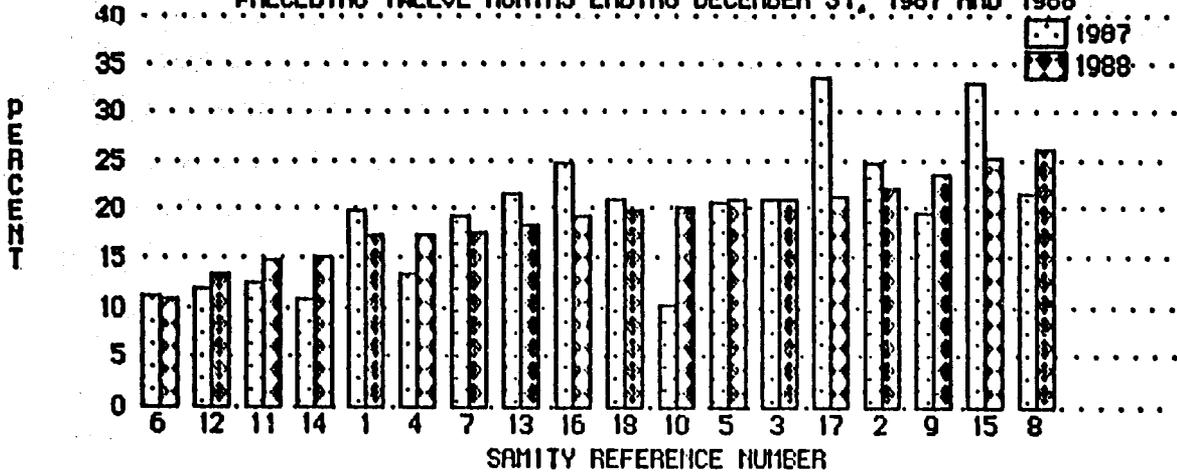
6. Administrative & General, Consumer Billing, Collection & Sales and Operation & Maintenance Expense

The next three (3) graphs are presented together because they are so inter-related. The viewer can more easily observe all the costs criteria for a particular PBS and refer to the tables, also. These bar graphs compare these expenses per consumer for A & G and Consumer Billing and per kilometer for O & M for 1988 and 1987. Also, the expenses in each category have been separated by older, more mature PBSs (Nos. 1-18) and the younger less mature PBSs (Nos. 19-33). For each grouping, the graphs are sorted by the lowest cost per consumer to the highest cost per consumer for 1988 for A & G and Consumer Billing and per kilometer of line for O & M.

The last charts have sorted all PBSs together by expense category into quartiles with a line drawn for the lowest quartile and the highest quartile: the middle two quartiles should provide the reader with an idea of what these expenses are for the average PBSs. It is noted that, with few exceptions, the newer PBSs with less consumers and KM are in the highest quartile. As these PBSs grow, they should show more efficiency of scale.

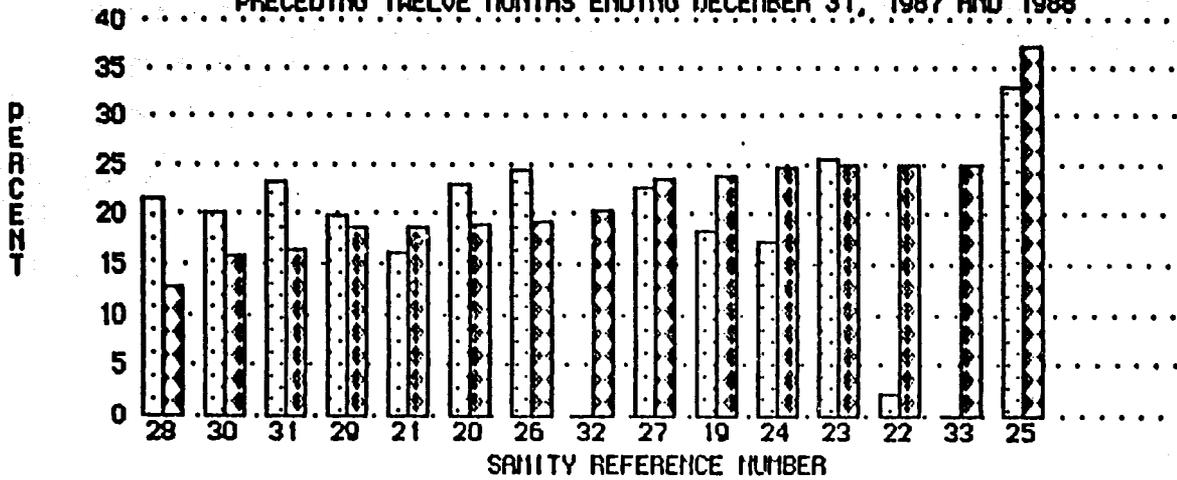
ANNUAL PERCENT SYSTEM LOSS

PRECEDING TWELVE MONTHS ENDING DECEMBER 31, 1987 AND 1988



ANNUAL PERCENT SYSTEM LOSS

PRECEDING TWELVE MONTHS ENDING DECEMBER 31, 1987 AND 1988



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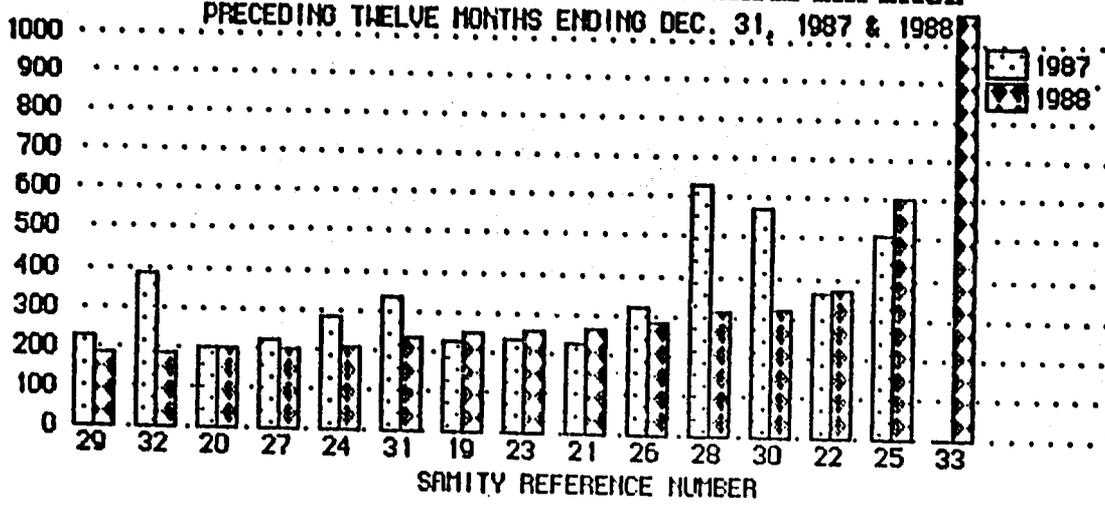
REF. NO.	SAMITY	DEC 1987	MAR 1988	JUNE 1988	SEPT 1988	DEC 1988	CHANGE
1	DHAKA	19.9	18.9	18.5	17.7	17.2	-2.7
2	COMILLA	24.6	25.6	24.0	23.5	22.1	-2.5
3	JESSORE II	21.1	22.1	22.3	22.9	21.1	0.0
4	NATORE I	13.3	13.1	15.3	16.7	17.2	3.9
5	SIRAJGANJ	20.6	18.1	19.8	19.9	20.9	.3
6	MOULVIBAZAR	11.1	12.9	11.9	11.2	10.7	-.4
7	JESSORE I	19.3	18.3	18.4	18.2	17.7	-1.6
8	TANGAIL	21.5	23.2	23.2	23.6	26.2	4.7
9	CHANDPUR	19.6	21.0	20.1	23.6	23.6	4.0
10	NATORE II	10.3	10.5	14.4	17.2	20.1	9.8
11	HABIGANJ	12.5	12.8	12.9	14.2	14.7	2.2
12	PAENA II	11.9	11.5	11.9	12.6	13.3	1.4
13	PAENA I	21.5	18.4	16.8	17.3	18.5	-3.0
14	SATHKIRA	10.9	10.3	9.2	12.4	15.0	4.1
15	FENI	33.0	30.9	29.9	27.1	25.3	-7.7
16	MYMENSINGH	24.8	21.5	21.4	20.0	19.3	-5.5
17	RANGPUR I	33.5	29.2	27.3	23.8	21.3	-12.2
18	DINAJPUR	21.0	21.6	21.0	20.7	20.0	-1.0
19	KUSHTIA	18.4	21.2	22.4	23.3	23.8	5.4
20	MADARIPUR	23.1	21.0	20.5	19.6	19.0	-4.1
21	BARISAL	16.1	15.7	18.2	20.0	18.8	2.7
22	JOYPURHAT *	2.4	16.5	23.4	24.5	25.1	22.7
23	BAGERHAT	25.6	27.0	26.8	26.7	25.0	-.6
24	RANGPUR II	17.2	17.1	19.2	22.5	24.8	7.6
25	PIROJPUR	32.9	37.4	39.0	38.1	37.1	4.2
26	JAMALPUR	24.5	22.7	19.6	20.3	19.4	-5.1
27	CHITTAGONG II	22.0	23.6	22.6	24.3	23.5	.7
28	THAKURGAON	21.5	17.4	14.9	11.4	12.8	-8.7
29	BOGRA	19.8	16.6	16.3	18.0	18.6	-1.2
30	NARSINGDI I	20.2	17.1	16.0	17.0	16.0	-4.2
31	NOAKHALI	23.4	19.9	19.9	17.6	16.4	-7.0
32	MEHERPUR *	(23.2)	(4.6)	5.9	14.3	20.5	43.7
33	CHITTAGONG I	0.0	0.0	14.9	29.2	25.1	25.1
	ARITHMETIC						0.0
	MEAN	20.5	19.9	19.4	20.3	20.3	-.2
		**	**	***	***	***	

* DATA OR METERING UNRELIABLE
** 30 SYSTEMS USED FOR AVERAGE
*** 33 SYSTEMS USED FOR AVERAGE

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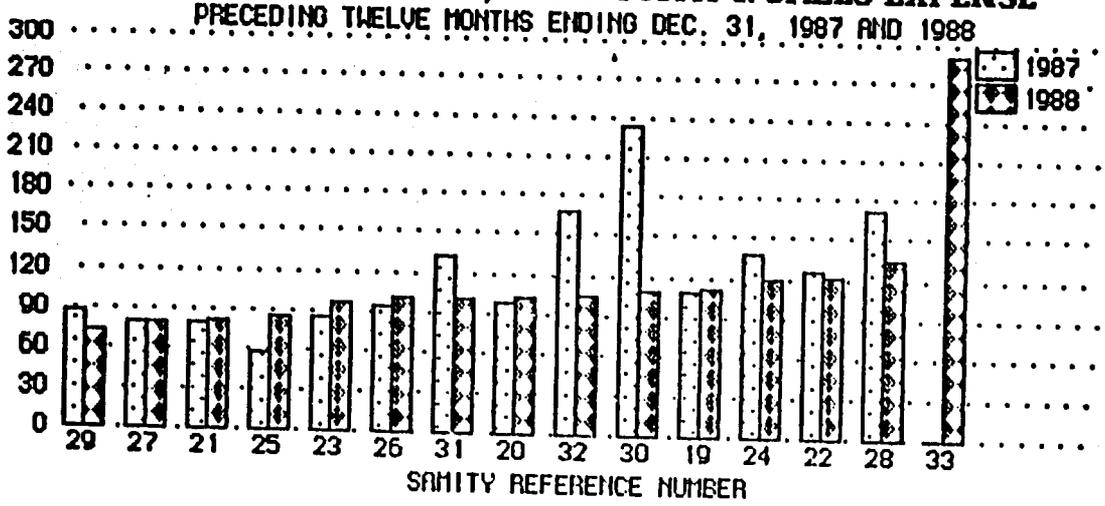
TAKA
PER
CONSUMER

ADMINISTRATIVE AND GENERAL EXPENSE
PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 & 1988



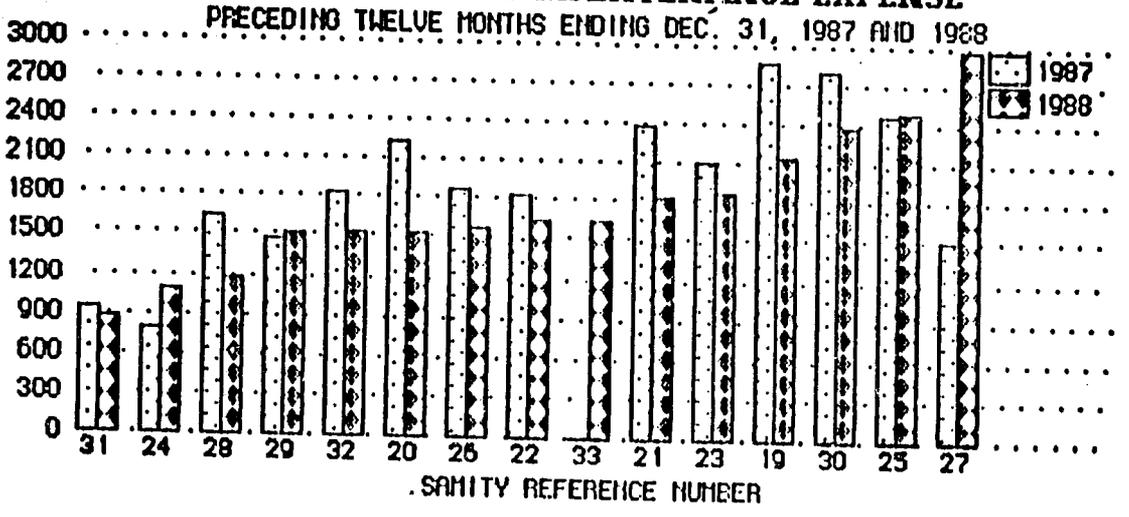
TAKA
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CONSUMER

CONSUMER BILLING, COLLECTION & SALES EXPENSE
PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



TAKA
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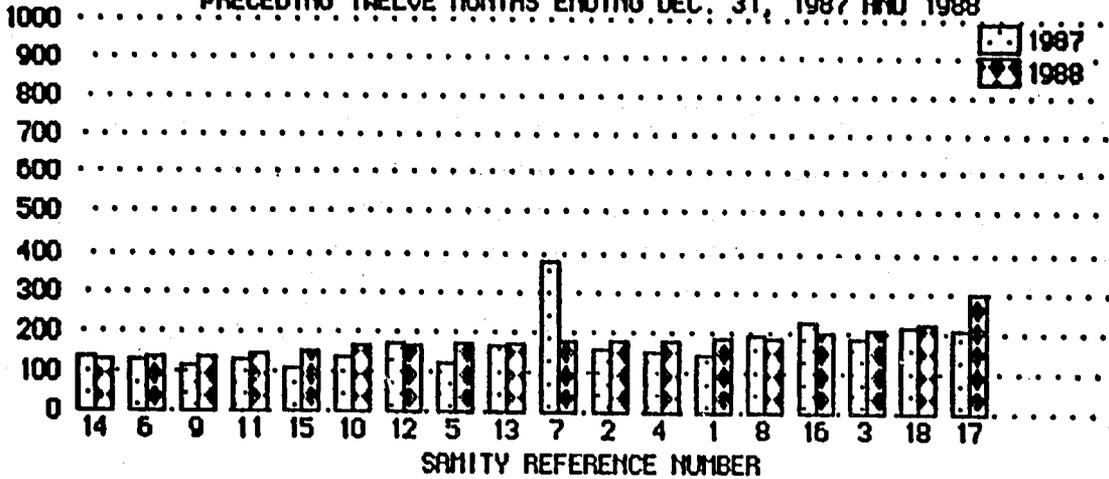
OPERATION AND MAINTENANCE EXPENSE
PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



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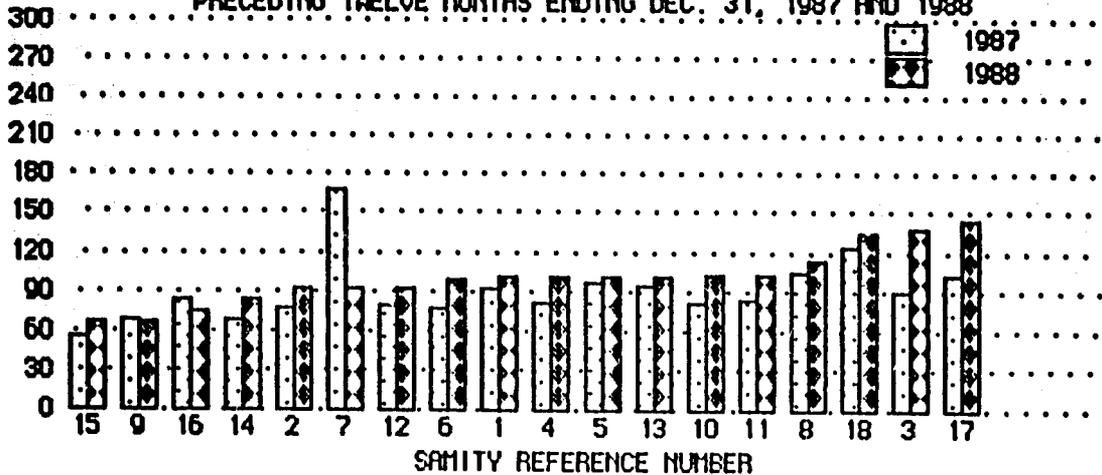
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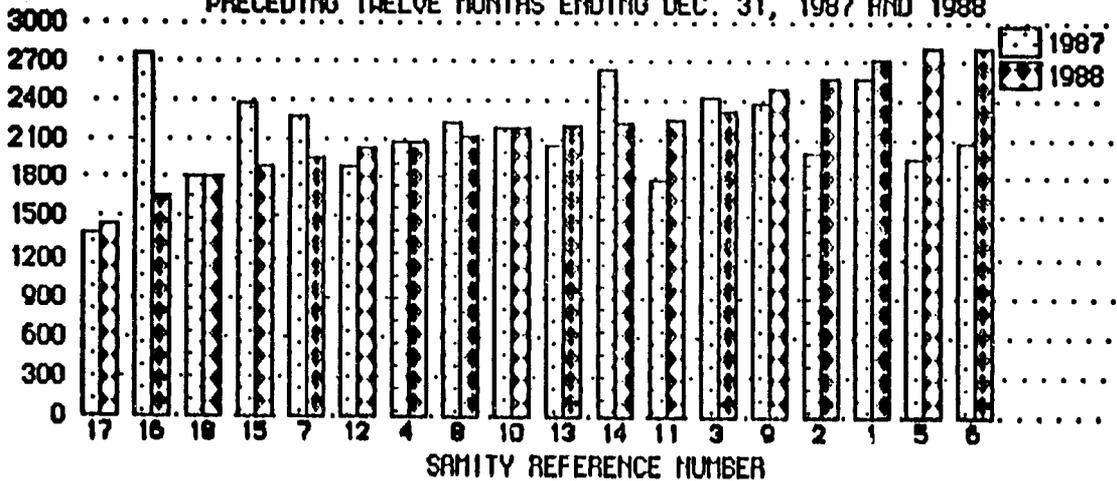
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CONSUMER BILLING, COLLECTION & SALES EXPENSE
 PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



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UTILIZATION AND MAINTENANCE EXPENSE
 PRECEDING TWELVE MONTHS ENDING DEC. 31, 1987 AND 1988



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REF. NO.	A & G EXPENSE		C B C S EXPENSE		O AND M EXPENSE	
	TAKA PER 1987	CONSUMER 1988	TAKA PER 1987	CONSUMER 1988	TAKA PER 1987	KILOMETER 1988
1 DHAKA	145	181	92	101	2576	2718
2 COMILLA	155	175	77	91	2010	2583
3 JESSORE II	182	206	89	138	2417	2320
4 NATORE I	148	178	81	101	2086	2081
5 SIRAJGANJ	121	170	95	101	1947	2801
6 MOULVIBAZAR	127	136	76	97	2091	2804
7 JESSORE I	374	174	168	91	2271	1948
8 TANGAIL	188	183	105	113	2224	2133
9 CHANDPUR	114	137	69	66	2393	2496
10 NATORE II	138	162	80	102	2197	2186
11 HABIGANJ	130	139	84	102	1780	2252
12 PABNA II	170	165	78	91	1891	2051
13 PABNA I	166	172	93	101	2071	2204
14 SATKHIRA	138	127	68	83	2647	2228
15 FENI	107	146	56	65	2373	1893
16 MYMENSINGH	226	200	82	74	2757	1658
17 RANGPUR I	204	299	103	145	1374	1452
18 DINAJPUR	215	220	124	133	1815	1814
19 KUSHTIA	226	248	108	111	2866	2155
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B. MEMBER SERVICES/POWER USE

SUMMARY

The Member Services/Power Use Policy of PBS Instruction 300-2 is to encourage each PBS to engage in a active Member Services/Power Use Program that will enhance the success of the Samity and the members it serves, develop member relations, and promote the cooperative concept while utilizing the Samity services safely and productively.

This years activities have accelerated the member education program developing better understanding of the cooperative concept. PBS consumers that were previously served by PDB are having more difficulty accepting the cooperative concept than those PBS consumers receiving electricity for the first time. As the members develop a better understanding of the ACRE concept, the illegal taking of electricity will be subsequently reduced. Illegal connections, meter bypassing, and meter tampering are some of the major contributors to PBS system losses. A look at 1988 shows a twelve month average of all PBSs at 19.39% system loss. Attempts have been made to overcome, or keep this to a minimum. Some consumers are required to rent or purchase the transformers they use, depending on the operation, or pay an aid to construction fee. These costs plus security deposits and other restrictions on power usage may be effective in reducing system losses but are detrimental to load building projects.

The irrigation connections continue to increase in number each irrigation season. It is the non technical problems such as initial costs for connections rather than energy charges that are creating the greatest resistance to higher connection numbers.

A revised Member Services/Power Use instruction with increased emphasis on member education and REB support material is being initiated in the PBSs. The results of this work may not be seen immediately, but in time will be productive if continued support is given by REB.

The Bangladesh Tobacco Company is working well with Meherpur PBS in field tests of tobacco curing. This is the first experimental project, that we have knowledge of, with electric drying in Bangladesh. The revenue potential of

this type of load certainly should not be overlooked. The KWH sales generated would be a substantial factor in the financial support to several PBSs.

With member education a priority, there is a need to increase REB support to the PBSs. Presently REB is offering Member Services/Power Use support in two directorates, Management Operation and Development. Each directorate has one Deputy Director involved in this work. Development has one Assistant Director and Management Operations has one Assistant Director plus one Assistant Engineer. During the last half of 88 both Deputy Directors of Member Services served as acting General Managers in PBSs for a time period of more than 1 1/2 months. This was a good learning experiences for the Deputy Directors and provided emergency leadership for the PBSs, but this left the already short Member/Service Department with out leadership during this time period.

The total work force of Member Services cannot possibly attend to all the Member Service needs in every PBS. Member education training at villages, schools, colleges, universities, upazila, etc., require teaching aids, recruitment of teachers, and development of teaching skills. It also requires additional REB Member Service/Power Use support staff to exploit the REB accomplishments and contributions made to Bangladesh through the RE program.

RECOMMENDATIONS

Bangladesh has four administrative divisions. Dhaka, Chittagong, Khulna, and Rajshahi. With member education programs and load building a priority, We recommend the organization and implementation of a Member Services/Power Uses Directorate in REB. The staffing would require one Director of Member Services/Power Use responsible for all PBSs. One Deputy Director would be posted for serving in each of the four divisions and two Assistant Directors would serve in each division under the Deputy Director. Member Services/Power Use appears to be second in priorities within the present system. The results of their efforts cannot be as effective while taking a lesser role than other REB directorates.

The Member Services/Power Use staffing recommendations are based on the commitment to fulfill the requirements of PBS Instructions 300-2.

ANALYSIS

Irrigation numbers continue to grow in most PBS service areas. PBS line construction has been completed and made ready for connections to 19,400 irrigation pump facilities. Only 11,016 have been connected. This leaves 8,384 with no connection and no revenue. This represents a rather large investment and continues to be a concern.

A thorough investigation was done in Meherpur PBS and Rangpur PBS II by the Deputy Director of Member Services/Power Use of REB Development and NRECA Member Services/Power Use Advisor. Individual contacts were made with 113 farmers and pump managers. Several reasons were given for not taking electrical connections from the PBS. Only a few are listed. Failure of the Deep Tube Well Manager to pay the rental fee collected from the farmer to BADC. When this happens BADC has no alternative but to discontinue support service on the well and pump. The rental fee must be paid in full before BADC will convert the system from diesel to electric. Some farmers expressed concern about the security deposit being too high. Local manufactured of electric pump sets have increased their selling price and electric pump sets are now more expensive than equivalent diesel. Much of the command areas of some DTWs have been lost to STW.

Many of the three phase lines built to the DTWs will only be utilized with proper motivation and handling. Some may never be connected because of the circumstances that exist. A few farmers told they did not request electricity and did not know why the lines were built to their pumps.

The Bangladesh Tobacco Company commands about 21,000 acres of tobacco. There are over 8,000 tobacco curing barns and about 75% are on PBS systems. Field tests are being conducted by REB and the PBS to determine the feasibility of curing tobacco with electric heat. These resistance loads are near 100% power factor and the PBSs are encouraged to pursue this type of load.

Load building is essential and must be foremost among the priorities of the PBS and REB. Systems become viable only through the revenue generated by energy sales. A search for productive uses of electricity should continue and technical assistance extended to existing and potential consumers.

C. Training

TRAINING REPORT SUMMARY

Training program administration was greatly disrupted by major personnel changes, an unexpected loss of facilities and natural disasters. Inadequacies in facilities constitute an ongoing handicap that continues to impede the delivery of sufficient good quality training.

A comprehensive Needs Analysis study was conducted that aided in identifying critical conditions of the training program and in formulating plans for action.

The Directorate is seriously understaffed but the maturity and performance level of those in the Directorate is generally good.

The Directorate could benefit from the development of comprehensive written formal instruction policies. Progress was made in interstaff communication and coordination. Budget restrictions hampered certain aspects of operations including efforts to publish training manuals.

Total training output of the Directorate in 1987 and 1988 was less than one half the 1986 level. At the time the 1986 output was declared to be inadequate for fulfilling all the training needs of the program.

The proportion of advanced training in 1988 was higher than in the past in some content categories and significant course offerings were made including Finance and Engineering workshops.

Preparations for revising the Curriculum Plan, last approved in 1986 were made and are to continue into 1989.

Course development included increased technical field program planning and review of several institutional courses in need of revision and future development.

In order to replace the lost technical facilities outdoor space near to the classroom building should be rented immediately. At the same time all out efforts should be made by REB to acquire a total complex including training facilities that is commensurate with the size and scope of the RE project.

RECOMMENDATIONS FOR TRAINING

1. A complete set of policies and procedures should be written to govern all aspects of the Training Directorate including curriculum, program implementation, staff administration, trainee administration, facilities, and management information services.
2. Budget provision for all mandatory functions of training such as publishing should be requested and provided for the Directorate.
3. During 1989 a new manpower assessment of Directorate should be conducted and recommendations should be made for increasing manpower along with improvements in the facilities situation.
4. The commendable practice of retaining effective trainer-officers in the Directorate for longer than the traditional posting period should be continued.
5. All annual conferences and workshops should be scheduled and held at least as frequently as called for in the approved Curriculum Plan.
6. Through improved planning and administration the average course batch size should be increased to the range of 12 to 15 participants.
7. More Training of Trainer (TOT) programs should be conducted in 1989 for personnel from the Training Directorate and other directorates as part of an ongoing staff development program.
8. Advisory committees should be formed and activated in order to revise and update the official REB/PBS Curriculum Plan and individual courses under development.
9. Open land with requisite provisions for Technical training should be rented as soon as possible for Technical training programs.
10. Full cooperation may be expected from training in the pursuit of acquisition of a new single site where all REB main offices and support facilities could be located together. Specific proposals should be made and pursued with the concerned authorities during the first months of 1989.

11. The overall planning function within the Training Directorate needs improvement relating to development of training schedules (both long and short range) that reflect maximum use of training facilities and staff in an attempt to increase Training Program outputs.
12. Efforts must be made to complete development of curriculum materials needed to implement more advanced training programs in the areas of management and administration.
13. The Training Directorate's Workplan must be continually reviewed and revised in order to provide overall guidance and direction for all activities within the Training Directorate.
14. Field visitations by Training Directorate personnel must be continued as a means of evaluating the effectiveness of training programs and to identify current training needs.

TRAINING REPORT DETAILS

Training Program Administration

As in 1987 several major personnel changes took place in the Training Directorate. A new Deputy Director for Planning and Records joined in the first quarter. Later the Assistant Director, Finance Training was replaced. The Institutional Training Advisor, Mr. Larry Beck left the project due to health reasons and he was replaced by Mr. James Ford in July. Director Mafuzur Rahman was replaced by Director Halim Mollah during the month of August.

An overall assessment of the needs of REB and the PBS's as well as the Training Directorate was conducted by Mr. Ford soon after his arrival. The results of this Needs Analysis, along with other considerations, became the basis for the identification of various tasks to be included in a Work Plan that has assisted in organizing the activities of the Directorate. In general the study showed that the officers and staff of the Training Directorate perform their duties with sincerity and increasing competence. However, most functions of the Directorate are not governed by any formal set of written policies or procedures. On the basis of experience a complete set of policies and procedures will

be written to govern all aspects of the Training Directorate including curriculum, program implementation, staff administration, trainee administration, facilities, and management information services.

In general REB continued the very commendable practice of retaining effective trainer-officers in the Directorate for longer than the traditional posting period. It takes from one to two years to develop a good trainer. In order to gain the most benefit from this investment, it is important that REB continue this practice.

In addition to personnel changes the Directorate experienced extreme instability and inconvenience related to facilities. This is outlined with suggested remedies in the Training Facilities Section of this Report. The biggest single event related to this occurred in July when REB was forced to abandon the practical training site in Joar Shahara. The facilities located there were nearing completion when an order was issued to dismantle them. At the time of this writing no reasonable solution to this problem had been implemented.

A chronic problem stems from the fact that the Training Directorate offices and classrooms are located in Uttara even though personnel report to work in Dhanmondi. Training officers are only present at their offices from 8:00 AM to 1:30 PM. This represents a loss of one man-day per person per week. As another result of this situation, outside instructors are frequently tardy or absent from their assigned classes. In 1987 the Training Directorate's operations were moved to Uttara supposedly as the first of many offices to do so. However no other Directorates followed suit.

The Directorate staffing levels are adequate to handle only a fraction of the course development and implementation that should be taking place. Even with the limitations of facilities most of the training officers and staff remain occupied with conducting courses including the increased amount of field supervision of PBS conducted training. A 1984 Martial Law Committee on Organizational Setup report on REB indicated that additional staff would be required to keep up with the rapidly expanding RE program. In spite of the increasing demand to provide more trained personnel the staff strength of the Training Directorate has

remained at the RE Phase I mandated level. The new REB reorganizational plan submitted for GOB approval included no additional officers for the Training Directorate. During 1989 a new manpower assessment of Directorate should be conducted and recommendations should be made for increasing manpower, along with improvements in the facilities situation.

In the fall the nationwide, unprecedented floods constituted a another major interruption of training. The Training Classroom building had to be abandoned for 10 days when flood waters blocked the approach roads and threatened to enter the building itself. Even after this transportation problems existed for a much longer period of time. Would-be trainees were unable to travel to Dhaka to attend any training programs.

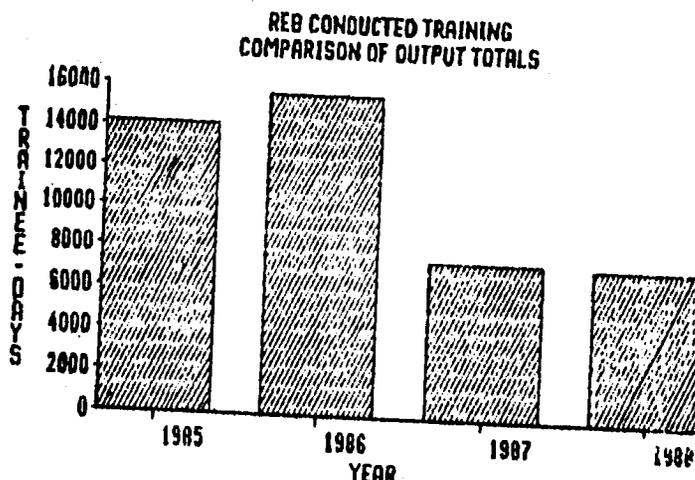
During most of the second half of the year, weekly meetings took place between the Director, Deputy Directors and Advisors which resulted in better planning and coordination of efforts in all facets of the program.

Progress in the training program was hindered by budget constraints. For example, a major Bengali training publication, Construction Practices and Procedures, has not been printed even though the revision and translation work on this important book was completed in July. This book was not published because of a lack of budgetary funds. In 1989 sufficient funding for all required publishing should be budgeted.

Training Program Implementation

GENERAL

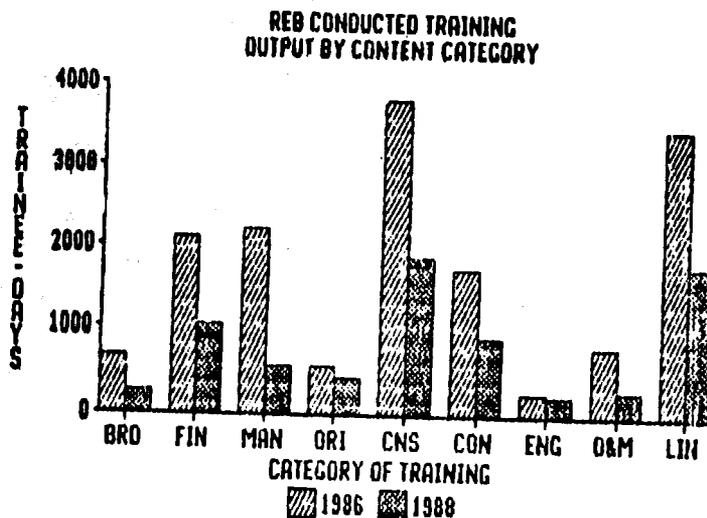
The graph below shows the training output levels for each of the past four years. Although the rural electrification program is growing and training needs are likewise increasing, it is apparent that the ability to deliver training has been severely reduced during the past two years. This reduction can be attributed almost entirely to negative changes in the arrangements for physical facilities available to the Training Directorate. In general, officers and staff have worked harder during 1988 than in previous years in order to try to overcome the handicaps that have existed in terms of facilities. The total result however is a greatly hindered training program.



In 1988, the training output per month was 611 trainee-days. This was 47 per cent of the 1986 bench mark record of 1300 trainee-days per month. It should be remembered that THE 1986 LEVEL OF TRAINING WAS NOT AND STILL WOULD NOT BE COMMENSURATE WITH THE SIZE AND SCOPE OF THE RE PROJECT. After several years of solid progress toward meeting the training needs of the project, the Training Directorate has seriously lost ground. This trend can only be reversed by concentrated efforts to improve the training facilities as outlined in the Training Facilities Section of this report.

One way that training output can be increased slightly with the present staff and facilities is to improve the batch sizes. In 1986 almost half the batches were in the range of 12 to 15 participants. This is

considered a very good size in terms of learning effectiveness. In 1988 only 18% of the batches fell into this range of sizes. At the same time 61 per cent of the batches had 11 or less participants. By ensuring full participation of PBS Boards in their training programs and other means of increasing the batch sizes, the efficiency of the Directorate will be enhanced. It is partially because of this that training output has decreased in all categories of training and not just in Technical training. The chart shown below shows the training output in 1986 and 1988 by course content category. Training decreased in all categories almost proportionally. This suggests that the negative impact of the facilities situation on Technical training is roughly matched by the administrative difficulties in Institutional training such as the separation between the Uttara center and the REB Headquarters. In 1988, 64 per cent of all Institutional training was conducted by officers from other directorates (who normally work in Dhanmondi). In 1986, the percentage was 72.



An area in which training has shown improvement is the proportion of advanced training to entry level training conducted. In 1988, 59 per cent of the training effort was dedicated to advanced training. This percentage was only 19 in 1986.

A series of construction and engineering workshops were held for REB, local consultant and contractor personnel. These workshops functioned as annual conferences and were valuable in terms of enhanced communication between all parties involved in system engineering and

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construction. Although these workshops did not allow sufficient time to thoroughly deal with the numerous issues which had been identified they were very helpful. These workshops illustrated the benefits that could be realized by implementing the already mandated annual conferences for REB officers, as well as PBS GMs, District Managers, and Department Heads. Time and space limitations have prevented the offering of these conferences according to the Curriculum Plan.

A Train the Trainer (TOT) program was conducted for the members of the staff at the Training Center. The need for more of this type of training was revealed in the analysis conducted by Mr. Ford. The main objective of the 18 hour program was to assist in the development of an understanding of the basic instructional theories, techniques, and attitudes which are required in order to be an effective trainer. More TOT programs are to be conducted in 1989 for personnel from the Training Directorate and as well as frequent trainers from other directorates. This is to be part of an ongoing staff development program related to all aspects of training.

Implementation of training programs will be discussed below in further detail according to course content.

BOARD OF PBS DIRECTORS

Programs conducted for PBS Directors included Orientation, Establishing Good Member Relations, Performing Effectively in the Board Room, and Understanding Financial Reports.

Training statistics show that the quantity of PBS Directors who received training during the year totaled only 73 and is an area that definitely requires improvement. Programs for PBS Directors constituted only 5% of all of the training programs that were offered for the entire year. In the coming year, a sufficient number of programs must be offered, as well as efforts being made to give proper advance notification to the PBS Directors to help ensure that when the programs are offered they are filled with participants.

FINANCE

During the year a total of 623 periods were conducted for Finance Training. The major emphasis for training in this area during the past year was for PBS personnel regarding the new Accounting Procedures. Workshops were conducted for General Managers, District Managers, Assistant General Managers -Finance, PBS Accountants, Plant Account Assistants, and Billing Supervisors. Expatriate Advisors and Officers from the Finance Directorate conducted nearly all of this training. All of these programs were followed up with on the job training in the PBS systems and were monitored by REB personnel. During the 2nd Quarter, Finance Training comprised 17% of the total training effort, the highest percentage for any quarter to date.

Other training for Finance personnel included seven different programs for newly recruited AGM Finance, as well as programs for Contract Auditors and REB AD-Finance/Accountants.

Future plans in the area of PBS Finance training include having REB Training personnel conducting training programs at the PBSs for Billing Assistants on a regional basis with emphasis on the New Accounting Procedures. Training related to relevant Sections of the new Accounting Procedures Manual (Work Orders and Material Accounting) for COM Department personnel, which still remains to be done, is planned for the first or second Quarter of 1989.

There were a limited number of programs conducted for REB Finance personnel due to anticipated changes in current procedures. Relevant programs can only be developed and scheduled as procedures are finalized and the new REB/PBS Accounts Manual is developed.

MANAGEMENT, ADMINISTRATION

A total of 17 programs were conducted in the area of management and administration. The emphasis was on the training of PBS personnel, with only one batch of REB personnel attending both the Office and Records Management programs.

Field visitations during the year identified the need to provide supervisory training for PBS supervisors (Wiring Coordinators, Billing Supervisors, and Line Supervisors), which will begin in early 1989.

Perhaps the most notable fact about the area of management training is that most of the training being conducted still relates primarily to "introductory" type programs with little progress toward conducting "advanced" programs. The continued delays in conducting programs in these advanced areas of management greatly hampers the ongoing development of management skills that are required by both REB and PBS management personnel. The expansion of the scope of the RE project and the rapid pace of its continued growth has placed additional responsibility on the REB Training Directorate to provide this type of training. The demand for trained personnel to effectively manage all aspects of the RE program (REB and PBS) has outpaced the growth of the resources available to the Training Directorate. Additional resources are required to develop and implement these advanced programs, as well as continue to offer the many programs that are currently being implemented.

ORIENTATION

The PBS Officer Orientation program was conducted seven different times and included personnel assigned to each of the PBS Officer positions. One PBS General Orientation program was conducted for Store Keepers and Store Assistants. During the year five separate Orientation programs were conducted for newly elected PBS Directors

Other Institutional Training

Plans for conducting an Annual Conference/Seminar for AGM Member Services had to be postponed due to the flood and the resulting conditions. The program will be held following the busy irrigation season in the 1st quarter of 1989.

The Training Directorate has initiated plans for including Annual Conferences/Seminars for GMs and all AGMs in the Quarterly Training Schedules during 1989.

The "draft copy" of a Report entitled "Rural Electrification in Bangladesh: Its Impact on Rural Commercial and Industrial Sectors" completed by the Bangladesh Centre For Advanced Studies included positive points about the RE project, as well as suggestions for improvement. The Report suggested additional training for PBS personnel in order to improve their effectiveness in the areas of member/customer relations and an improved understanding of the services provided by the PBS. This also supports the need for efforts to improve the Village Advisor Training programs.

CONSTRUCTION AND INSPECTION

Even though construction training amounted to almost one fourth of the total training effort, volume in this category was far below the level of previous years. In order to keep up with the most minimal needs of the program two technical courses requiring outdoor facilities should be in progress during any normal week. Under the circumstances as of the end of the year this remained an impossibility.

A major effort went into Warehouse management training for new and older stores personnel of REB and the PBS systems. This training utilized the newly published and very useful illustrated REB Material Item List. One newly appointed training staff member has several years of experience in REB stores management and his expertise in this area is being applied in these courses. In spite of this effort reports of improper warehouse procedures and deficiencies are still received as evidence of the need for more training. Also the REB Instructions on Material Stores are out of date and in need of revision. It is not possible to deliver good training if the primary instructions are not correct and up to date.

Several batches of contractor line personnel have had to wait for training courses to get underway because of the facilities crisis.

CONSUMER WIRING

The introductory housewiring program for PBS officers can still be offered however certain topics cannot be conducted with the intended level of authenticity because of the lack of outdoor facilities.

One of the last programs offered at the Joar Shahara site was the Advanced Wiring course, which cannot be offered again until a suitable outdoor training facility is established (Refer to Training Facilities Section).

ENGINEERING

This is one of the most neglected areas of Technical training. Good advanced engineering courses have been identified for the project but these require more than the available development time on the part of qualified engineers. There is also a tendency to minimize the time allowed to engineers to participate in training. This was illustrated during the workshops that were held in the fall when inadequate time was planned for complete discussion of the many issues that arose.

OPERATION AND MAINTENANCE

As the RE project moves more fully into the operations stage of development there is an increasing need for this type of training. The core course in this subject is offered for PBS AGMs, REB AEs and other mid-level officers. Unfortunately this course cannot be offered in the absence of adequate outdoor practice facilities.

One course in repair and maintenance for meter specialists was conducted in the early part of the year. This important course was well managed and effectively conducted using damaged meters collected from Savar, Dhaka PBS I.

PBS LINEMAN TRAINING

Because of the present facilities situation, only a few of the Technical Training courses can be offered effectively. In late October, a PBS Lineman Part II course was conducted by shuttling tools, materials, and

personnel back and forth between the Savar campus of Dhaka PBS I and the classrooms and hostels in Uttara. Under these circumstances time consuming and expensive transportation arrangements have to be made. The overall effectiveness of training is poor in spite of greater increased efforts of the trainers. Frequently because of transportation problems trainers have to work long overtime with no compensation. Trainees also return to the hostel in the evening having had little to eat after working long hours. Most technical courses call for classroom presentations and explanations of a topic followed by immediate practice in field simulated conditions. In order to use the remote site for practical exercises classroom discussion on many topics had to take place on certain days. Practice in applying the new knowledge took place on other days. This is not a good way to conduct training. Poor results, wasted time and expense in transportation, and the burden on an already crowded PBS make this a very bad situation.

By the end of 1988 a large backlog of candidates for each of the PBS Lineman courses existed.

Because of the loss of facilities the first batch of Lineman Part IV training had to be cancelled indefinitely. Linemen Part III courses cannot be offered either.

Curriculum Development

The Preliminary Needs Analysis Report recommended the 1986 REB Curriculum Plan be reviewed and updated in order to more accurately reflect the current training needs of the REB/PBS organizations. Initial steps were taken for conducting this review. Advisory committees are to be formed in early 1989 for this purpose. An updated Curriculum Plan will assist in providing an improved overall direction for REB Training, as well as serving as the basis for establishing priorities for future curriculum development activities.

Policies and procedures for curriculum development activities need to be established to provide uniformity in the process used for the development, review and revision of REB curriculum. These will help to ensure that the curriculum is designed to meet the identified training

needs and that it has a consistent format which will improve its effectiveness. In addition these will provide the guidance necessary to prepare REB Training personnel to assume the curriculum development activities that will continue be part of the Directorate's responsibilities and one of its major activities.

The new revision of the Basic Part III Lineman Training Manual was completed and printed. This will be a great asset when it again possible to conduct this program properly.

Translation of the PBS System Construction Practices and Procedures Manual into Bengali advanced to completion in July. This important and much needed book was not printed however due to budget difficulties.

Plans and materials for PBS Lineman Part IV were developed. This included an outline type training manual and some audio visuals.

With the limitation on central facilities for Technical training attention was turned toward additional field follow-up training for PBS COM Department personnel. In conjunction with System Operations an outline and strategy were formulated for providing such training in every PBS over the coming months in 1989. The training will focus on maintenance and care of tools.

Curriculum development activities related to programs for Institutional Training involved development of an evaluation tool for reviewing of existing curriculum to identify the need for required revisions. Also initial work began on the "draft" copy of the Personnel Management curriculum, that is scheduled for pilot testing during the 2nd Quarter of 1989.

Training Program Facilities

In early 1987 the Technical Training facilities had to be moved from the rented house in Dhanmondi. The outdoor facilities were shifted to a one acre site in Joar Shahara, just south of the Zia International airport. Later in the year a building was completed to provide material storage, offices and one classroom. In mid-1987 the Training Directorate moved all classrooms and offices from Dhanmondi to Uttara. Later in the year the hostels were also moved to Uttara. At that time there existed an assumption that all REB offices would be moving to the Uttara area. In July 1988 the Technical Training facilities at Joar Shahara were had to be removed. In late July. The loss of this facility created a long range problem because Technical Training activities have been severely curtailed since that time. Presently tools and materials are being stored in makeshift arrangements in three different locations and there is no acceptable location for conducting the practical sessions of PBS Lineman and most other categories of Technical Training. In order to alleviate this immediate problem, REB has been advised to lease open space within close proximity of the Training Center to use for this purpose. At this point in time, no progress has been made in renting such a site. In the absence of this remedy attempts have been made to conduct Technical training practice sessions in Savar. Many logistical problems make this situation ineffective and inefficient.

For a variety of reasons, the only reasonable long range plan to provide facilities for REB Training is to acquire land for the necessary classrooms, outdoor space, offices, and hostels in a location that is no more than 5 miles from the site of the REB permanent office building. Ideally a new single site should be acquired where all REB main offices and support facilities could be located together. Specific proposals should be made and pursued with the concerned authorities during the first months of 1989.

In third quarter specifications for new audio-visual equipment were forwarded to REB Procurement. Once acquired, the new equipment will permit the Training Directorate to produce and display video based training programs that should greatly enhance training effectiveness and improve control over presentation quality and content.

Improvements in technical equipment included procurement of new sets of climbing tools and facilities for irrigation equipment demonstrations. Unfortunately the later mentioned improvements were lost with the other facilities at Joar Shahara.

Appropriate training videos that are available at the British Council Video Library in Dhaka have been previewed and are expected to be incorporated into programs for Training the Trainer and for Management and Supervisory training.

**REB CONDUCTED TRAINING
STATISTICS AND TABULATION
JANUARY THROUGH DECEMBER 1988**

TRAINEES, CLASS PERIODS AND TRAINEE-DAYS BY COURSE CATEGORY

COURSE CONTENT CATEGORY	TRAINEES		PERIODS		TRAINEE-DAYS	
	NO.	%	NO.	%	NO.	%
Board of FBS Directors	73	6%	231	5%	270	4%
Finance	303	26%	623	15%	1031	14%
Management, Administration	186	16%	417	10%	577	8%
Orientation	86	7%	430	10%	426	6%
ALL INSTITUTIONAL TRAINING	648	55%	1701	40%	2304	31%
Construction and Inspection	214	18%	998	23%	1854	25%
Consumer Wiring	70	6%	538	13%	886	12%
Engineering	92	8%	116	3%	228	3%
Operation and Maintenance	60	5%	223	5%	289	4%
PBS Lineman Training	88	8%	699	16%	1771	24%
ALL TECHNICAL TRAINING	524	45%	2574	60%	5028	69%
TOTAL REB CONDUCTED TRAINING	1172	100%	4275	100%	7332	100%

TYPE OF COURSE FORMAT	TRAINEES		PERIODS		TRAINEE-DAYS	
	NO.	%	NO.	%	NO.	%
INSTITUTIONAL TRAINING:						
Central Course Training	475	41%	1173	27%	1560	21%
Field Training	13	1%	336	8%	313	4%
Conferences, Workshops	160	14%	192	4%	431	6%
TECHNICAL TRAINING:						
Central Course Training	325	28%	1907	45%	3645	50%
Field Training	54	5%	583	14%	1167	16%
Conferences, Workshops, etc.	145	12%	84	2%	217	3%

TOTAL REB CLASS HOURS BY INSTRUCTOR TYPE

	ALL TRAINING		INSTITUTIONAL		TECHNICAL	
TRAINING INSTRUCTORS	2365	55%	608	36%	1757	68%
OUTSIDE INSTRUCTORS	1910	45%	1093	64%	817	32%

NUMBER OF COURSES CONDUCTED BY REB

	ALL TRAINING		INSTITUTIONAL		TECHNICAL	
REB Conducted Central:	97	93%	13	46%	13	46%
Field Training Only:	5	7%	1	4%	1	4%

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TOTAL REB CONDUCTED TRAINING. TRAINEES BY RECIPIENT CATEGORY

REB Personnel: 119 10%
 PBS Personnel: 837 71%
 Others : 216 19%

REB CONDUCTED FIRST YEAR LEVEL VERSUS ADVANCED TRAINING

	Trainees	Periods	Trainee-days
FIRST YEAR LEVEL:	485 41%	1316 31%	2910 40%
ADVANCED LEVEL:	687 59%	2959 69%	4422 60%

TRAINING COURSE IMPLEMENTATION: TO DATE AND FOR JANUARY-DECEMBER 1988

NAME OF COURSE	PARTICIPANTS	NUMBER OF:		
		CLASS PERIODS	1/88 - 12/88	TO DATE
<u>COURSES FOR PBS BOARD DIRECTORS:</u>				
Challenges and Problems in the PBS	PBS Directors, Lady Advisors	0	0	79
Establishing Good Member Relations	PBS Directors, Lady Advisors	31	23	121
PBS Directors Orientation Course	PBS Directors and Lady Advisors	168	28	629
Policy Development	PBS Directors, Lady Advisors	0	0	277
The PBS Director in the Board Room	PBS Directors and Lady Advisors	18	12	317
Understanding Financial Reports	PBS Directors, Lady Advisors	14	10	254
Understanding Policy Instructions	PBS Directors, Lady Advisors	0	0	131
Workshop on PBS Policy Instructions	PBS Directors, Lady Advisors, GMs	0	0	189
Board Meeting & PBS Management Intro.	PBS Directors, Lady Advisors	0	0	19
<u>FINANCE COURSES:</u>				
Accounting Procedures	REB/PBS Finance Personnel	42	7	138
Auditors Orientation Course	Contract Auditors	44	57	263
Billing Procedures	Finance Personnel	21	7	182
PBS Audit Manual Course	PBS Finance Personnel	7	7	43
Preparing Financial Reports	PBS AGM (Finance) and Accountant	21	7	193
Procurement Procedures	REB, PBS Officers	8	17	31
REB/PBS General Accounts	REB, PBS Finance Personnel	92	28	277
Retail Rate Construction	PBS AGM (Member Services)	0	0	14
Understanding Financial Reports	REB/PBS Officers	21	6	37
Work Order Procedure and CPR	REB Officers/PBS Finance Personnel	0	0	239
Workshop on Imprest Fund	REB Personnel	0	0	31
<u>MANAGEMENT COURSES:</u>				
Class for Departmental Exams	REB Personnel	36	14	84
Controlling and Measuring Results	PBS Directors, Lady Advisors	0	0	14
Duplicating Machine Operation	PBS Office Employees	0	0	39
Effective Management of the PBS	REB Directors	0	0	16
Management-Its Nature and Scope	REB Officers, PBS GMs, AGMs	94	34	592
Management-Understanding People	REB Officers, PBS GMs, AGMs	0	0	0
Managing the COM Department	PBS Dept. Head (COM)	20	8	49
Managing the GS Department	PBS AGM(GS)	17	10	35
Managing the MS & Power Use Dept	PBS AGM(MS)	21	11	114
Managing the PBS	PBS General Managers	14	3	14
Managing the PBS Finance Department	PBS AGM(FIN)	0	0	1

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TRAINING COURSE IMPLEMENTATION: TO DATE AND FOR JANUARY-DECEMBER 1988

NAME OF COURSE	PARTICIPANTS	NUMBER OF:		
		CLASS PERIODS	1/88 - TO 12/88	TO DATE
New Connection Procedures	PBS Finance, GS Personnel	0	0	27
Office and Administrative Duties	REB Line Inspectors	0	0	49
Office Management	REB, PBS Management Personnel	63	36	140
Office Procedure/Personnel Policy	REB Officers	0	0	29
PBS Enforcement Course	PBS Assistant Enforcement Officer	0	0	16
Planning and Organizing	PBS GMs, AGMs	0	0	176
Records Management	REB, PBS Officers	70	36	155
Teacher Training Course	Selected REB Officers	24	10	20
The Nature of Supervision	REB ADs and Class II Officers	0	0	91
Introduction to PBS Instructions	REB/PBS Officers	58	24	56
<u>ORIENTATION COURSES:</u>				
Orientation Course	REB, PBS Officers & Support Staff	269	80	1,411
Refresher Course on REB Activities	REB Officers and Supporting Staff	0	0	513
<u>CONSTRUCTION COURSES:</u>				
Distribution Line Construction	Contractor Linemen and Supervisors	0	0	577
Line Construction Orientation	Construction Contractor Principles	0	0	259
PBS System Construction/Inspection	REB, PBS, Consultant Engineers	112	11	754
PBS Substation Construction	Contractors and Engineers	40	21	21
Warehouse Management	REB, PBS Stores Personnel	256	68	272
<u>CONSUMER WIRING AND POWER USE COURSES :</u>				
Power Use in the PBS	Wiring Coordinators/Inspectors	0	0	14
Advanced Consumer Wiring	PBS Power Use Personnel	98	10	525
Housewiring Course	MS Dept. Personnel	398	35	319
PBS System Introduction	MS Dept. Personnel	21	11	11
<u>ENGINEERING COURSES:</u>				
Distribution Line Staking	REB, PBS, Consultant Engineers	60	20	305
PBS Line Renovation	REB, Local Consultant Engineers	0	0	28
PBS System Design	REB, Consultant Inspectors	0	0	49
PBS System Design & Construction	REB, Local Consultant and	21	10	227
Timber Specialists Orientation	REB Timber Specialists	0	0	6
<u>OPERATIONS AND MAINTENANCE COURSES:</u>				
Capacitors & Power Factor Control	REB, COM, & MS Dept. Personnel	0	0	153
COM Accounting	REB and COM Dept. Personnel	0	0	47
Distribution System Introduction	PBS GMs & AGM(PIN),(GS),(MS)	49	9	36
Driver Skills Training	REB Drivers	0	0	64
OCR/Regulator Maintain, Repair	Operations & Maintenance Personnel	0	0	58
PBS System Operation & Maintenance	REB AE, PBS AGM(COM) and LS	0	0	141
Single Phase Meter Maintain, Repair	Meter Specialists	126	10	81
Single Phase Meter Testing	PBS COM Personnel	0	0	114
Substation Introduction	AGM(COM)	14	10	77
Transport Maintenance	REB & PBS Personnel	19	21	199
Tractor and Truck O&M	Equipment Operators, Supervisors	0	0	36
Wireless Operation and Maintenance	PBS COM Personnel	0	0	135
<u>PBS LINEMAN COURSES:</u>				
PBS Lineman's Training, Part I	PBS Linemen	0	0	676
PBS Lineman's Training, Part II	PBS Linemen	573	74	451
PBS Lineman's Training, Part III	PBS Linemen	126	14	122

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TRAINING COURSE IMPLEMENTATION: TO DATE AND FOR JANUARY-DECEMBER 1988

NAME OF COURSE	PARTICIPANTS	NUMBER OF:		
		CLASS PERIODS	1/88 - 12/88	**TRAINEES** TO DATE
TOTAL CENTRALLY ADMINISTERED COURSE TRAINING.....		3,080	799	12,862
Conferences, Workshops, Forums, etc.:				
PBS General Managers		0	0	130
AGM(MS)		0	0	22
AGM(FIN)		0	0	39
Contractor Firms		28	73	155
REB Engineers, Consultants		56	72	305
PBS Staff for Accounting Manual		192	160	97
TOTAL REB CONFERENCES, ETC.....		276	305	748
Field Training Programs Arranged by REB Training Directorate:				
PBS General Managers		0	0	17
REB Engineers & PBS AGM(COM)		154	10	118
AGM(GS)		161	6	22
AGM(MS)		0	0	25
AGM(FIN)		175	7	29
Contractor Linemen		408	30	124
Electricians and MS Staff		21	14	24
Polytechnic Students		0	0	10
TOTAL FIELD TRAINING BY REB.....		919	67	369
TOTAL REB CONDUCTED TRAINING.....		4,275	1,171	13,979
<u>PBS CONDUCTED TRAINING SUPERVISED BY REB TRAINING DIRECTORATE:</u>				
PBS Conducted Lineman Basic Part I: (linemen who passed the REB exam)..		NA	40	458
PBS Conducted Housewiring Course: (Electricians qualified by REB)....		NA	89	2,470

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D. FINANCE

SUMMARY:

The staffing of REB Finance remained fairly stable throughout the year. Mr. Mahbubur Rahman joined the Rural Electrification Board as Member-Finance on 1 June 1987 and continued in that post during the year of 1988.

The Directorate of Accounts that was established in mid 1986 by the division of duties and responsibilities of Director Finance is functioning smoothly.

One of the worst floods in the History of Bangladesh, followed by a cyclone, caused considerable damage to the PBSs.

During the year of 1988, several changes took place in regards to Finance Advisors. Mr. John Hinton departed post as PBS Finance. This position was filled by Mr. Wesley Bell. Mr. Roland Heard was assigned to the Rural Electrification Board as REB Finance Advisor. This position had been vacant since 1984.

The Advisors and REB Staff were involved with the Coopers & Lybrand Study on the "FINANCIAL POLICIES AND PERFORMANCE OF THE PBSs". Several meetings were held with REB Members, Directors, USAID personnel and the Consultants.

Work is progressing in establishing the Financial Planning Cell. The Rate Cell has run the Coopers & Lybrand model of draft information and projections for a ten (10) year period on the thirty-three (33) energized PBSs.

Mr. Donald Hertzmark conducted a study on the current Status of REB Rate Cell and Financial Planning Activities.

Strong emphasis has been placed on finance, accounting, and business management of both REB and all PBSs throughout this year. This was highlighted by an increased training effort.

Educational programs and training will require continual efforts and support as maturation of the RE Program increases. Continual training, refresher courses, workshops, and advanced classes are needed by those filling vacancies caused by promotions, transfers, formations of new PBSs, and persons leaving the program.

The PBS Accounting Procedure Manual-Instruction 200-06, was re-written during 1987 and placed in effect during the year of 1988. Training was held for the General Managers, AGMs-Finance, Accountants and Plant Account Assistants. The Work Order Procedures Section for AGM-CO&M was not conducted but postponed until later.

RECOMMENDATIONS

1. Implement the Work Order Procedures Training as soon as possible.
2. Action should be taken on the Coopers & Lybrand Study recommendations.
3. Revise policy on PBS Staffing requirements.
4. Increase REB Staff according to the growth in number of PBSs.
5. Establish a co-ordination committee to review required circulars.
6. In-depth study of the tariff should be conducted immediately.

PBS FINANCE

As the number of PBSs continue to grow, the need for qualified personnel increases. Several PBSs have vacancies in Key positions. These vacancies have existed for long periods of time. A meeting was held with the Director of Finance and Director of Management and Operations along with the concerned Advisors to discuss the PBSs staffing problem.

The present GOB requirement is that all correspondence and information be in Bangla, with the exception of direct involvement with an expatriate or Donor. The total impact of this tends to be adverse to development of progress of the RE Program.

During the year, the PBS Office System Branch of the Directorate of Finance remained fully staffed. Two (2) Deputy Directors plus eight (8) Assistant Directors continued in their posts for the total year which is the authorized number of posts. There are now thirty-nine (39) PBSs in various stages of development. Each financial review visit takes about a week to conduct and the present staffing is not sufficient to provide area coverage on a bi-monthly schedule. Many deficiencies, irregularities and misapplied

Instructions are brought to the attention of REB officials. During the year, two (2) new PBSs were activated which entails setting up all financial records, systems, and training personnel to perform the various tasks. These PBSs require more frequent visits than bi-monthly.

The present staff cannot satisfactorily monitor the financial activities of thirty-nine (39) PBSs. More Assistant Directors are needed to provide the necessary support in the development of PBSs

Review work on Instructions and Directives continues. The Consultants reviewed numerous Instructions during the year. A committee was formed to review the Transformer Policy and recommendations were made to REB.

At the end of 1988 there were thirty-nine PBSs in various stages of development.

The number of consumers continue to increase and more and more problems are developing in Billing and Accounts Receivable. Computerization still appears to be the answer to the majority of the problems confronting several systems now and more in the near future. A plan should be developed based on the needs of what is to be accomplished, type of system, equipment, expertise of personnel, training, and what is available in the country. NRECA is in the process of securing a Computer System Analyst to conduct a thorough analysis of computer needs.

Rates and others charges, such as transformer rent and meter rent imposed on the consumers are causing an adverse effect in the acceptance of the Rural Electrification Program. A detail study should be conducted on the tariff and other charges based on known requirements such as a Cost to Serve Study.

REB FINANCE

Mr. Roland Heard arrived on the post August 2, 1988 and will serve as REB Finance Advisor. The filling of this post will be an asset to the project as this position has been vacant for approximately four (4) years. Mr. Heard brings with him a vast knowledge of utility financing as his previous assignment was with the REA in Washington, D. C. for the past 25 years as Chief, Technical Accounting & Auditing Staff.

Progress, though slow, is being made on analyzing debt to GOB and Donors. The first facet is to analyze material purchased from foreign suppliers. Analysis of loan receivables from PBSs is also of prime concern.

RATE CELL

The Rate Cell has been running the Coopers & Lybrand Model. This financial model can project the load growth, revenue, expenses, assets, liabilities, and cash flow for a ten year period. The initial stage of inserting data and running the model has been more of an exercise in training than actual analysis and financial planning. As data becomes more available and personnel realize input must come from PBS and REB personnel, the financial planning and forecasting will become a valuable tool with which to manage. The next large aspect of the cell will be to model and forecast REB along with the PBSs.

The recommendation of Coopers & Lybrand Study is that the Rate Cell run financial models and to project the results of operations that are based on various assumptions. These projections are calculated based on a program written by Coopers & Lybrand for financial planning purposes. Because of the change in emphasis in this Cell, we feel that the name should be changed to Financial Planning Cell to better reflect its present and future function.

Careful consideration must be given in selection of personnel to enter computer training as to ability, desire, background, and dependability to stay with the program. Personnel losses after training has begun will be very costly both in waste of funds and delaying of operation.

AUDIT

All PBSs and REB are required to be audited by Chartered Accounting Firms of Bangladesh at the end of each fiscal year. Additional audits are performed by PBS Loans & Audit, and Internal Audit Branch

E. SYSTEM OPERATIONS

SUMMARY OF 1988 OPERATIONS:

System Operations encompasses a wide variety of utility work and it is not the intent of this report to give details on relatively insignificant or routine day to day operations. Some PBS's are approaching 10 years of age while others are relatively new and operating problems vary widely. This report is intended to concentrate on matters which are of general concern from the standpoint of organization, staffing, and training. Also of great concern are the matters of inadequate and unreliable power supply and the widespread theft of energy and line conductors. For most of the PBS's, the change from the initial construction phase to actually operating a system is at hand and entirely new problems arise each day. Conductor and energy theft is widespread and no easy solution is in sight. Routine maintenance of major equipment and lines must be planned for and carried out. Load shedding and inadequate supply voltages by the power supplier, PDB, is becoming a routine thing. Even though this report deals primarily with areas that need improvement, it should not be interpreted to mean that there are only problems. On the contrary, the progress that has been made in the few short years of the program are quite amazing considering obstacles faced in a developing nation such as Bangladesh. Comparisons to systems in the developed nations would be completely out of order at this time but great accomplishments in the Bangladesh Rural Electrification program are obvious.

RECOMMENDATIONS:

As in any organization, review of job responsibilities and staffing is an ongoing process. As one PBS has grown to 23,000 consumers, the Director of REB Operations has recognized that the original organizational structure and staffing may need changing. We recommend that this review and oversight be continued to insure that the operational responsibilities are being met.

Continued effort must be made to solve the serious problem of conductor and energy theft. The REB Operations Director and his staff are working closely with the PBS people on this problem but the solution is not in sight.

Better cooperation between the power supplier (PDB) and REB is an absolute necessity if the rural electrification program is to grow. We recommend that

some way be found whereby REB will be aware of short and long-term generation and transmission planning in order that present problems of load-shedding and inadequate transmission voltage levels can be avoided. Possibly a Joint PDB-REB Engineering and Planning Group could work together for the benefit of the total electrical system in Bangladesh.

DETAIL ON OPERATIONS:

Organization, Staffing, and Training:

The present organizational structure for each PBS allows for one AGM-COM (Asst Gen Mgr-Construction Operations & Maintenance). In the larger PBS's, such as Dhaka with 23,000 consumers, it is becoming apparent that the responsibilities are far beyond the capabilities of any one individual. Disconnects, new connections, and investigations of energy theft are consuming all this individual's time and the important tasks of planning and supervising are suffering. The REB Director of System Operations has proposed that for PBS's with over 15,000 consumers, an additional position of AGM-Engineering would be created. This position would be responsible for many of the duties now assigned to the AGM-COM who would then have more time to adequately supervise the operation of the distribution system. Although specific details of assigned duties must still be worked out, this is a step in the right direction and, hopefully, can be implemented. All operational activities must be continually reviewed to insure that personnel are carrying out their assigned responsibilities and also that they have the training and time necessary to perform what is expected of them.

Training of all operations personnel is continually going on and must continue for the foreseeable future. The formal training programs which have been implemented are excellent but it takes actual field experience to create skilled workers. This field experience takes time and it will be many years before PBS operating personnel develop the skills which are found in the developed countries. Again, it is important to realize that the conditions in Bangladesh - such as travel, communications, etc., are not comparable to developed nations and operating methods must be adapted to the existing situation.

Conductor and Energy Theft:

The problem of conductor and energy theft has been discussed previously in other reports and there has been no improvement in this area. Theft of the neutral conductor from three-phase lines appears to be most prevalent near the larger metropolitan areas but has happened at all PBS's. When the conductor is replaced, it is again stolen. It has been proposed that stolen neutral be replaced with a conductor which would be of no value to thieves but no action has been taken on this matter. Since the cost of replacing the stolen ACSR conductor with something like amerductor would not be significantly more, this suggestion may be worth a try at one PBS.

Meter tampering and energy theft continues to be widespread. Not only is this a financial burden on all consumers of the PBS but is taking most of the time of the PBS personnel trying to investigate and locate theft problems. The problems are being addressed by REB and PBS personnel but no significant progress is being made. System energy losses at least twice what should normally be expected are commonplace. There doesn't appear to be any technical solution - only a change in the social and moral values can have much of an effect.

Power Supply:

As loads at the substations of some of the larger PBSs approach 3 to 5 MVA, significant problems with the PDB power supply are apparent. Incoming 33 kv voltage has been observed to drop as low as 26 kv. Load shedding is becoming more and more frequent. The coordination of system protection devices between PDB and REB is almost non-existent and results in much confusion when line faults occur.

We have been told that there is a study being made of the generation and transmission requirements of PDB. We plan to make an immediate effort to find out the status of this study and to make PDB aware of the power supply problems being experienced by the PBSs. Good historical data on the PBS loads is not available - this will be improved with the installation of the Sangamo electronic meters. Even without actual data, however, we feel that load flow studies with assumed reasonable loads on the system will indicate that the 33kv subtransmission system may be inadequate as of today. If and when the PBS substation loads reach 10 MVA, which they are designed for, the 33 Kv

system will be inadequate unless transmission step-down stations to 33 Kv are all over the country. At any rate, study and analysis will indicate potential problems as the PDB and REB loads grow. Since the construction of generation and transmission facilities require a long lead time (not to mention significant additional investment), we feel that this planning must be expedited. It is entirely possible that a planning group could be composed of both PDB and REB personnel so that the overall interests of the Bangladesh electrical system are taken care of. This same group could be responsible for the overall coordination of the protective devices on both the REB and PBS systems. From our observations of the day-to-day operations, we feel that it is very important that the power supply and transmission system be given immediate attention.

Operations Workshop:

The need for an adequate REB electrical workshop has been discussed in many previous reports but there has been no significant change in the facilities. Even so, commendable work has been and continues to be accomplished by the present workshop staff. Coils have been replaced in several power transformers - a job that most utilities in the developed countries would not undertake as specialized repair shops are available to do such work. That is not the case in Bangladesh so repairs have to be done by the REB or the equipment becomes junk. It is becoming more apparent that it is not practical to transport equipment such as voltage regulators and reclosers to Dhaka for maintenance and repair. Discussion is underway as to the best way to handle all but the most highly technical problems at the PBS site. A good example is the substation voltage regulators - some of which are approaching the 200,000 operations mark - and which will need oil filtering and possible contact replacement in the not too distant future. How can this be done in the field? Mobile filtering equipment and a mobile workshop may be required. Those considerations are being addressed at the present time. We do feel that it is in the best interests of the RE program to have a central REB workshop which is fully equipped and staffed to handle the larger equipment problems and the more sophisticated testing procedures.

A tabulation of work performed in the Dhaka REB workshop for the last year and a total since the workshop was established is given below.

<u>Workshop Activity</u>	<u>1988 Activity</u>	<u>Total to date</u>
Rebuild Power transformers	2	6
OCRs Serviced	25	260
OCR Coil Changes (1)	31	81
Oil Filtered (gallons)	5,625	15,541
Oil Samples tested	424	1,469
Dist. Transformers repaired	23	42
Transformers tested	22	37
Regulators repaired (2)	17	62
Wireless sets Repaired	56	917
Wireless sets Installed	49	223
PBS Meters tested (3)	1,398	5,321
Project Meters tested (new)	1,343	8,630
Flood damaged meters repaired	3,538	3,538

- (1) McGraw Edison Factory Error Correction
- (2) Includes Field Repairs
- (3) Used PBS meters returned for testing

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III. ENGINEERING AND TECHNICAL DEVELOPMENT:

A. Summary

Budget constraints placed by the Government of Bangladesh forced REB to borrow money from the PBSs in order to maintain their construction program. In addition, REB investigated the possibility of using U.S.A. P.L. 480 funds for construction purposes, however this did not materialize during 1988.

Numerous projects were accomplished by the System Engineering and Design Directorate during this reporting period. A REB Substation Standard, Publication 901-1988, was finalized. PBS Instruction 100-45, "Standard Specifications and Drawings for 33 KV Line Construction" was completed. A dual circuit pole top configuration design was initiated and completed. Revisions to PBS Instruction 100-28, Standard Specifications and Drawings for 6.35/11 KV Line Construction" was started and nearly completed. Several new 6.35/11 KV construction drawings were designed, approved and distributed. A number of locally produced material items were reviewed and viable substitutions established. An engineering solution to the stolen neutral problem was advocated. A standard design for 600 foot river crossings was initiated and finalized. Investigation into the economic crossing of rivers in excess of 600 feet was started. The technical system loss for a typical service area was determined. A new concept in electronic metering to be used with computer programs for the purpose of gathering and analyzing electrical parameters was initiated. In conjunction with most of the above points there were numerous memorandums, circulars and reports prepared and formal training classes held.

Twelve (12) substations were completed and the construction of seven (7) substations was continuing at the end of this reporting period. A number of inspection trips were made to the Khulna Warehouse for the purpose of verifying substation material and equipment quantities, plus determining damages incurred during shipping and handling. An area within the Tongi Warehouse was allocated to the Substation Cell where they are now able to store surplus substation material. Several visits were made to Bangladesh by personnel of the substation supplier (HICO). The purpose of these visits was the rectification of a poor meter cabinet design, the investigation of power transformer problems due to poor quality control and the replacement of defective power transformer accessories. Formal training classes on the subject of substation construction were held at the Training Institute.

Line construction for 1988 progressed exceedingly well despite two (2) major natural catastrophes and a severe shortage of 35 foot Class 5 poles. Only minor construction discrepancies were reported by the Consultant's Construction Advisors, however they did report that the quantity and quality of line construction contractor's tools requires attention. A new reporting form for the evaluation of line construction contractors was introduced. This form should solve the inadequate tool problem and, more importantly, aid REB in their determination of contractors performance. Extensive revisions were made to REB Form 341, "Line Inspection Report"; both the format and coding system were changed to make the form more understandable and easier to use.

The material and equipment shipping specification was redesigned; there are now three (3) distinct boxes. Each of the three (3) boxes were designed to accommodate particular pieces of material or equipment. The REB Material Identification Manual was extensively revised and upgraded. Several new line material items have been substituted for those material items that local manufacturers find impossible to manufacture to REB standards. Three (3) new wood species were approved as being acceptable for wood poles. A number of international and domestic pre-shipment and/or post-tender pre-contract factory inspection trips were made by two of the Consultant's engineering personnel. A total of twenty (20) tender documents were opened and awarded during this reporting period.

B. General

The budget of all Government of Bangladesh organizations were curtailed because of the floods. In order to continue construction of PBS electrical systems as near to schedule as possible, REB resorted to the borrowing of funds from the PBSs. These borrowed funds will have to be repaid in the very near future. It is anticipated that construction funds will be curtailed in the 1988-89 and 89-90 GOB/REB budgets. Construction funds are used for payments to construction contractors (civil, line and substation), payments to Local Electrical System Design Consultants and payment to hauling contractors. REB saw, as a solution to the shortfall of construction funds, the possibility that the GOB and the USAID might be receptive to a plan of infusing Title III U.S.A. Public Law 480 funds into the REB construction program. The plan to use P.L. 480 funds for construction was submitted by REB through proper

channels. The plan was accepted by all concerned until the occurrence of the 1988 flood and subsequent cyclone, after which certain quarters in the GOB made a decision to procrastinate on final approval of the plan, therefore to date there have been no P.L.480 funds available to REB.

The U.S.A. Public Law 480 funds may never materialize for REB. This will put in jeopardy the present and future REB/PBSs electrical system construction program, as the REB Annual Development Budget for this and future years, will certainly not be large enough to repay the loans taken by REB from the PBSs, plus be adequate enough to pay for the construction of new lines, substations and the ancillary PBS civil construction projects. At the moment plans have been finalized by REB for 8,000 kilometers of electrical system installations in different PBSs during the construction season of 1989. The major portion of that work will not happen without funds.

The Consultant recommends that the local engineering consultant of each of the original thirteen (13) PBSs initiate an Engineering Construction Master Plan program for a five (5) year, ten (10) year and a fifteen (15) year time range. These plans should correspond to the time frame that is presently being used by the Government of Bangladesh; for example, the range of the GOB Fourth Five Year Plan will be from 1990 to 1995. The objective of these Master Plans is to project the future resource and financial requirements of each PBS, therefore they must be of sufficient detail to support expected system improvements as well as projected system growth.

C. System Engineering and Design Directorate

Several major accomplishments were achieved by this directorate during 1988. Early in the year the REB Substation Standard was completed. This became Volume V of the REB Material and Equipment Standards and is identified as Publication 901-1988. A number of new design features were included into the specification, the principal ones being the provision of being able to upgrade the station from a 5 MVA to a 10 MVA capacity with only relatively minor modifications, the use of electronic multifunction programmable metering, and the utilization of the economical Gilbert/Commonwealth foundation design. Material and equipment revisions or additional specification data, plus clarifications where needed, were also incorporated into the substation standard. Most of the recommendations for additional specification details

and clarifications were made by the REB Substation Cell personnel. A close working relationship has developed between the recently organized REB Substation Cell and the substation design section of SE & D. Field problems are brought to the attention of the design section where the problems are reviewed and discussed. Necessary additional information or clarification is then requested from the substation supplier. A solution is attained, then communicated to all applicable personnel utilizing an official REB circular. The benefits from this concerted effort have been reflected in a Substation Standard that fulfills both the present and future electrical and mechanical design requirements of REB.

The "Standard Specifications and Drawings for 33 KV Line Construction", PBS Instruction 100-45 was completed. The final edition of the manual has a total of thirty-three (33) Construction Assembly Units and eighteen (18) installation or information Guide Drawings. Included in the manual is a design section which details required design criteria that is not found in the "Engineering and Staking Manual", PBS Instruction 100-21. Two new concepts were introduced in this manual; a new conductor size, 477 mcm ACSR to aid in the reduction of technical system losses, and an overhead shield wire to provide the line with ground stroke lightning protection. The manual was formally introduced and reviewed for REB and local engineering consultant personnel at a formal engineering training seminar held at the Training Directorate facilities.

Revisions to the "Standard Specifications and Drawings for 6.35/11 KV Line Construction" manual, PBS Instruction 100-28, were initiated during the year. The revisions take into consideration material consolidation or substitution, plus drawing corrections and/or clarifications were necessary. The final revised manual will also include all of the new Construction Assembly Units and the new Guide Drawings that had been approved since the last manual revision. A major addition to PBS Instruction 100-28 are the five (5) newly designed double circuit pole top assembly units that were completed during the last year. These double circuit construction standards utilize a common pole for two 11 KV distribution circuits thereby achieving a savings in material and right-of-way. As with the 33 KV standards, a written design section detailing the required design criteria plus double circuit considerations which addresses topics pertaining strictly to double circuit construction will be included in the latest revision.

The Consultant's recommendation is that construction manuals of this type be periodically reviewed by a formal committee which should comprise of representative personnel from the System Engineering and Design, System Operations, Equipment and Material Directorates, plus the Superintending or Executive Engineers and perhaps representatives from the local consultant engineering firms. Noted above is the working relationship that developed between SE & D and the Substation Cell and the favorable results derived from this relationship. Unfortunately there is not a field assigned line construction staff whose functions are equivalent to the Substation Cell and therefore the input from other directorates and field personnel is normally limited to specific problems that must be solved. It is a fact that all standards are subject to modification if necessitated due to material availability or substitution. It should also be recognized that standards are subject to change because of field conditions, construction, operations or maintenance problems or simply because someone has a better idea on how to accomplish an objective easier or more economically. In this regard a central standard review committee which would jointly review and discuss suggestions, plus analyze repercussions involved if the suggestion is adopted, can only have a positive effect that would ultimately be advantageous to the rural electrification program as a whole.

In conjunction with the Equipment and Materials Directorate, the SE & D Directorate investigated a number of line material items. Due to local manufacturing problems, preformed type conductor deadend grips were substituted for both the three-bolt guy clamp and the wedge type service conductor grip. For the same reason steel crossarm braces were approved for use in lieu of wooden crossarm braces, plus an idea was promoted wherein standard square nuts could be substituted for locknuts.

The use of an Alumoweld type conductor to replace (and hopefully stop the recurring theft of) missing neutral conductors was advocated during 1988. (Alumoweld is an aluminum covered steel conductor which, if melted, would yield very little pure aluminum). The severity of this problem is such that every time the missing neutral conductors are replaced they are stolen, hence the PBSs have reached the point wherein they have stopped their neutral replacement program. It has always been recognized that to operate a multi-grounded type electric system with portions of neutral conductor missing

is both a public hazard and an operations problem. An Alumoweld conductor was selected with the criteria that the sag characteristics of the Alumoweld will match as closely as possible the sag characteristics of the ACSR phase conductors. To accomplish this a compromise had to be made concerning the electrical characteristics of the Alumoweld. The Alumoweld electrical properties differ somewhat from the ACSR conductors which it is replacing, however, the fact is that any type of conductor installed as a neutral is better than none at all. Several reels of the Alumoweld conductor will be tendered in early 1989, and will be used strictly for neutral replacement purposes.

A total of seven (7) different river crossings were investigated by this directorate during the year, six (6) of which required a special structure design to make the crossing. The special crossing structures utilize a basic design of two 50-4 poles with three 12'-0" crossarms arranged in an H-frame configuration. All materials and hardware required for the structures are in REB stock and readily available. These type of structures are acceptable for river crossings if the banks are at relatively the same level as the river and a span length of 600 feet is not exceeded. As a result of the numerous river crossings that were experienced in 1988 a memorandum entitled "Procedure for Preparing River Crossing Designs" was written in which the necessary criteria required to make a crossing design was stipulated. The memorandum was distributed to the local engineering consultants, then reviewed and discussed at the engineering training seminar that was held at the Training Directorate. Investigation into the possible use of sectional steel poles to solve the problem of river crossings in the range of 1000 feet was started during the year. For isolated areas where an overhead river crossing would be economically unfeasible or physically impossible, the practicality of small MVA capacity wood type substations, or generation if a 33 KV source is not available, was considered. Further research into the solution of river crossings in excess of 600 feet will continue into 1989.

A through system loss study was conducted on the distribution system served by the Dhaka PBS Headquarter's Substation. At the time that this study was performed the total system loss was measured at eighteen and one half percent (18 1/2 %). Calculations established that the technical losses accounted for only seven percent (7 %) of the total system losses. Further research

combined with field observations indicated that the non-technical losses can be categorized under, and are the results of, the following factors: improperly installed metering, meter tampering, inaccurate or no meter records, illegal connections, meter reading mistakes, improper multipliers where current and potential transformers are installed as part of the metering package. It is the opinion of the Consultant that the major portion of non-technical losses is the result of metering tampering in industrial plants with capacities over 250 KVA, plus the recording of incorrect meter readings, and that all of the other non-technical losses as listed above are of little consequence to the total non-technical energy power loss. The SE & D Directorate has taken several measures to reduce system technical losses. Three (3) reports were written and distributed: "Economic Line Design", "Economic Selection of Transformers" and "Capacitor Installation". These reports establish engineering design criteria and provide guidelines which the line designer and the operations personnel can use to design or modify their systems to realize the most economical electric distribution system possible with the material and equipment now available. The reports were reviewed at a formal engineering training seminar held in the fall of 1988 for REB engineers and local engineering consultant personnel. The recommendation of the Consultant is that system loss studies be periodically performed on all PBS substations.

After the Dhaka PBS Headquarter's Substation system loss study was completed it became very obvious that such a study is extremely time consuming and would be virtually impossible to periodically perform on every substation now in the PBS system. The device now utilized to gather the required electric readings of a system is a recording Dranetz System Analyzer. The analyzer is placed on each outgoing circuit of the substation under study, the information is recorded onto a paper tape, then the tape is transcribed by hand onto a spreadsheet. This information must then be entered into a personal computer for analysis or utilized in conjunction with a hand held calculator. To more realistically realize their objective of the determination and reduction of technical losses the SE & D Directorate, in conjunction with the System Operations Directorate, researched the feasibility of using Quantum electronic programmable energy meters. These meters have the provision to directly download the system information it has gathered in the previous sixty (60) days into a hand-held unit which is supplied as an accessory to the meter.

The data thus gathered and stored in the data retriever may then be transferred directly into an IBM or compatible type computer that has the meter manufacturer's system loss analysis program in its memory. The use of this electronic meter-computer system would reduce the time required for system loss studies from what now takes months to just a few hours. The electronic programmable energy meters and the necessary accessories, plus the IBM computers were specified and placed under procurement during 1988. The REB Substation Standard now specifies the socket type electronic programmable energy meters for the 33 KV metering requirements, plus makes provisions for the (temporary) placement of this meter on every 11 KV feeder.

D. Substation Construction:

A total of twelve (12) substations were completed as of 31 December 1988, while construction of seven (7) substations were still in progress. To date the total number of substations completed or now under construction is sixty-six (66) which will provide a combined total capacity of 360 MVA.

During this report period the number of substations test energized were eight (8) and commissioned four (4).

- 1) Six (6) test energized substations are in USAID Project areas. Two (2) test energized substations are in the Mymensingh PBS extension area where the Asian Development Bank (ADB) has funded a tubewell project.
- 2) Two (2) commissioned substations are in USAID Project areas. One (1) commissioned substation is in the extension area under Mymensingh PBS of the Asian Development Bank's (ADB's) funded tubewell project.
- 3) The five (5) substations shown above that were test energized but not commissioned, could not be commissioned due to procrastination on the part of certain personnel working for the Bangladesh Power Development Board.

REB personnel and the consultant Substation Construction Advisor made several trips throughout the year to the Khulna Warehouse. The objective of these trips was to both verify the completeness of recently received substation packages and to document damages incurred for insurance purposes. In general, the packing and crating of material and equipment has improved, however excessive damages are still occurring, especially to voltage regulators. As a

result of the excessive, and for the most part unnecessary, equipment damages that REB has been experiencing (both with substation and line equipment), the Equipment and Material Directorate initiated and developed more stringent shipping box designs. This redesign should alleviate to a greater extent that quantity of equipment being damaged by improper packing, however it is recognized that some amount of equipment will still be received damaged or damaged through improper handling. In most instances the majority of damaged equipment can be fixed; minor repairs on site at the Khulna Warehouse, more extensive repairs at the System Operations Workshop at Dhaka. Even though most equipment can be repaired, a considerable amount of time and equipment is being wasted which could be salvaged if the proper actions are immediately undertaken. A two part solution to this problem is recommended. The first part, and probably the most important, is immediate isolation and proper storage (i.e., out of the elements) of the damaged equipment. Second, a more elaborate and better equipped workshop, especially with the capability of handling large substation equipment, should be considered.

The shortage of material and equipment for substations under construction was alleviated when the Substation Cell was allocated space within the REB Tongi Warehouse to store their surplus substation equipment and materials. This will help resolve the frequently occurring construction problem wherein one substation package has an excess of material and another substation package has a shortage of that same material. Excess material from recently completed stations are now brought to the warehouse, inventoried and stored, then issued to the construction contractors when and if required. In the future the excess substation material which is now located within the PBS warehouses will be collected and brought to the Tongi Warehouse location for storage. One obstacle that must still be overcome is the accountability of this extra material. Presently the surplus materials are being received and recorded as chargeable items. These materials have to be thought of as misplaced items; i.e., items which in actuality belong to substation "A" but which were inadvertently shipped to substation "B". It is recommended that the warehouse accounting procedure concerning the receiving and disbursement of extra substation material be reviewed and revised to accurately reflect the condition under which the materials are to be categorized.

At the insistence of REB the substation supplier sent a number of their representatives to Bangladesh to rectify various substation design problems. One major problem that was addressed was the modification of metering cabinets

that were supplied under a number of HICO contracts. The HICO Power Control Design engineers modified one cabinet under the supervision and to the satisfaction of the System Operations Directorate, then proceeded with a program to visit all substations in which the poorly designed cabinet was installed and to modify the cabinet accordingly. The HICO Design Manager of the Small Power Transformer Division made several substation site visitations for the investigation of the several transformer power defects, the most notable being; nitrogen gas leaking from around the 11 KV bushing stud bolts, defective temperature gauges and defective pressure vacuum bleeder valves. As a result of REB's perseverance concerning the correction of the design problem issues, modifications or replacement parts were either supplied or promised. HICO will re-design where necessary and hopefully insist on more stringent quality control for their products.

REB took a number of steps to remedy the substation construction related problems that were divulged during the past year. A training class was held at the Training Directorate facilities wherein Substation Cell personnel and the Substation Advisor reviewed and taught correct construction methods and procedures to the substation construction contractor foremen. Even though only the more common construction problems could be emphasized due to the time constraints placed on this training session, it was felt that all participants benefited from the program. The System Engineering Design Directorate, in conjunction with the Substation Cell issued several clarification and design change circulars. Clarifications were given to those areas in which the substation drawings were either too vague or completely lacked the required information which subsequently forced each contractor to make individual interpretations. A number of design changes were necessitated after taking into account their practicality and consideration of the actual field conditions under which the substations are to be operated and maintained. Both the clarifications and the design changes have been incorporated into the REB Substation Publication and the conceptual substation design drawings for future tender purposes. In addition to the above, the Substation Advisor began filming a series of video tape sequences which will depict all stages of correct substation construction. When completed, this presentation will undoubtedly be extremely valuable to all substation construction contractors.

E. Line Construction:

During the year the amount of new REB/PBS line construction and renovation of installed distribution systems taken over from the Bangladesh Power Development Board continued at a relatively steady pace. This pace continued despite the two severe natural catastrophes that occurred and the fact that REB experienced a major material shortage. The 1988 flood exceeded the magnitude of any that had previously occurred in the recorded history of Bangladesh. A cyclone then followed in the wake of the flood. Both of these calamities caused comparatively minor damage to the REB/PBS distribution system and a slight disruption of the construction schedule. The principal material shortage that slowed down construction was the non-availability of 35 foot class 5 poles.

The 35-5 is the nominal pole length and class that is used on 11 KV substation exit lines and most equipment installations. The availability of 35-5 poles is of major importance in maintaining the construction continuity of any given PBS because of the fact that percentage wise backbone lines and equipment locations account for approximately thirty-five percent (35%) of all PBS installations. A series of unfortunate circumstances led to REB's 35-5 pole shortage problem. Several unavoidable occurrences caused an REB supply contractor/manufacturer of 35-5 poles to delay both the cutting and treatment process of the wood. In addition to this certain wood inspectors who were under contract to REB did not fully live-up to the spirit of their contracts which only further impeded the pole manufacturer's production schedule. Upon realization of their predicament REB immediately took steps to remedy the shortage problem; they requested all wood supply contractors that were then under contract to speed up delivery of 35-5 poles, then they issued a directive stating that under certain specified conditions it is permissible to substitute a 30-5 pole for a 35-5 primary voltage line pole. In the future, REB will make every effort to have a wood inspector under contract and ready to perform his duties immediately after the wood supply contract is finalized. This will make the manufacturer's work easier, faster and subsequently they should be able to complete delivery in a much shorter time.

A major concern of the donors is the quality of electrical systems designed, installed and operated within their project funding areas. As previously noted, the construction of new distribution systems has progressed

exceedingly well during this report period. Most line construction contractors have reached, or in some instances exceeded, their quota of line construction for the fiscal year. The Consultant's Construction Advisors (Field) have been encountering only minor construction related problems and have found that for the most part the REB/PBS construction contractors are adhering to the PBS Instruction 100-28, "Specifications and Drawings for 6.35/11 KV Line Construction"

The program that was implemented toward the end of 1986 wherein one of the Consultant's personnel attends or teaches courses at the REB Technical Training Institute, continued throughout 1988. These courses covered most engineering aspects of a distribution system such as the planning and design, construction methods and procedures. The attendees included appropriate REB personnel, local engineering consultant personnel, PBS lineman, contractor linemen and contractor foremen. The Consultant's Construction Field Advisors participated in all of the Lineman Training Courses held at the Technical Training Center this year. The attending linemen received valuable "hands-on" practical training and took part in a two-way exchange of information concerning new or different ways versus old methods of construction procedures or construction problem solving. This type program is deemed most beneficial to all concerned. Unfortunately, as noted in other sections of this report, practical lineman's training has been curtailed since the site previously used for field exercises was recently dismantled on orders from the GOB. REB has not yet been allocated a new site on which linemen may practice their skills and thus obtain the agility and expertise to fulfill the needs of their vocation. REB's ability to maintain personnel with high levels of expertise and a will to satisfactorily perform their work is the result of its Training Program. The excellence of REB's Training Program must not be permitted to deteriorate; it must be maintained, enhanced and expanded. REB, without its ability to train personnel, will become "just another organization in Bangladesh that will not be able to attract needed development funds and will subsequently become stagnant".

A new form entitled "Contractor Evaluation Form" was introduced during the last part of 1988. The purpose of this form is the monitoring of a line contractor's overall performance. A number type of rating system (0 = very poor, 4 = excellent) is used to evaluate the quality of workmanship and the

quality/quantity of construction crew personnel. A checklist is also provided which lists the necessary construction tools and the required quantity. There is also space beside each tool on the list for the inspector to evaluate the quality of the tools. The form is to be completed on a quarterly basis by the Local Consultant Engineer and the Executive Engineer, then sent to the REB Chief Engineer for his perusal.

REB Form 341, "Line Inspection Report" was extensively revised to simplify the task of formal line inspections. This form is to be used to verify the correctness of new construction and to report discrepancies on existing overhead primary lines, secondary lines or service drops which require rectification. It should be noted that the old Line Inspection Report fell into disuse probably due to the fact that the form required a special coding system which was unwieldy and confusing. The benefits that will be derived from the proper utilization of the two forms described above are self evident.

The following data compares the progress of REB line construction activities for the past year (1988) to the total installations made by REB in nine (9) previous years (January 1979 to January 1988).

1. POLES ERRECTED (NEW AND RENOVATED)

<u>Prior to 1988</u>	<u>1988</u>	<u>Total</u>	<u>Percent Increase</u>	<u>Donor/Phase</u>
157,670	12,946	170,616	8	USAID-I
30,300	12,011	42,311	40	USAID-II
59,182	11,567	70,749	20	KFAED
54,152	11,635	65,787	21	IDA-I
7,997	3,972	11,969	50	FINLAND
7,293	2,179	9,472	30	ADB-EXT.
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TOTALS: 316,594	54,310	370,904	17	ALL DONORS

2. METERS OF POLE LINE (NEW AND RENOVATED)

<u>Prior to 1988</u>	<u>1988</u>	<u>Total</u>	<u>Percent Increase</u>	<u>Donor/Phase</u>
11,857	756	12,613	6	USAID-I
1,976	909	2,885	46	USAID-II
4,000	948	4,948	23	KFAED
3,055	1,170	4,225	38	IDA-I
619	292	911	47	FINLAND
621	233	854	38	ADB EXT.
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TOTALS: 22,128	4,308	26,436	19	ALL DONORS

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3. KILOMETERS OF UNDERBUILD LINE (NEW AND RENOVATED)

<u>Prior to 1988</u>	<u>1988</u>	<u>Total</u>	<u>Percent Increase</u>	<u>Donor/Phase</u>
1,559	114	1,673	7	USAID-I
241	94	335	39	USAID-II
575	150	725	26	KFAED
535	295	830	55	IDA-I
60	37	97	62	FINLAND
18	7	25	39	ADB EXT.
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TOTALS: 2,988	697	3,685	23	ALL DONORS

4. KILOMETERS OF SERVICE DROP (NEW AND RENOVATED)

<u>Prior to 1988</u>	<u>1988</u>	<u>Total</u>	<u>Percent Increase</u>	<u>Donor/Phase</u>
1,998	441	2,439	22	USAID-I
80	65	145	81	USAID-II
602	206	808	34	KFAED
131	245	376	187	IDA-I
27	57	84	211	FINLAND
6	8	14	133	ADB EXT.
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TOTALS: 2,844	1,022	3,866	36	ALL DONORS

5. TOTAL KILOMETERS OF ALL LINES ENERGIZED (NEW AND RENOVATED)

<u>Prior to 1988</u>	<u>1988</u>	<u>Total</u>	<u>Percent Increase</u>	<u>Donor/Phase</u>
13,989	631	14,620	5	USAID-I
1,652	1,131	2,783	68	USAID-II
4,498	1,329	5,827	30	KFAED
1,993	1,570	3,563	79	IDA-I
288	714	1,002	248	FINLAND
280	337	617	120	ADB EXT.
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TOTALS: 22,700	5,712	28,412	25	ALL DONORS

6. TOTAL NUMBER OF CONSUMERS CONNECTED IN NEW AND RENOVATED SYSTEMS

<u>Prior to 1988</u>	<u>1988</u>	<u>Total</u>	<u>Percent Increase</u>	<u>Donor/Phase</u>
194,019	21,313	215,332	11	USAID-I
14,220	11,490	25,710	81	USAID-II
55,327	12,529	67,856	23	KFAED
32,665	14,569	47,234	45	IDA-I
2,068	2,057	4,125	99	FINLAND
0	0	0	0	ADB EXT.
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TOTALS: 298,299	61,958	360,257	21	ALL DONORS

The percentage increases noted in the above six (6) categories of construction are summarized below:

1. Poles Erected	17 % Increase
2. Kilometers of Pole Line	19 % Increase
3. Kilometers of Underbuild	23 % Increase
4. Kilometers of Service Drop	36 % Increase
5. Kilometers of Line Energize	25 % Increase
6. Number of Consumers	21 % Increase

By averaging the above noted percentages, it can be assumed that the REB/PBS electrical systems increased by approximately twenty four percent (24 %) during the year covered by this report and as noted above in the proceeding paragraphs, much of that construction was paid for by REB with funds borrowed from PBSs.

F. Equipment and Material Directorates

Past experience of REB has shown that material and equipment incur considerable damage in shipping and handling. To help rectify this mostly unnecessary problem the Equipment and Material Directorate decided to redesign the material and equipment shipping boxes. In 1988 three new designs were completed and approved by REB for insertion into all future tender documents. Each shipping box specification depicts a pictorial representation of the box, the placement and size of wooden members, plus banding and marking requirements. Listed on each box design are the specific pieces of material or equipment for which the box is to be utilized. These shipping specifications are sufficiently detailed so that now there can be no doubt in the mind of the shipper exactly what is required from REB, hence REB can now more strictly enforce their shipping and marking policy.

The REB Material Identification Manual was extensively revised and updated, printed and issued during 1988. This manual lists every piece of material and equipment that is being or has been procured by REB. In the revising of this manual all material and equipment identification numbers were either verified for correctness and/or were assigned standardization numbers. Pictorial representations were used when deemed necessary for the clarification of

material/equipment identification. As this manual is a key component in the ordering, handling, storing and utilization of all material and equipment, its revision, updating, verification and standardization can only be considered as a major accomplishment which will prove invaluable to its users.

This directorate was directly involved with determining the use and practicality of a number of line material items and linemen's tools. It was realized during the year that neither Bangladesh nor India are capable, or have extreme difficulty manufacturing certain material items. Samples of these items were tested and failed to meet the quality and performance standard that REB demands. In keeping with the concept that REB must strive to purchase locally produced products as much as possible, an alternate solution to the manufacturing of problem material items was sought. Investigation revealed that substitution of certain problem material items for items which can be easily and readily manufactured in the area could be made without jeopardizing the mechanical or electric integrity of the REB distribution system. The following list illustrates the substitutions made during this reporting period: a preformed type guy grip for the three-bolt type guy clamp, a preformed conductor grip for the wedge type conductor grip used for service drops, steel crossarm braces for wooden crossarm braces, standard square nuts for locknuts. The Consultant commends and recommends the continuation of the efforts of REB for their cooperation and assistance with local manufacturers in their pursuance in establishing manufacturing standards to meet and maintain the quality of international standards. The Consultant also recommends that REB not waiver from their high quality material and equipment standards for the sole purpose of justifying the procurement of locally produced items.

A number of international and domestic trips were made by the Consultant's Engineering Advisor and the Construction Design Engineer. The purpose of these trips was material and equipment pre-shipment inspections and/or post-tender pre-contract factory inspections. The observations and recommendations of these inspections were presented to, discussed at, and final decisions made by, the REB International Tender Evaluation Committee. A recommendation from the Consultant is that REB personnel become more involved in international factory inspections to familiarize themselves with inspection procedures and gain the expertise necessary to conduct meaningful investigations.

Other accomplishments completed in 1988 include: three new wood species from designated countries were included in the REB Wood Products Standard as being acceptable for wood product use, and the review, revision and finalization of the "boiler plate" portion for both USAID and IDA tender documents.

Listed below are the tenders which were opened and on which contracts were awarded during this reporting period.

<u>Donor Lender</u>	<u>Bid Package Number</u>	<u>Opening Dates</u>	<u>Remarks</u>
USAID/0054	11	09-MAY-88	Conductor, Connectors, Meters, Sectionalizing Devices, Distribution Equipment.
USAID/0054	12	09-MAY-88	Treated Wood Products.
ADB	10	27-APR-88	Treated Wood Products.
ADB	11	27-APR-88	Line Hardware.
IDA/1262	15	01-JUN-88	Treated Wood Products.
IDA/1262	16	01-JUN-88	Line Hardware, Insulators, Conductor and Connectors.
IDA/1262	17	01-JUN-88	Metering Equipment.
IDA/1663	12	03-JUL-88	Line Material.
IDA/1663	13	03-JUL-88	Distribution Equipment.
IDA/1663	14	05-JUL-88	Line Tools, Transportation Equipment.
IDA/1663	15	05-JUL-88	Treated Wood Products.
IDA/1663-BD	B-10	05-APR-88	Anchor Logs.
IDA/1663-BD	B-11	05-APR-88	Line Hardware.
IDA/1663-BD	B-12	09-MAY-88	Treated Wood Products.
IDA/1633-BD	B-13	06-JUN-88	C.T. Connectors.
IDA/1633-BD	B-14	12-SEP-88	Line Hardware.
KFAED	16	26-JUN-88	Distribution Transformers.
KFAED	17	26-JUN-88	Anchor and Stabilizer Logs.
FINLAND	B-1(FIN)	29-JUN-88	Conductor and Insulators.
FINLAND	B-2(FIN)	29-JUN-88	Treated Wood Products.