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PHILIPPINE RURAL ELECTRIFICATION REVISITED

by

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In the 1950s, electric power cut across middle America and reached the most rural parts of the U.S. [USAID 1976 p.17]. While not exactly catching up with U.S. development, Philippine Congress in the early 1960s passed a law to provide rural electrification, and in 1969 Republic Act No. 6038 created the National Electrification Administration (NEA). In 1970, NEA drafted a program which schedules the total electrification of the countryside on a 24 hour daily basis by 1990.

Before mid-1970s, however, events have changed important parameters; the "oil crisis", for one, escalated energy prices. In addition, capital funds for rural electrification, including concessional foreign loans, have started to become scarcer [USAID 1976, Annex M]. Yet it was estimated that the whole electrification program needs around ₱12 billion (as of February 1973 [CRC 1973, p.2]) and the NEA program for 1978-82 alone would today cost about ₱2.7 billion. Such conservative estimate of capital costs may not even include the investment requirements of the National Power Corporation (NPC) of about ₱48.9 billion ($6.1 billion) for FY 1976-85. Thus a review of rural electrification is in order.

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This paper attempts to estimate the Present Social Value (PSV), the Present Private Value (PPV), and the Business Enterprise Rate of Return (BERR) of electric projects under various assumptions. This paper is divided into several sections. The first section presents electrification before the NEA program was launched. Second, the NEA Program is reported followed by a report on its development. The next two sections discuss the methods, assumptions, and data used in the estimation of private and "social" profits. And, in the sixth section, the PPV, PSV, and BERR are estimated; and the last section evaluates the NEA implementation.

Electrification Before the NEA Program

Before the advent of NEA-cooperatives, private firms and government utilities have supplied electricity in the country, including the rural areas. In 1971, there were about 479 electric utilities. These and some industrial firms operated 896 electric generating plants with a total capacity of 2,314,868 KW. The Manila Electric Company (MERALCO), the biggest electric utility, accounted for 1,191,000 KW or 51 percent. The 193 members of the Electric Plant Owners Association (PEPOA), an organization of private utilities, operated plants with a total capacity of 216,585 KW or 9.3 percent, while the 151 non-PEPOA private utilities have a total of

20,925 KW or only .9 percent of the country's total. In contrast, the state owned National Power Corporation (NPC) generated electricity on 591,990 KW capacity plants which comprised about 25.6 percent of the total; and the municipal-owned utilities generated electricity from plants with 22,750 KW total capacity which was 1.0 percent of the country's. Presumably, the unaccounted 282,414 KW or 12.2 percent of the country's capacity were owned by industrial firms.

Except MERALCO and NPC, almost all utilities operated plants of small capacities. Table 1 summarizes the distribution of plant capacity as of 1971. Two hundred eighty-four plants have individual capacity of less than 50 KW, 232 plants of 50-99 KW, 231 plants of 100-499 KW, and 128 plants have capacities ranging from 500-9,999 KW. Only 21 plants, which accounted for 86.3 percent of total capacity, have more than 9,999 KW of individual capacity.

In terms of plant types, there were 21 thermal plants, 18 hydro plants and 857 internal combustion engine-driven plants. The thermal plants have 1,247,955 KW capacity or 53.9 percent of the total, hydro plants could generate 607,051 KW or 26.2 percent of total capacity, while the internal combustion engines could account 459,927 KW or 19.9 percent of total capacity.[1/]

[1/] For more details, refer to NEA 1971, CRC 1973, and PDC 1973.

Table 1 -

TYPE/SIZE/NUMBER/INSTALLED CAPACITIES, AND OWNERSHIP
OF POWER GENERATING PLANTS IN THE PHILIPPINES
(As of June 30, 1971)

Plant Size (KW Capacity)	NUMBER OF PLANTS				Installed
	Thermal	Hydro	Int. Comb. Engines	Total	Capacity (K
Smaller than 50	-	-	284	284	6,674
50 - 99	-	1	231	232	15,549
100 - 499	2	3	226	231	50,897
500 - 999	5	2	46	53	35,850
1,000 - 4,999	8	5	50	63	122,687
5,000 - 9,999	-	1	11	12	85,016
10,000 and Larger	6	6	9	21	1,998,195
T O T A L	21	18	857	896	2,314,868

Ownership	TYPE OF PRIME MOVER			Tota
	Thermal	Hydro	Int. Comb.	(kilowa
GOVERNMENT: National	-	587,850	4,140	591,9
Municipal	-	3,000	19,750	22,7
Sub Total	-	590,850	23,890	614,7
PRIVATE: Meralco	1,176,000	15,000	-	1,191,0
Others	71,955	1,201	436,037	509,1
Sub Total	1,247,955	16,201	436,037	1,700,1
T O T A L	1,247,955	607,051	459,927	2,314,9

SOURCE: National Electrification Administration Annual Report for the Year Ended June, 1971.

Moreover, Table 2 summarizes the provincial and regional distribution of installed capacity and capacity per thousand.[2/] At a glance, capacity was unevenly distributed across regions and provinces. Southern Tagalog, with the Greater Manila Area (GMA) and Rizal province, have shared the greatest KW capacity of 54.8 percent of total, while Cagayan Valley has only .2 percent. By provincial capacity, Rizal province, which included GMA, expectedly accounted for the highest share of 50.8 percent. Most provinces shared less than one percent each of the total country's capacity. At the bottom, Ifugao and Quirino did not have any share.

In terms of capacity per thousand population, Southern Tagalog registered the greatest capacity of 152.3 KW per thousand, Northern Mindanao ranked second with 102.3 KW per thousand and the Cagayan region has the lowest with 3.0 KW per thousand. In provincial ranking, Mt. Province led with its 1881.7 KW capacity per thousand, Lanao Norte followed with its 438.8 KW per thousand, and Rizal came in third with 323.4 KW per thousand. Manila, alone, had only 192.3 KW capacity per thousand which was the fifth biggest in the country. Provinces without installed plants were, of course, at the bottom. On

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[2/] This does not accurately reflect potential provincial supply since some provinces are provided electricity from the plants installed in other provinces.

TABLE 2

DISTRIBUTION OF ELECTRIC POWER FACILITIES
AS OF JUNE 30, 1971

Region/ Cooperatives	INSTALLED CAPACITY (KILOWATTS) GOVERNMENT NPC & Municipal System	PRIVATE Including Meralco	TOTAL	Percentage Distribution	TOTAL C (KW)/Th Populatio
REGION I - Ilocos Region					
Abra	202	220	422	.02%	2
Benget	3,020	9,925	12,945	.56	49
Ilocos Norte	1,900	360	2,260	.10	6
Ilocos Sur	1,540	308	1,848	.08	4
La Union	200	180	380	.02	1
Mountain Province	175,000	-	175,000	7.56	1881
Pangasinan	-	7,300	7,300	.32	5
Sub Total	181,862	18,293	200,155	8.65	66
REGION II - Cagayan					
Batanes	60	-	60	.003	5
Cagayan	390	1,477	1,867	.08	3
Ifugao	No Electric System		-	-	
Isabela	93	2,080	2,173	.09	3
Kalinga-Apayao	105	-	105	.005	0
Nueva Vizcaya	150	641	791	.03	4
Quirino	-	-	-	-	
Sub Total	798	4,198	4,996	.22	2
REGION III - Central Luzon					
Bataan	-	460	460	.02	2
Bulacan	218,000	150	218,150	9.42	260
Nueva Ecija	580	830	1,410	.06	1
Pampanga	400	14,152	14,552	.63	16
Tarlac	-	3,221	3,221	.14	5
Zambales	200	950	1,150	.05	3
Sub Total	219,180	19,763	238,343	10.32	64
REGION IV - Southern Tagalog					
Laguna	36,000	16,221	52,221	2.26	74
Batangas	210	3,235	3,445	.15	3
Cavite	-	514	514	.02	0
Marinduque	435	27,183	27,618	1.19	191
Mindoro Occidental	-	840	840	.04	5
Mindoro Oriental	30	1,322	1,352	.06	4
Palawan	-	335	335	.01	1
Quezon	504	5,454	958	.26	6
Rizal	-	920,000	920,000	39.74	323
Romblon	120	100	220	.01	1
Manila	-	256,000	256,000	11.06	192
Sub Total	37,298	1,231,204	1,268,503	54.80	152

Table 2 (Continued)
DISTRIBUTION OF ELECTRIC POWER FACILITIES
AS OF JUNE 30, 1971

Region/ Cooperatives	INSTALLED CAPACITY (KILOWATTS) GOVERNMENT NPC & Municipal System	PRIVATE Including Meralco	TOTAL	Percentage Distribution	TOTAL CAPAC (KW)/Thousa Population (1
REGION V - Bicol					
Albay	60	5,558	5,618	0.24%	8.34
Camarines Norte	-	1,481	1,481	0.06	5.65
Camarines Sur	2,010	6,181	8,191	0.35	8.64
Catanduanes	610	20	630	0.03	8.89
Masbate	210	700	910	0.04	1.85
Sorsogon	550	1,348	1,898	0.08	4.44
Sub Total	3,440	15,288	18,728	0.81	6.31
REGION VI -Western Visayas					
Aklan	195	1,130	1,325	0.06	5.04
Antique	400	40	480	0.02	1.66
Capiz	90	2,015	2,105	0.09	5.34
Iloilo	950	16,682	17,632	0.76	16.10
Negros Occidental	445	28,732	29,177	1.26	19.40
Sub Total	2,120	48,599	50,719	2.19	14.31
REGION VII - Central Visayas					
Bohol	1,010	7,372	8,382	0.36	12.27
Cebu	1,137	71,185	72,322	3.12	44.26
Negros Oriental	1,070	1,503	2,573	0.11	3.95
Sub Total	3,217	80,060	83,277	3.60	28.04
REGION VIII - Eastern Visayas					
Southern Leyte	175	125	300	0.01	1.20
Leyte	725	6,043	6,768	0.29	6.09
Eastern Samar	414	503	917	0.04	3.38
Northern Samar	510	-	510	0.02	1.67
Western Samar	802	380	1,182	0.05	2.80
Sub Total	2,626	7,051	9,677	0.42	4.06
REGION IX - Western Mindanao					
Sulu	-	1,802	1,802	0.08	5.72
Zamboanga Norte	314	1,140	1,454	0.06	3.56
Zamboanga Sur	6,300	15,044	21,344	0.92	20.64
Sub Total	6,614	17,986	24,600	1.06	13.99

Table 2 (Continued)

DISTRIBUTION OF ELECTRIC POWER FACILITIES
AS OF JUNE 30, 1971

Region/ Cooperatives	INSTALLED CAPACITY (KILOWATTS) GOVERNMENT NPC & Municipal System	PRIVATE Including Meralco	TOTAL	Percentage Distribution	TOTAL (KW)/ Popula
REGION X - Northern Mindanao					
Agusan Norte	30	32,090	32,120	1.39%	1
Agusan Sur	-	1,330	1,330	0.06	
Bukidnon	1,600	2,470	4,070	0.18	
Camiguin	25	115	140	0.01	
Lanao Norte	150,190	3,377	153,567	6.63	4
Lanao Sur	60	2,015	2,075	0.09	
Misamis Occidental	300	4,893	5,193	0.22	
Misamis Oriental	279	41,385	41,664	1.80	
Surigao Norte	1,330	11,500	12,830	0.55	
Surigao Sur	235	57,080	57,315	2.48	2
Sub Total	154,049	156,255	310,304	13.40	1
REGION XI - Southern Mindanao					
Cotabato	270	16,555	16,825	0.73	
South Cotabato	30	13,866	13,896	0.60	
Davao Norte	270	15,885	16,155	0.70	
Davao Sur	2,950	53,875	56,825	2.46	
Davao Oriental	15	1,315	1,330	0.06	
Sub Total	3,535	101,496	105,031	4.54	
GRAND TOTAL	614,740	1,700,193	2,314,933	100.00	

SOURCE: National Electrification Administration Annual Report for the Year Ended 1971

the whole, the total capacity/population was about 63.1 KW per thousand population (as of 1970 census).

With regards to area coverage, MERALCO mostly covered the GMA and its environs. PEPOA utilities served 294 towns and cities, non-PEPOA served 176 towns and cities, and some 121 municipal-owned utilities covered 132 towns and cities. The NPC, on the other hand, has been primarily involved in generating electricity for distribution to other utilities and big industrial firms. On the whole, of the 1432 towns and cities in the country, 716 towns and cities or 50 percent had electric service before the entry of NEA cooperatives.[3/]

Furthermore, Table 3 presents the degree of electrification in terms of town, city and population coverage in 1971. As anticipated, the extent of energization remarkably differed among provinces (and also regions). The percentage of towns electrified varied from zero percent (Ifugao) to 100 percent (e.g., Laguna). Surprisingly, Rizal being the prime province, has towns without electricity. On the whole, about 52.4 percent of the towns and cities have electricity. In terms of population coverage, the provincial population with electricity ranged from zero percent (e.g., Ifugao) to 98 percent (Manila). Rizal province was, like in capacity

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3/ For a complete listing of towns and cities with and without electric service, see NEA 1971 and NEA 1972.

Table 3

DEGREE OF ELECTRIFICATION BY TOWN, CITY AND POPULATION COVERAGE IN 1971

Region/ Cooperatives	Number of Towns and Cities	Percentage of Towns and Cities Electrified	Population (1,000)	Percentage of Population with Electricity
REGION I - ILOCOS				
Abra	22	32.8%	149	11.4%
Benguet	14	36.0	271	28.8
Ilocos Norte	20	30.0	354	15.5
Ilocos Sur	32	25.0	397	8.3
La Union	20	75.0	386	15.0
Mt. Province	10	10.0	96	5.2
Pangasinan	47	83.0	1,428	17.5
Sub Total	165		3,081	
REGION II - CAGAYAN				
Batanes	5	20.0	12	25.0
Cagayan	29	34.0	598	5.0
Ifugao	7	0.0	96	0.0
Isabela	34	24.0	667	5.1
Kalinga-Apayao	15	7.0	140	5.0
Nueva Vizcaya	16	25.0	229	7.9
Sub Total	106		1,742	
REGION III - EENTRAL LUZON				
Bataan	12	83.3	222	39.6
Bulacan	24	100.0	862	22.6
Nueva Ecija	32	81.2	877	13.6
Pampanga	22	100.0	934	38.6
Tarlac	17	100.0	576	28.5
Zambales	14	100.0	353	30.6
Sub Total	121		3,824	
REGION IV - SOUTHERN TAGALOG				
Laguna	30	100.0	720	55.1
Batangas	34	76.0	954	14.2
Cavite	22	100.0	535	52.0
Marinduque	6	83.0	148	10.1
Mindoro Occidental	11	36.0	117	17.9
Mindoro Oriental	15	47.0	338	7.1

Table 3 (Continued)

DEGREE OF ELECTRIFICATION BY TOWN, CITY AND POPULATION COVERAGE IN 1971

Region/ Cooperatives	Number of Towns and Cities	Percentage of Towns and Cities Electrified	Population (1,000)	Percentage of Population with Electricity
Palawan	20	15.0%	246	5.7%
Quezon	48	64.6	1,012	17.8
Rizal	29	96.6	2,930	70.0
Romblon	14	29.0	173	8.7
Manila	-	-	1,371	98.0
Sub Total	229		8,544	
REGION V - BICOL				
Albay	18	67.0	695	6.7
Camarines Norte	12	75.0	271	12.9
Camarines Sur	37	60.0	975	11.1
Catanduanes	11	46.0	167	8.4
Masbate	21	33.0	507	4.1
Sorsogon	16	69.0	440	11.4
Sub Total	115		3,055	
REGION VI - WESTERN VISAYAS				
Aklan	17	53.0	271	9.2
Antique	18	22.0	297	5.1
Capiz	17	29.0	405	6.7
Iloilo	47	44.7	1,204	15.5
Negros Occidental	31	71.0	1,549	15.4
Sub Total	130		3,726	
REGION VII - CENTRAL VISAYAS				
Bohol	47	28.0	702	7.6
Cebu	53	64.0	1,684	24.3
Negros Oriental	31	35.5	719	11.8
Sub Total	131		3,105	
REGION VIII - EASTERN VISAYAS				
Southern Leyte	17	41.0	259	7.3
Leyte	51	47.1	1,144	11.1
Eastern Samar	23	48.0	282	8.2
Northern Samar	23	35.0	315	6.7
Western Samar	23	65.2	455	8.8
	137		2,455	

Table 3 (Continued)

DEGREE OF ELECTRIFICATION BY TOWN, CITY AND POPULATION COVERAGE IN 1971

Region/ Cooperatives	Number of Towns and Cities	Percentage of Towns and Cities Electrified	Population (1,000)	Percentage of Population with Electricity
REGION IX - WESTERN MINDANAO				
Sulu	21	19.0%	438	5.5%
Zamboanga Norte	19	36.8	422	12.8
Zamboanga Sur	33	45.4	1,065	8.1
Sub Total	73		1,925	
REGION X - NORTHERN MINDANAO				
Agusan Norte	11	45.0	286	15.7
Agusan Sur	13	92.0	180	2.2
Bukidnon	19	26.0	427	4.2
Camiguin	5	60.0	56	12.5
Lanao Norte	19	57.9	360	15.8
Lanao Sur	29	6.9	468	3.4
Misamis Occidental	16	62.5	329	18.5
Misamis Oriental	26	80.8	487	21.4
Surigao Norte	26	42.3	249	17.7
Surigao Sur	18	50.0	269	7.1
Sub Total	182		3,111	
REGION XI - SOUTHERN MINDANAO				
Cotabato	35	49.0	1,170	6.2
South Cotabato	15	46.7	480	10.0
Davao Norte	19	47.6	455	5.1
Davao Sur	14	43.0	809	19.5
Davao Oriental	11	46.0	255	6.3
Sub Total	94		3,169	
T O T A L	1,484	52.4%	37,739	22.6%

SOURCE: National Electrification Administration Annual Report for the Year Ended June, 1971.

ranking, the leading province having about 70 percent of its population benefiting from electricity. Many provinces have less than 10 percent of their population with electric supply. To be sure, the interprovincial degree of electrification was much affected by the installed capacities in the provinces.

To sum up, of the 38 million total population in 1970, about 8.54 million or 22.5 percent had electric service. Of the 8.54 million served with electricity, 4.32 million or 50.7 percent were in GMA, 1.66 million or 19.4 percent lived in other urban areas, while 2.56 million or 29.9 percent resided in the rural areas. In other words, in the rural areas where 70 percent of our people live 86.7 percent of the families did not receive electric service during the pre-NEA period.

To give a regional consumption picture Table 4 shows the estimated kilowatthour (KWH) consumption and per customer consumption in various regions in 1970. Perhaps because of the differences in installed capacities and degree of energization among regions, regional consumption also differed significantly. GMA shared the highest in electric consumption of about 58.9 percent of the total, while Cagayan Valley shared only .1 percent of the country's total consumption of 7,944.6 million KWH in 1970. In per customer consumption, again GMA led with 8,759 KWH per customer, while Cagayan Valley has only 519 KWH per customer, the lowest in the Philippines.

Table 4

REGIONAL CONSUMPTION AND CONSUMPTION PER CUSTOMER OF ELECTRICITY IN 1970

	CONSUMPTION			
	Million KWH	Regional Distribution	Increase 1960-1970	KWH Per Customer
Manila and Suburbs	4,686.0	58.9%	12.4%	8,759
Ilocos-Mt. Province	54.0	0.7	7.2	1,742
Cagayan Valley	4.2	0.1	5.3	519
Central Luzon	260.0	3.3	21.1	1,486
Southern Luzon	237.0	2.9	20.4	2,116
Bicol	35.2	0.4	13.2	951
Total Luzon				5,869
Western Visayas	108.0	1.4	15.1	1,928
Eastern Visayas	175.0	2.2	16.9	2,035
Total Visayas				1,993
Southwestern Mindanao	189.0	2.4	21.4	2,779
Northwestern Mindanao	44.2	0.6	16.0	1,473
Total Mindanao				2,380
Total Utilities	5,792.6	72.9	13.2	
NPC Sales to Non-Utilities	627.0	7.9	11.8	
Self-Generating Industries	1,526.0	19.2	8.4	
Total Philippines	7,944.6	100.0%	12.2%	6,975

SOURCE: Center for Research and Communication Proceedings of the Makiling Industrial Conference on Electric Power, February 6, 1973.

In rural areas, the residential, vis-a-vis commercial and industrial customers consumed almost all electricity generated and/or distributed by electric utilities (CRC 1973). As noted, rural electric service was usually for lighting purposes only during the period between dusk to midnight (NEA 1972). Many if not all rural customers were on a minimum monthly flat rate (PDC 1973). Thus the minimum flat residential rates on the first KWH consumed could reflect the average prices of rural electricity.

Table 5 summarizes the highest and average monthly flat rates in various provinces and regions during the early 1970s. In regards to the highest monthly flat rates, Southern Tagalog has the highest rate of ₱27.50 which was the rate in Mindoro Oriental. In contrast, Ilocos Region has the lowest rate among the regions; having its highest monthly rate of ₱6.00. In terms of average rates, utilities in Eastern Visayas region charged the highest average of ₱8.87 flat monthly rate while Ilocos has the lowest average rate of ₱5.43 per month. By province, Mindoro Oriental has the highest rate of ₱27.50 per month while Lanao del Norte and Misamis Oriental have utilities with the lowest rate of ₱4.00 which was the highest monthly rate in the province. In terms of average rates, again Mindoro Oriental charged the highest average ₱17.50 monthly flat rate; while Lanao del Norte and Misamis Occidental, the lowest of ₱4.00 per month.

Table 5

REGIONAL AND PROVINCIAL
HIGHEST AND AVERAGE MONTHLY FLAT RATES OF
PRIVATE ELECTRIC UTILITIES

	Highest	Average
I. ILOCOS REGION	6.00	5.43
Ilocos Norte	6.00	6.00
Ilocos Sur	6.00	6.00
La Union	6.00	5.19
II. CAGAYAN VALLEY	8.65	6.44
Cagayan	6.00	6.00
Isabela	8.65	7.33
Nueva Viscaya	6.00	6.00
III. CENTRAL LUZON	16.35	5.44
Bataan	7.50	5.88
Bulacan	8.40	5.86
Nueva Ecija	11.25	5.69
Pampanga	9.00	5.25
Pangasinan	8.00	5.09
Tarlac	5.00	4.37
Zambales	16.35	8.78
IV. SOUTHERN TAGALOG	27.50	6.65
Rizal	13.00	7.09
Batangas	10.00	5.55
Cavite	6.60	6.10
Laguna	16.00	8.50
Quezon	12.00	7.07
Mindoro Occidental	6.00	6.00
Mindoro Oriental	27.50	17.50
Marinduque	6.00	6.00
V. BICOL REGION	9.00	6.32
Sorsogon	7.50	6.13
Albay	8.00	6.00
Camarines Norte	6.00	6.00
Camarines Sur	9.00	6.71
VI. WESTERN VISAYAS	13.20	6.83
Iloilo	6.50	5.83
Negros Occidental	13.20	7.74
Antique	10.50	7.12
Capiz	5.50	5.50
Aklan	6.00	6.00
Negros Oriental	8.00	6.62

Table 5 (Continued)

REGIONAL AND PROVINCIAL
HIGHEST AND AVERAGE MONTHLY FLAT RATES OF
PRIVATE ELECTRIC UTILITIES

	Highest	Average
VII. CENTRAL VISAYAS	6.60	5.49
Bohol	6.00	4.83
Cebu	6.60	5.88
VIII. EASTERN VISAYAS	15.00	8.87
Leyte	8.70	6.68
Southern Leyte	9.00	9.00
Eastern Samar	15.00	15.00
Western Samar	11.40	11.40
IX. NORTHERN MINDANAO	17.55	6.67
Agusan del Norte	7.70	5.58
Bukidnon	6.00	6.00
Lanao del Norte	4.00	4.00
Lanao del Sur	7.95	7.95
Misamis Occidental	6.00	5.53
Misamis Oriental	4.00	4.00
Surigao del Sur	7.95	6.65
Surigao del Norte	17.55	9.85
Agusan del Sur	10.50	8.15
X. SOUTHERN MINDANAO	9.00	6.87
Cotabato	7.50	7.50
South Cotabato	6.50	6.17
North Cotabato	9.00	7.50
Davao del Norte	7.80	6.60
Davao del Sur	9.00	7.50
Davao Oriental	9.40	6.80
XI. WESTERN MINDANAO	11.70	7.62
Zamboanga del Norte	6.79	6.79
Zamboanga del Sur	11.70	8.85
Sulu	6.00	6.00

SOURCE: Board of Power and Waterworks.

With respect to industrial consumptions, the poblaciones and cities consumed the highest shares. Of the total industrial electricity used, MERALCO accounted about 36.4 to 46.7 percent in 1960-70, NPC industrial sales were about 14.5 to 17.1 percent and self-generating industries shared about 39.3 to 47.5 percent during the period. Most industrial electric consumption outside of GMA was accounted for by self-generating private firms.

Table 6 indicates wide differences in industrial electric consumption by provinces during 1970. Sorsogon and Antique, for instance, did not register any industrial consumption while Rizal including Manila consumed more than one million KWH (43.9 percent of total industrial electricity). Likewise, industrial energy productivity, measured by ratio of value-added to energy input, varies across the country. Table 6 also presents the provincial industrial energy productivity in 1970, and indicates that it varied across provinces. Nueva Vizcaya registered the most productive energy use with ₱35.27 of value-added per KWH while Lanao Norte produced only ₱0.31 of value-added per KWH. Regionally, energy productivity differentials appeared narrower. The Bicol region displayed the highest value-added energy ratio of ₱12.60 per KWH, while Ilocos region has the lowest of ₱0.36 per KWH. On the whole, the energy productivity was estimated

Table 6

CONSUMPTION AND PRODUCTIVITY OF INDUSTRIAL ELECTRICITY IN 1970

Region/Provinces	Value-Added (₱1000)	Electricity Consumed (1000KWH)	Distribution of Consumption	Energy Productivity (Peso/KWH)
ILOILO*	45,991.1	33,750.6	1.24%	₱ 0.36
Benguet	10,630.4	2,440.8	0.09	4.36
La Union	21,458.5	30,088.8	1.10	0.71
CAGAYAN VALLEY**	25,802.5	49,657.6	1.82	0.52
Cagayan	12,209.7	49,006.3	1.80	0.25
Isabela	9,054.1	522.6	0.02	17.33
Nueva Vizcaya	4,538.7	128.7	0.01	35.27
CENTRAL LUZON	503,282.2	483,198.3	17.71	1.04
Bataan	89,927.9	188,495.3	6.91	0.48
Bulacan	306,965.4	241,724.8	8.86	1.20
Nueva Ecija	1,806.4	121.0	0.004	14.93
Pampanga	60,435.5	19,438.1	0.71	3.10
Pangasinan	12,983.9	21,742.0	0.80	0.60
Tarlac	30,416.0	11,583.3	0.42	2.63
Zambales	747.1	93.8	0.003	7.96
SOUTHERN LUZON	3,249,944.9	1,121,200.2	41.09	2.90
Batangas	385,029.6	77,815.2	2.85	4.94
Cavite	48,507.4	9,368.7	0.34	5.15
Laguna	105,484.4	32,514.6	1.19	3.24
Palawan	174.4	0.0	0.00	-
Quezon	32,246.9	11,751.2	0.43	2.74
Rizal	2,678,502.2	989,750.5	36.27	2.70
MANILA	675,540.0	207,451.9	7.60	1.12
BICOL	10,070.0	799.2	0.03	12.60
Albay	2,953.0	226.0	0.01	13.07
Camarines Sur	6,727.8	436.2	0.02	15.42
Sorsogon	0.0	0.0	0.00	-
WESTERN VISAYAS	623,783.0	125,996.0	4.62	4.89
Antique	38.7	0.0	0.00	-
Iloilo	49,613.1	14,565.6	0.53	3.13
Negros Occidental	547,577.5	106,591.5	3.91	5.12

Table 6 (Continued)

CONSUMPTION AND PRODUCTIVITY OF INDUSTRIAL ELECTRICITY IN 1970

Region/Provinces	Value-Added (₱100)	Electricity Consumed (1000KHW)	Distribution of Consumption	Energy Productivity (Peso/KW
EASTERN VISAYAS	357,502.0	153.657.6	5.63%	2.29
Bohol	1,784.0	330.1	0.01	5.40
Cebu	252,350.7	103,443.8	3.79	2.44
Leyte	39,522.5	6,409.4	0.23	6.17
Negros Oriental	61,866.8	43,471.3	1.59	1.39
NORTHERN MINDANAO	267,916.6	469,978.1	17.22	0.57
Agusan del Norte	51,629.6	50,078.4	1.84	1.03
Bukidnon	376.4	22.1	0.00	17.03
Lanao del Norte	82,804.6	269,159.9	9.86	0.31
Lanao del Sur	5,486.7	2,492.8	0.09	2.20
Misamis Occidental	8,272.8	4,364.7	0.16	1.90
Misamis Oriental	92,574.1	113,096.8	4.15	0.82
Surigao del Sur	25,077.5	24,525.9	0.90	1.00
SOUTHERN MINDANAO	194,822.5	83,065.5	3.04	2.34
Cotabato	39,050.7	18,836.3	0.69	2.07
South Cotabato	48,193.8	27,746.9	1.02	1.74
Davao del Norte	11,257.0	7,072.6	0.26	1.59
Zamboanga del Sur	27,099.1	9,517.4	0.35	2.85
Davao del Sur	66,894.8	17,463.5	0.64	3.81
PHILIPPINES (TOTAL)	5,954,664.0	2,728,755.8	100.00	2.74

* Including Mountain Province

** Including Batanes

SOURCE: National Census and Statistics Office Manufacturing Division.

at ₱2.74 per KWH.[4/] Needless to say, the differences in energy productivity among provinces may indicate varying profitability in energy uses across the industrial sector.

Rural Electrification Program

In the early 1960s, Philippine Congress passed Regpublic Act No. 2717, a law aimed to provide electricity to rural areas. The Electrification Administration (EA) was formed with a budget of only ₱36 million for over a 7-year period (1962-69) despite an estimated ₱750 million needed to energize 40 percent of the country. The EA installed only 108 electric plants, mostly of the 30-60 KW capacity, serving only one poblacion usually for lighting purposes from dusk to midnight. Due to the very limited budget, the EA program could not substantially electrify the rural areas.

Before mid-1960s, however, the United States Agency for International Development (USAID) entered behind our electrification program. The USAID funded the 1965 national survey on electric power which, as alluded by USAID, started

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[4/] For comparison, energy productivity in 1973 has changed. The changing energy efficiency among provinces may indicate changing factors affecting energy use across provinces. The relative efficiency position, however, of each province has not significantly changed. Rank correlation of energy productivity by province in 1970 vis-a-vis 1973 was estimated at $r_k = .77$ significant at the usual level.

the Philippine rural electrification program (USAID 1976 p. 10).[5/] USAID extended $3.4 million loan to finance the foreign exchange costs of two USAID-recommended pilot cooperatives, namely, VRESCO and MORESCO. To start a national program, a $600,000 USAID loan financed a team of American consultants to prepare the feasibility studies of NEA-cooperatives.

In 1969, Republic Act No. 6038 established the NEA to shape the electrification of the whole country on an "area coverage"[6/] through rural cooperatives. In 1970 NEA drafted a program with three targets: 1) to form at least one electric cooperative in every province by 1977, 2) to complete the electrical backbone systems connecting all towns by 1980 in coordination with NPC, and finally 3) to have total electrification of the country by 1990. NEA-supported cooperatives are expected to primarily distribute and/or generate adequate, low-cost electricity on a 24 hour a day basis. In Phase I of

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[5/] USAID went so far as to claim that when the Philippi rural electrification began "the model that it was patterned after was the experience of the United States in the 1930-1950s when electric power made its way across middle America and reached into the most rural parts of the land". (USAID 1976, p.

[6/] "Area coverage" implies that electricity be provided to all prospective consumers in the franchised area (including the barrios) provided that the extension of electric service does not impair the financial feasibility of the cooperative's entire operation.

the NEA Program implementation, there are eight basic steps at the cooperative level: 1) project feasibility study 2) registration of cooperative 3) loan agreement 4) architecture and engineering (A-E) work 5) bidding 6) construction 7) partial energization, and 8) complete energization. After electrification, Phase II would deal mainly with the profitable use of electricity [NEA 1973-74 p. 25].

On August 6, 1973, Presidential Decree No. 269 created NEA into a public corporation. The decree exempts electric cooperatives from the regulation of the Board of Power and Waterworks and the Securities and Exchange Commission. Also it delegates NEA to repeal, alter, and amend franchises which, in effect, repealed the local governments franchising power. Moreover, it authorizes NEA to have a ₱1 billion capital stock, ₱50 million of which subscribed and paid by the Philippine government and the remaining ₱950 million to be paid in goods and services from: 1) Japanese reparation proceeds, 2) sales and reparations goods, 3) government share proceeds in all electric franchise taxes, and 4) other government funds. Lastly, the decree empowers NEA to borrow from foreign and domestic sources.

Since the start, NEA banks heavily on five sets of USAID Rural Electrification Loans committed to the Philippine government. To start the financial pipeline, in FY 1972 USAID

approved a $19.4 million loan to finance the foreign exchange costs of imported materials and supplies, and the two-year extension of the services of American consultants. In FY 1974, USAID approved its second loan of $18.0 million and in in F.Y 1975 its third loan of $20 million. The terms of USAID loans are very soft at 2 percent interest during the 10 year grace period and 3 percent for the 30 years remaining to maturity. Moreover, USAID granted $3.0 million funds and $6.0 million of U.S. excess property.

Including the loans committed from other foreign sources, like the French loans (thru NPC) of $8.0 million, World Bank loan of $2.3 million, and Japanese Reparations of $7.5 million, the total NEA foreign exchange funds reached $94.8 million as of December 1975. On the other hand, Philippine appropriation stood at ₱775 million or $103 million. Thus, in December 1975 the NEA drew a total funds of $197.8 million.

Table 7 summarizes the planned coverage, costs, and power source of cooperatives under the NEA program, as of December 1976. Estimated project cost per cooperative ranges from ₱0.3 million (for PRESCO) to ₱38.2 million (for Central Negros), with an average cost of ₱14.9 million and a total of

Table 7

SUMMARY OF NEA-COOPERATIVE PROJECTS AS OF 1976

Region/ Cooperatives	Number of Towns and Cities to be Covered	Population to be covered as of 1970 (1,000)	Cost of Projects (₱M)	Cost Per Person	Power Source
REGION I - ILOCOS					
Ilocos Norte	23	343	19.2	₱ 56.00	NPC
La Union	15	309	14.2	46.00	NPC-SG
Abra	12	92	10.5	114.00	NPC
Benguet	8	191	15.0	7.85	NPC
Ilocos Sur	34	385	18.2	47.27	NPC
Mt. Province	8	82	3.9	47.56	SG-NPC
Pangasinan West	9	174	8.3	47.70	NPC
Central Pangasinan	12	458	27.9	60.92	NPC
Sub Total	121	2,034	117.2	57.62	
REGION II _ CAGAYAN VALLEY					
Isabela	9	243	11.3	46.50	NPC
Nueva Viscaya	6	114	6.1	53.51	NPC
Cagayan	12	292	16.4	56.16	NPC
Quirino	5	50	5.7	114.00	NPC
Ifugao	6	87	8.7	100.00	NPC
Kalinga-Apayao	8	82	8.6	104.88	NPC
Sub Total	46	868	56.8	65.44	
REGION III - CENTRAL LUZON					
Bataan	12	216	19.2	88.89	NPC
Bulacan	10	395	35.5	89.87	NPC-MECO
Nueva Ecija South	14	437	33.2	75.97	NPC
Bulacan II	4	73	8.1	110.96	NPC
Nueva Ecija North	13	16	19.0	1,187.50	NPC
Pampanga	13	400	22.2	55.50	NPC
North Tarlac	8	192	7.3	38.02	NPC
Zambales	14	341	20.1	58.94	NPC
South Tarlac	5	163	10.5	64.42	NPC
Lubang I	2	20	3.5	175.00	SG
Pampanga (PRESCO)	19 bo.	18	0.3	16.67	NPC
Sub Total	95*	2,271	178.9	78.78	
REGION IV - SOUTHERN TAGALOG					
Rizal	6	73	11.3	154.79	-
Batangas	14	299	29.1	97.32	NPC
Cavite	10	279	20.4	73.12	MECO
Laguna	11	108	15.4	142.59	NPC
Marinduque	6	144	20.4	141.67	SG

Table 7 (Continued)

SUMMARY OF NEA-COOPERATIVE PROJECTS AS OF 1976

Region/ Cooperatives	Number of Towns and Cities to be Covered	Population to be Covered as of 1970 (1,000)	Cost of Projects (₱M)	Cost Per Person	Powe Sour
Mindoro Occidental	13	400	22.2	₱ 55.50	SG
Mindoro Oriental	15	328	27.7	84.45	SG
Palawan	3	65	8.5	130.77	SG
Rizal (Talim)	2	32	7.4	231.25	MECO
Quezon I	12	287	14.0	48.78	NPC
Quezon II	3	40	6.6	165.00	-
Romblon	7	90	9.3	103.33	SG
Sub Total	102	2,145	192.3	89.65	
REGION V - BICOL					
Albay	12	459	12.4	27.02	NPC
Camarines Norte	11	262	11.7	44.66	NPC
Camarines Sur I	11	235	12.9	54.89	SG-I
Camarines Sur II	10	263	22.1	84.03	SG-I
Camarines Sur III	6	415	12.2	29.40	NPC
Catanduanes I	5	94	6.7	71.28	SG
Sorsogon	13	332	16.8	50.60	SG-I
Masbate	15	375	27.7	73.87	SG
Sub Total	83	2,435	122.5	50.31	
REGION VI - WESTERN VISAYAS					
Aklan	10	170	12.6	27.02	NPC
Capiz	10	210	26.1	124.28	SG
Iloilo	15	368	22.0	59.78	PEC
Iloilo II	17	364	22.9	62.91	SG
Central Negros (CENECO)	4	334	38.2	114.37	SG
Negros Occidental	6	157	23.9	152.23	SG
Antique	8	154	15.4	100.00	PEC
San Carlos, Negros Occidental	4	224	17.9	79.91	-
Sub Total	74	1,981	179.0	90.36	
REGION VII - CENTRAL VISAYAS					
Bohol	9	148	11.1	75.00	SG
Cebu	7	124	10.3	83.06	NPC
Negros Oriental	10	298	22.9	76.85	SG
Siguijor	6	63	6.2	98.41	SG
Negros Oriental II	14	358	36.1	100.84	-
	46	991	86.6	87.39	

Table 7 (Continued)

SUMMARY OF NEA-COOPERATIVE-PROJECTS AS OF 1976

Region/ Cooperatives	Number of Towns and Cities to be Covered	Population to be Covered as of 1970 (1,000)	Cost of Projects (₱M)	Cost Per Person	Power Source
REGION VIII - EASTERN VISAYAS					
Leyte I	15	334	18.2	₱ 54.49	SG
Leyte II	3	229	24.5	106.99	-
Leyte III	9	155	14.8	95.48	LECI
Leyte IV	6	167	14.2	85.03	-
Biliran, Leyte	7	84	7.4	88.10	SG
Leyte Sur	7	141	10.4	73.76	LECI
Northern Samar	6	108	16.7	154.63	SG
Western Samar	4	156	6.1	39.10	SG
Eastern Samar	6	86	10.9	126.74	SG
Samar II	11	173	18.9	109.25	-
Sub Total	74	1,633	142.1	87.02	
REGION IX - WESTERN MINDANAO					
Zamboanga Norte	11	218	13.0	59.63	NPC
Zamboanga Sur	17	410	12.7	30.98	NPC
Zamboanga City	87 bo.	187	12.7	67.91	NPC
Sulu	8	209	12.6	60.29	SG
Alicia, Zamboanga Sur	1	19	0.9	47.37	SG-NPC
Cagayan de Sulu	1	13	0.9	69.23	SG
Tawi-Tawi	2	28	3.9	139.28	SG
Basilan, Zamboanga Sur	3	144	12.1	84.03	SG
Sub Total	43*	1,228	68.8	56.03	
REGION X - NORTHERN MINDANAO					
Agusan Norte	7	241	14.3	59.34	NPC
Agusan Sur	7	115	9.6	83.48	NPC
Bukidnon	19	415	16.9	40.72	NPC
Camiguin	5	54	10.5	194.44	SG
Misamis Occidental	7	132	8.2	62.12	NPC
Misamis Occidental II	8	184	11.6	63.04	NPC
Misamis Oriental(MORESCO)	14	232	15.7	67.67	NPC
Surigao Norte	10	133	13.6	102.26	NPC
Lanao Sur	17	244	14.8	60.66	NPC
Lanao Norte	13	182	9.5	52.20	NPC
Bukidnon II	9	162	16.4	101.23	-
Sub Total	116	2,094	141.1	67.38	

Table 7 (Continued)

SUMMARY OF NEA-COOPERATIVE PROJECTS AS OF 1976

Region/ Cooperatives	Number of Towns and Cities to be Covered	Population to be Covered as of 1970 (1,000)	Cost of Projects (₱M)	Cost Per Person	Pow Sou
REGION XI - SOUTHERN MINDANAO					
Davao Norte	14	419	24.7	₱ 58.95	NPC
Davao Sur	11	317	16.5	52.05	NPC
Davao Oriental	5	153	10.0	65.36	NPC
South Cotabato II	7	213	25.8	121.53	NPC
Surigao Sur	5	111	8.8	79.28	PIC
Cotabato	6	261	12.6	48.28	NPC
Surigao Sur II	10	121	13.8	114.05	NPC
Maguindanao	14	446	20.1	45.00	NPC
Sultan Kudarat	12	208	11.2	53.85	NPC
Cotabato Sur	6	197	13.5	68.53	
Sub Total	90	2,446	157.0	64.19	
T O T A L	890*	20,126	1,442.3	71.66	

NOTE:

* Exclude some barrios

NPC - National Power Corporation
SG - Self Generating
MECO - Manila Electric Company
CAPELCO - Capiz Electric Cooperative
PEC - Philippine Electric Corporation
PICOP - Paper Industries Corporation of the Philippines
LECI - Leyte Electric Cooperatives, Incorporated

SOURCE: National Electrification Administration

₱1.4 billion.[7/] The number of towns (including cities) and persons to be covered differs among cooperatives. Ilocos Sur would cover the greatest number of 34 towns while Zamboanga City, Cagayan de Sulu, and Alicia would only cover one town each. The average coverage is 12 towns out of a total 1,089 towns to be covered.

With respect to population, the coverage noticeably varies from one cooperative to another. Albay, for example, would cover the biggest number of 459,000 persons while Cagayan de Sulu would cover the lowest number of 13,000. On the whole, the total population to be covered would not be less than 20.1 million or not less than 53.3 percent of the country's population or only 68.8 percent of the 29.2 million people without electric service in 1970. Also, the per capita cost substantially differs among cooperatives. Table 7 reveals that per capita cost ranges from ₱7.85 (in Benguet) to ₱1,188 (in Nueva Ecija), with an average of ₱71.7 costs per person to be covered.

7/ Presumably this amount is understated since it may exclude inter-cooperative expenses such as transmission and backbone expenses. As already mentioned, NEA program for 1978-82 alone would cost about ₱2.7 billion (Table 9) and the whole electrification program would cost about ₱12 billion as of February 1973. Obviously, the NPC investment requirements of ₱48.9 billion for FY 1976-85 are not part of the estimated investment costs.

In terms of power source, NPC would supply, partially or totally, most cooperatives in Luzon and in Mindanao. Other cooperatives, particularly in Visayas, are planned to generate all or part of their own electricity. Thirty-one cooperatives are expected to generate, either partially with NPC or totally their own electricity. Not less than 47 cooperatives, nonetheless, depend entirely on NPC for power supply.

With the approval of the fourth USAID loan of $20 million in 1976 plus additional government appropriation, Table 8 reports that the NEA program funding as of October 1977 consists of ₱1 billion peso component and $103.5 million foreign exchange counterpart (World Bank loan excluded). These funds were earmarked to carry out the NEA program up to the end of 1977, at which time the "backbone" systems in 750 towns and cities are expected to operate. As of October 1977, NEA has released ₱662.4 million of peso component and $92.86 million of foreign exchange counterpart. About ₱71.8 million however was used to take over existing franchises in 263 towns and cities having an estimated total cost of ₱113.1 million. In contrast, the $92.86 million counterpart was used to open letters of credit for imported electrical materials.

As of October 1977, the NEA funds have a balance of ₱337.58 million of peso component and only $10.64 million

Table 8

PROGRAM FUNDING OF THE
NATIONAL ELECTRIFICATION ADMINISTRATION
AS OF OCTOBER 31, 1971

Peso Component	Amount	Amount Released	Balance
Presidential Decree No. 269, Section 6:			
a. Japanese Reparation	₱ 17.53M	₱ 17.53M	--
b. Proceeds from sale of JRI	30.00	--	₱ 30.00M
c. General Revenue	535.00	282.15	252.85
d. NEDA-FS/PL 480	130.00	130.00	--
e. Franchise Taxes	60.00	22.15	37.85
f. Additional Allocation Special Activities Fund	177.47	160.59	16.88
Republic Act No. 2717	50.00	50.00	--
	₱1,000.00M	₱662.42M	₱337.58M

Dollar Component	Amount Committed	Letter of Credit	Balance
Japanese Reparation	$ 7.50M	$ 7.50M	--
A I D Loan I	20.00	20.00	--
A I D Loan II	18.00	17.96	$ 0.04M
A I D Loan III	20.00	20.00	--
A I D Loan IV	20.00	9.40	10.60
French Loan	18.00	18.00	--
	$ 103.50M	$92.86M	$ 10.64M

SOURCE: National Electrification Administration.

foreign exchange counterpart. From 1978 to 1982, nevertheless the NEA plans of covering 778 towns or 21,051 barrios or 2.7 million houses would cost about ₱2.7 billion (Table 9). This involves the construction of 63 headquarters and of 57,949 kilometers of backbone, laterals, and transmission lines durin the 1978-82 period.

Obviously, USAID loans are not enough to support the NEA program beyond 1977. In fact, USAID would unlikely approv its last loan of $30 million for whatsoever reasons. As early as 1975, we already started to explore for a $20 million Japanese loan and a $3 million German loan. We also considere applying for a $50 million World Bank loan (or $25 million ADB loan) on a "third window" term (4 1/2 percent interest). If these loans get approved, our government would still provide the additional resources (both local and foreign exchange) needed to push the NEA program. As stated earlier, however, a conservative estimate of around ₱12 billion (as of February 1973) is needed for the electrication of the country (CRC, p. 2).[8/]

8/ Surely this excludes NPC investment requirements during FY 1978-85, which the World Bank estimated at about US$6.1 billion (₱48.9 billion) in current prices, for the construction of generating and transmission facilities (including the acquisition of MERALCO plants). About $4.2 billion (₱31.0 billion) in current prices would have to be borrowed, primarily from foreign sources (World Bank 1976, pp. 512-17).

Table 9

TOTAL COST OF NEA PROGRAM 1978-1982
LOCAL & FOREIGN
(In Million Pesos)

	Region	1978	1979	1980	1981	1982	Total
I.	Ilocos Region	68	62	42	34	39	245
II.	Cagayan	12	46	47	36	38	179
III.	Central Luzon	58	38	32	42	46	216
IV.	Southern Tagalog	91	103	85	70	49	398
V.	Bicol	60	54	43	45	49	251
VI.	Western Visayas	70	56	51	58	60	295
VII.	Central Visayas	36	51	52	49	38	226
VIII.	Eastern Visayas	34	57	54	49	51	245
IX.	Western Mindanao	27	32	28	23	26	136
X.	Northern Mindanao	44	37	37	40	41	199
XI.	Southern Mindanao	21	34	26	31	32	144
XII.	Central Mindanao	28	28	29	33	40	158
	T O T A L	549	598	526	510	538	2,721
	Foreign Costs	292	317	289	301	326	1,525
	Local Costs	257	281	237	209	212	1,196
	Foreign Share	.531	.530	.549	.590	.606	.560

SOURCE: National Electrification Administration.

NEA Electrification

As of October 1977, 111 units of the 123 proposed cooperatives, have complete feasibility studies while 93 cooperatives are already registered. One hundred nine loan agreements have been signed with some cooperatives having more than one loan, while others do not yet have any agreement. Sixty one cooperatives have completed their architecture and engineering (A.E.) phase while 44 finished constructing their headquarters. Also, 25 cooperatives are reported to have constructed their plants, 35 put up their distribution system while 26 are still in the process of installation. Total-installed capacity of NEA-coopratives reached 71 thousand or only 3.06 percent of 1971 capacity. Lastly, though 76 cooperatives are considered energized, only the two pilot projects, MORESCO and VRESCO, are reported to be completely energized.

Table 10 summarizes the status of 98 cooperatives. The status of individual cooperatives pertains only up to the end of 1976 since NEA no longer makes a public report on this. However, the registration and energization dates and the so-called degree of energization refer to NEA's latest report as of December 1977. It is of interest to note that many cooperatives are in their various implementation phases. Twenty-three cooperatives, for instance, were reported to be simultaneously engaged in A-E work, construction, and energization.

Table 10

REGISTRATION AND ENERGIZATION DATES, DEGREE OF ELECTRIFICATION OF COOPERATIVES

Region/Cooperatives	Registration Date	Energization Date	Degree of Coverage as Percentage of Potentia		
			Towns and Cities	Barrios	Hous Connec
REGION I - ILOCOS					
Ilocos Norte	7 July 71	Jan. 73	100%	53%	43%
La Union	6 Aug. 71	Aug. 74	90	64	31
Abra	28 Mar. 72	Apr. 73	100	76	55
Benguet	5 Oct. 73	Nov. 73	100	69	48
Ilocos Sur	24 Jan. 74	28 Apr. 74	76	31	30
Mt. Province	25 May 74	Dec. 74	13	14	4
Pangasinan West	28 Sep. 72	Dec. 75	100	42	17
Central Pangasinan	6 Oct. 75	May 76	100	55	21
REGION II - CAGAYAN VALLEY					
Isabela	24 Mar. 71	1 Nov. 75	100%	52%	15%
Nueva Vizcaya	23 Sep. 72	May 77	17	5	7
Cagayan	25 Nov. 71	15 Dec. 75	67	24	11
Quirino	7 July 77	N.E.	--	--	---
Ifugao	16 May 77	N.E.	--	--	--
REGION III - CENTRAL LUZON					
Bataan	8 Aug. 73	Oct. 73	100%	83%	58%
Bulacan I	11 Mar. 73	July 73	60	87	38
Bulacan II	28 Aug. 76	Feb. 77	100	77	33
Nueva Ecija I	24 Nov. 73	Jan. 74	71	86	30
*Sapang Palay	--	N.A.	--	48	56
Nueva Ecija II	22 Sept.75	Mar. 76	71	20	17
Pampanga	20 Dec. 72	1973	86	80	42
Tarlac	24 Jan. 75	June 75	100	35	28
Zambales	30 Jan. 72	29 Dec. 74	93	81	26
*San Jose City	--	N.A.	100	--	22
Lubang I	4 Jan. 71	N.A.	100	--	97
REGION IV - SOUTHERN TAGALOG					
Batangas II	12 Aug. 77	N.E	--	--	--
Batangas	14 June 72	Dec. 74	77	31	31
Cavite	23 June 73	Jan. 74	60	82	45
Laguna	3 Apr. 73	Oct. 73	100	62	73
Marinduque	27 Mar. 73	Dec. 73	50	27	6
Mindoro Occidental	25 Mar. 74	May 74	75	13	10
Mindoro Oriental	16 Feb. 73	July 73	100	78	20
Palawan	25 Jan	Dec. 74	33	29	14

Table 10

Table 10 (Continued)

REGISTRATION AND ENERGIZATION DATES, DEGREE OF ELECTRIFICATION OF COOPERATIVES

Region/Cooperatives	Registration Date	Energization Date	Degree of Coverage: Poblacion Towns Cities	Barrios	Com
Rizal (Taliñ)	31 Aug. 70	Dec. 75	100%	100%	
Quezon I	24 Apr. 72	26 Mar. 76	92	8	
Mindoro Oriental II	15 Aug. 77	N.E.	--	--	
Rizal II	9 Jan. 76	Jan. 77	83	73	
Caniaya Community	14 Sept. 71	N.E.	--	--	
Infanta	--	N.A.	100	8	
REGION V - BICOL					
Sorsogon II	14 Apr. 77	Aug. 77	11	2	
Albay	9 Aug. 72	31 Mar. 73	100	20	
Camarines Norte	23 Oct. 75	May 76	83	43	
Camarines Sur I	27 Nov. 72	Dec. 74	100	36	
Camarines Sur II	10 Aug. 75	1 Aug. 77	89	--	
Camarines Sur III	2 Dec. 75	15 May 77	83	32	
First Catanduanes	28 Oct. 71	Apr. 72	100	70	
Sorsogon	17 Jan. 73	6 June 74	75	28	
Masbate	19 Nov. 77	N.E.	--	--	
Camarines Sur IV	18 Feb. 77	N.A.	44	2	
REGION VI - WESTERN VISAYAS					
Aklan	25 Apr. 72	16 Apr. 74	100	26	
Capiz	16 June 71	9 Aug. 73	82	26	
Iloilo I	10 June 71	Nov. 74	100	20	
Iloilo II	18 Oct. 75	12 Sept. 77	6	--	
Antique	10 Dec. 72	23 Jan. 77	88	22	
Central Negros (CENECO)	24 Feb. 75	Dec. 75	50	9	
Negros Occidental (VRESCO)	1 Feb. 71	N.A.	56	39	
Negros Oriental I	14 June 72	July 77	10	--	
Negros Oriental II	2 Apr. 77	N.A.			
REGION VII - CENTRAL VISAYAS					
Bohol	11 Aug. 71	Dec. 74	37	13	
Cebu	22 Apr. 72	July 76	100	29	
REGION VIII - EASTERN VISAYAS					
Leyte I	21 June 71	2 June 73	92	29	
Leyte II	26 Oct. 75	Sept. 76	100	58	
Leyte III	30 Oct. 75	17 Mar. 74	33	4	
Leyte IV	7 Nov. 75	N.A.	--	--	
Leyte Sur	27 Aug. 73	Feb. 76	86	30	
Biliran, Leyte	6 July 13	--	--	--	

Table 10 (Continued)

REGISTRATION AND ENERGIZATION DATES, DEGREE OF ELECTRIFICATION OF COOPERATIVES

Region/Cooperatives	Registration Date	Energitation Daze	Degree of Coverage as Percentage of Potential* Towns and Cities	Barrios	Hous Connect
Samar I	27 Feb. 74	1 May 74	25%	2%	5%
Samar II	23 Aug. 75	1 Dec. 75	9	2	8
Northern Samar	3 Oct. 77	N.E.	--	--	--
Eastern Samar	--	N.E.	--	--	--
REGION IX - WESTERN MINDANAO					
Basilan, Zamboanga Sur	24 May 75	Feb. 76	100	12	19
Zamboanga Norte	23 Aug. 72	N.E.	--	--	--
Zamboanga Sur	25 Aug. 72	24 Aug. 77	39	7	4
Zamboanga City	23 Feb. 74	Apr. 74	100	7	27
Sulu	24 Feb. 73	Oct. 75	38	4	5
Alicia	21 Jan. 75	N.A.	100	37	16
Cagayan de Sulu	4 Apr. 75	Aug. 76	100	70	7
Tawi-Tawi	25 Jan. 75	Sept.76	50	37	6
REGION X - NORTHERN MINDANAO					
Agusan Norte	12 Feb. 77	N.A.	29	--	5
Agusan Sur	26 Aug. 77	N.E.	--	--	--
Bukidnon	13 May 72	N.E.	--	--	--
Misamis Occidental	18 Aug. 72	N.E.	--	--	--
Misamis Occidental II	2 June 76	N.A.	12	--	.86
Surigao Norte	24 Sept.77	N.A.	--	--	--
Misamis Oriental, MORESCO	1 Feb. 71	N.A.	100	92	45
MORESCO II	2 Oct. 76	N.E.	--	--	--
Bukidnon II	26 July 77	N.E.	--	--	--
Lanao del Sur	7 Sept.71	16 Aug. 73	95	39	13
Lanao del Norte	27 May 72	Dec. 74	92	77	25
Surigao del Sur	20 July 71	Dec. 74	40	11	28
REGION XI - SOUTHERN MINDANAO					
Davao del Norte	24 Sept.71	Nov. 75	50	88	6
Davao del Sur	1 June 75	Nov. 75	82	11	5
South Cotabato	31 Aug. 71	N.A.	17	--	7
Cotabato	16 May 72	N.E.	--	--	--
South Cotabato II	15 May 77	N.E.	--	--	--
Maguindanao	4 Sept.75	20 Mar. 76	57	93	5
Sultan Kudarat	4 Nov. 75	N.E.	--	--	--

NOTE: * - As of October 31, 1977
N.E. - Not Energized
N.A. - Date not Available

SOURCE: National Electrification Administration

Only Davao del Sur and Zambales cooperatives have complete backbones, and only Ilocos Norte and Albay cooperatives have constructed their extension facilities.

As of 1977, the degree of electrification in the NEA-cooperative areas greatly varies in terms of town, barrio, or housing coverage. Generally, the town or city coverage has a greater degree of electrification than the barrio coverage while the housing coverage has the least. On the average, for instance, 522 or 73 percent of 714 towns and cities to be covered by the cooperatives as of 1977 have electricity. In contrast, on the average, only 31 percent of the 17,272 barrios under cooperative franchises have received NEA-cooperative electric service in 1977. In terms of housing coverage, only 20 percent of the 321,900 houses under the 74 energized cooperative areas have benefited from electricity. It is depressing to note that MORESCO and VRESCO, the so-called completely energized cooperatives, have some towns, many barrios and houses without electric connections.

To be sure, the NEA report on energization does not depict the overall development on rural electrification. Aside from including urban areas, the report does not include towns in non-energized cooperative areas. There were, for instance, 123 cooperative areas in 1977 but only 74 were reported energized. Furthermore, not all of the reported

energized areas or units can be deemed additional and newly energized since many were already under private franchises before the NEA cooperative "take over". Out of the reported 522 towns and cities energized by NEA-cooperatives, for example, 263 were previously under private utilities. Of the 596,967 houses supposedly electrified by NEA-cooperatives, 302,978 houses or about 50.8 percent were formerly serviced by the "taken over" private utilities.

With respect to efficiency, most private electric utilities were considered inefficient mainly because they operate what experts may classify "obsolete" plants in small isolated rural areas whose population cannot justify large investments in "modern and economic-sized" plants [CRC, 1973 and World Bank 1974]. On this issue, Table 11 presents the estimated system losses in 1975 and 1976 of operating cooperatives. On the average, 20.0 percent of electric supply were part of system losses in 1975. In 1976, system losses went up to 22.0 percent. In contrast, private firms in 1975 registered a 22.2 percent average system losses, not statistically different from the average system losses of cooperatives.[9/]

[9/] A test of the difference of the two means of the system losses between private vis-a-vis cooperatives in 1975, when data were available, gives a computed t-value less than the tabulated t-value at 5 percent significance level. Also, a mean test of the system losses of cooperatives in 1975 and 1976 indicates no significant difference between losses in the two periods.

Table 11

SYSTEM LOSSES OF NEA-COOPERATIVES AND PRIVATE UTILITIES IN 1975

Region/Coopenatives	Total Supply (KWH) (1,000)	PEPOA System Losses (Gains)	Total Supply (KWH) (1,000)	Cooperatives System Losses (Gains)
REGION I - ILOCOS				
Ilocos Norte	7,841.8	.20	3,061	.20
Ilocos Sur	4,217.0	.17	6,534	.37
La Union	16,657.5	.20	6,731	.15
Benguet	-	-	99,783	.22
Mountain Province	-	-	157	.14
Sub Total	28,716.3		116,266	
REGION II - CAGAYAN				
Isabela	650.0	.22	-	-
Nueva Vizcaya		-	-	-
Cagayan	2,900.0	.20	-	-
Sub Total	3,550		0	
REGION III - CENTRAL LUZON				
Bataan		-	14,504	.05
Pampanga (South)	59,898.8	.31	33,679	.27
Nueva Ecija (South)		-	20,976	.34
Bulacan	3,351.6	.37	16,398	.29
Sapang Palay		-	1,454	(.29)
Porac		-	2,060	.30
Nueva Ecija (North)		-	1,793	.28
Zambales		-	1,755	.21
Tarlac	32,022.0	.21	2,562	.22
Nueva Ecija I	29,922.5	.21	-	-
Pangasinan	31,653.1	.75	-	-
Sub Total	156,848.0		95,181	
REGION IV - SOUTHERN LUZON				
Cavite	10,300.0	-	24,666	.35
Laguna	24,444.8	.20	12,250	.26
Mindoro Occidental		-	436	.28
Marinduque		-		(.10)
Talim, Rizal		-	675	.32
Mindoro Oriental	110.0	.20	4,481	.39
Palawan		-	1,220	.32
Batangas	20,579.2	.18	1,314	.81
Quezon	2,449.0	.78	-	-
Rizal	10,732.8	.85	-	-
Sub Total	62,615.8		45,042	

Table 11 (Continued)

SYSTEM LOSSES OF NEA-COOPERATIVES AND PRIVATE UTILITIES IN 1975

Region/Cooperatives	Total Supply (KWH) (1,000)	PEPOA System Losses (Gains)	Total Supply (KWH) (1,000)	Cooperatives System Losses (Gains)
REGION V - BICOL				
Camarines Sur	23,809.4	.13	826	.16
Albay	14,185.7	.28	5,529	.13
Sorsogon	4,192.7	.05	388	.20
Catanduanes	-	-	2,136	.14
Camarines Norte	7,750.0	.20	-	-
Sub Total	49,937.8		8,879	
REGION VI - WESTERN VISAYAS				
Aklan		-	1,651	.15
Negros Occidental (VRESCO)	81,702.9	.14	16,961	.17
Capiz	7,100.0	.197	-	-
Iloilo	63,918.1	.16	624	(.02)
Negros Oriental	14,004.5	.15	-	-
Sub Total	166,725.5		19,236	
REGION VII - CENTRAL VISAYAS				
Bohol	413.0	.22	357	.33
Cebu	223,878.9	.138	-	-
Sub Total	224,291.9		357	
REGION VIII - EASTERN VISAYAS				
Samar	-	-	607	.31
Leyte	4,593.2	.14	26,670	.35
Eastern Samar	172.0	.02	-	-
Western Samar	2,450.0	.21	-	-
Sub Total	7,215.2		27,277	
REGION IX - WESTERN MINDANAO				
Zamboanga City	-	-	30,938	.37
Sulu	12.0	.17	-	-
Zamboanga Sur	2,396.9	.15	-	-
Zamboanga Norte	3,500.0	.13	-	-
Sub Total	5,908.9		30,938	

Table 11 (Continued)

SYSTEM LOSSES OF NEA-COOPERATIVES AND PRIVATE UTILITIES IN 1975

Region/Cooperazives)	Total Supply (KWH) (1,000)	PEPOA System Losses (Gains)	Total Supply (KWH) (1,000)	Cooperative System Losses (Gains)
REGION X - NORTHERN MINDANAO				
Misamis Oriental (MORESCO)	70,635.5	.10	6,455	.14
Lanao Sur	-	-	3,929	.18
Lanao Norte	20,600	.19	826	.11
Surigao Sur	-	-	2,327	.02
Agusan Norte	9,457.8	.25	-	-
Bukidnon	500.0	.20	-	-
Misamis Occidental	1,071.2	.15	-	-
Surigao Norte	2,800.0	.20	-	-
Sub Total	105,064.5		13,537	
REGION XI - SOUTHERN MINDANAO				
Davao Norte	5,400.0	.20	32	.19
Cotabato	31,003.2	.09	-	-
South Cotabato	12,257.2	.22	-	-
Davao Sur	195,852.7	.08	-	-
Davao Oriental	1,369.9	.12	-	-
Sub Total	245,883.0		32	
GRAND TOTAL	1,062,756.9	0.22	356,745.0	0.20

SOURCE: Statistical Data on Philippine Electric Plant Owners Association (PEPOA) Members, December 31, 1975 Part I-(Technical).

Basic Data for Financial Evaluation of Operating Cooperatives Form No. FRN 7501-00IR, December 1975.

If the system losses were interpreted to mean technical waste, one can conclude that NEA-cooperatives, inspite of greater government support, are not technically more efficient than the private utilities. Moreover, it should be remembered that most private utilities survived without much government subsidies but under state regulations and taxations, high foreign exchange risk, very low credit priority, and heavy import tariff penalties.[10/] Thus, given the small isolated markets and the true domestic capital scarcity, one can argue that most private electric utilities were economically efficient and have operated "socially appropriate" and "economic-sized" plants.

Estimation of Costs and Benefits

Like many government projects, the electrification program is perhaps better evaluated in terms of its costs and benefits to society instead of its effects on certain objectives, e.g., balance of payments, employment, total electrification, or energy conservation. Electrification, may raise or diminish energy efficiency depending on its impact on energy production or consumption. Besides, energy

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10/ Imports of private utilities have been under heavy tariffs, mostly 30 or 50 percent ad. val. rates, see, for instance, Presidential Decree 34.

efficiency is not the only factor affecting optimal resource allocation. Also electrification may affect favorably or adversely balance of payments or employment. But electrification is not solely desired in terms of the above social indicators. To be sure, social profit can be the most reasonable indicator of optimal resource allocation and it captures the effects of electricity on the other social concerns.

Social profit from rural electrification cannot, however, be measured by the difference between revenues and costs of electric cooperatives. Because of price distortions the prices and costs of rural electricity may not necessarily reflect the real cost and benefits to society. Hence, electrification projects are perhaps better evaluated with social cost-benefit analysis [Prest and Turvey 1965; Little and Mirrless 1969, pp. 235-6].

In this study my estimation of social benefits and costs of NEA projects are based mainly on the guidelines suggested in USAID Capital Project Appraisal (USAID-CPA). The economic analysis used in USAID Rural Electrification IV was, in fact, based on the USAID-CPA guidelines, in particula the estimation of PSV to justify the fourth NEA loan. Moreover, the USAID-CPA guidelines are not in conflict with standard project evaluation. Lastly, to compare the previous

estimates of PSVs, I am constrained to use the method used in the earlier evaluation, namely, USAID-CPA method.

Though the USAID-CPA estimation of PSV does not significantly differ from standard cost-benefit estimation, several distinguishing features of former method should be mentioned: (USAID-CPA 1971, p. 25)

1) No distinction between capital outlays and current outlays, both being treated as inputs in the year in which they occur;

2) Interest paid and depreciation are not recorded as inputs (i.e., as costs). Outlays for assets are treated as inputs in the year in which the outlay is made, while interest is treated as a part of the rate of return on total assets;

3) The estimated asset values at the end of the discounting period is entered as a negative input or addition to output;

4) In general, inputs and output are valued at constant prices over the lifetime of the project and;

5) Normally, no special allowance of linkage effects are provided since such effects will normally have been taken into account by the suggested method of valueing inputs (USAID-CPA, p. 31).

As in traditional social cost-benefit analysis, the USAID-CPA estimation of PSV, nevertheless, uses shadow prices in lieu of actual prices "if the latter are clearly inaccurate measures of real costs and/or real value of output" (USAID-CPA, p. 28).

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Given these considerations, the computation of PSV of a rural cooperative differs from its PPV mainly with respect to: 1) prices of output and inputs, 2) items included in output and inputs, and 3) treatment of taxes, subsidies and certain other transfers.

In my estimation of PSV, the average price of cooperative electricity is assumed to be approximated by the flat residential rates. Usually, the flat residential rates pertai to the first 15 KWH consumed in a month. Social price of coop erative electricity, therefore, can be adjusted based on the highest or average flat residential rates fixed for private electric utilities in the region or province where the cooperative is to operate. This assumes, of course, that the difference between the weighted average price of electric kilowatt hours of a cooperative and the selected private utility is reasonably approximated by $(P_u - P_c)/P_c$ or, in symbol, it is assumed that:

$$\frac{P_u - P_c}{P_c} = \frac{\left(\sum_{i=1}^{n} \frac{p_i g_i}{g_i}\right)_u - \left(\sum_{i=1}^{n} \frac{p_i g_i}{g_i}\right)_c}{\left(\sum_{i=1}^{n} \frac{p_i g_i}{g_i}\right)_c}$$

where:

P_c = flat residential rate of rural cooperative electricity

P_u = highest or average flat residential rate of private utility electricity in the region (or province);

p = price of ith electricity per kilowatt hour, i = 1, ..., n;

g_i = ith kilowatt hour consumption, i = 1, ..., n;

u = subscript for the selected private utility with the highest electricity price in the region or province;

c = subscript for cooperative.

Now total revenue of cooperative $R = \sum_{j=1}^{n} P_j Q_j$. To estimate social benefit B we apply δ on R, i.e., $B = \delta R$, where, P = weighted average price for consumer j, 1 ... n, Q = weighted kilowatt total consumption of consumer j, 1 . . . n, and $\delta = \frac{P_u - P_c}{P_c}$. In effect, the social prices of electricity are reasonably assumed to be the highest or average known rates that consumers in a given region (or province) could bear.[11/] This output price adjustment may very likely capture linkages because the highest or average prices pertain to the more developed commercial areas where actual prices presumably embodied the linkages. Lastly, the private utility prices probably better reflect the real productivity

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11/ In effect, this assumes homogeneous taste or profitability of electricity within the region or province. Also, this assumes away consumer surplus since it is not meaningful and feasible to measure consumer surplus particularly interindustry relative consumer surplus [yet some economists define social benefit to include consumer surplus, see, for instance, Williamson O.E. 1966]. For some discussions on the social pricing of electricity, see, for example, King 1967 and Worcester 1967. In contrast, it can be argued that rate should be one determined from the lowest competitive bid that could be had for utility (Demsetz 1968).

or value of electricity since their distortions are lesser compared to those of public utilities.[12/]

On the cost side, perhaps for lack of data and because of the less significant price distortion of major inputs, only labor costs are adjusted to reflect shadow wages. A prima facie evidence exists for social wage adjustment. First, the NEA-approved salary and wage rates for cooperative and also NEA's construction workers are much above their rural market levels. Second, in most employment staffing, NEA-cooperative wages are even above the legal industrial minimum wage. Lastly, various evidence points to the significant divergence of actual wages from their social opportunity costs (Sicat 1972, ILO 1974, Alonzo 1974). Thus,

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12/ Theoretically, it has been argued that prices of private utilities are not the socially desirable prices since capital costs for regulated monopoly are distorted by regulation (Averch and Johnson 1962). In the Philippines, however, electricity rates are fixed at some levels that allow private utilities to earn a maximum rate of return, say, 12 percent, on assets and not on investments or equity. For some evidence see, for example, Armas 1970. This may imply that the so-called Averch-Johnson effect may not be significant for a firm under asset return regulation since the return on capital is not effectively regulated. Moreover, electricity production and distribution involve highly fixed factor proportion such that one can conclude that "the regulated firm is constrained to the efficient expansion path" (Averch and Johnson 1962, p. 1057). Lastly, the Averch-Johnson effect is shown invalid theoretically, (see Pressman and Carol 1973) and some empirical evidence exists to show that regulations have no significant effect on electric utilities, (Stigler and Friedland 1962).

social total costs can be estimated as follows:

$$\frac{\Delta P_j}{P_j} = \frac{\sum N_i w^*_{ik} - \sum N_i w_i}{\sum N_i w_i} = \text{percentage change in payroll costs in jth account due to shadow wage rate adjustment,}$$

$$\frac{\Delta C_j}{C_j} = \rho_j \left(\frac{\Delta P_j}{P_j}\right) = \text{percentage cost change in jth account due to shadow wage rate adjustment,}$$

$$C^*_j = C_j \left(\frac{\Delta C_j}{C_j} + 1\right) = \text{social cost in jth account adjusted for shadow wage rates,}$$

$$C = \sum C_j (\beta_j) = \text{total social costs,}$$

where:

N_i = employment in ith classification, $i = 1, \ldots n$;

w_i = NEA-approved base wage rate for N_i;

w^*_{ik} = shadow wage rate in region where cooperative is located, $k = 1, \ldots n$;

$= w_i X_k$;

X_j = shadow wage rate adjustment factor for whole Philippines or kth region where cooperative is to operate;

P_j = total payrolls in jth account, $j = 1, \ldots, 4$;

C_j = total private costs in jth account, $j = 1, \ldots 4$;

ρ_j = ratio of total payrolls to costs in the jth account, $j = 1, \ldots, 4$;

$\beta_j = \left(\frac{\Delta C_j}{C_j} + 1\right)$ = social costs adjustment factor in jth account, $j = 1, \ldots, 4$;

No adjustment was done for foreign exchange inputs though the peso may seem overvalued. It was reported, for instance, that during 1974-75 the cross Hongkong rate went up to $1 to ₱8.00. Most feasibility studies (61) on cooperatives, however, have finished their financial analysis before 1974.[13/] Moreover, the foreign currency undervaluation may possibly be offset by the higher prices of untaxed imports (e.g., U.S. excess properties). Most loan tie-ups limit purchases to the U.S. and countries under USAID Geographic Code 941, and at least 50 percent of USAID loan financed imports "shall be transported on privately owned U.S. flag commercial vessels." In this regard, however, it is not easy to resolve whether the effective import prices are over or undervalued.[14/]

For power costs, it may be assumed that the electric rate charged by NPC reasonably reflect the true social costs of electric power to rural cooperatives. Until recently, however, NPC electric rates could be considered below the social prices of generating and distributing electricity.

13/ Before 1974, the peso seemed near the equilibrium exchange rate guided by the free market rate. A floating rate system was adopted in early 1970 under Circular 289 of the Central Bank Monetary Board. For further discussion see, ILO 1974.

14/ On probable net-overvaluation of loan-tie imports, see, for example, Johnson (1967).

This is so because NPC rates of return were below the prevailing market interest rates or even the minimum rate requirement of the Asian Development Bank and the World Bank (NPC 1977). Similarly, power costs of self-generating cooperatives are likely below their social costs since prices of imported oil to cooperatives are probably below their social foreign exchange costs. Thus, the unadjusted power costs may overstate the PSV of rural cooperatives.

Lastly, I need not consider environmental costs because they are negligible [USAID 1976, Annex C]. Likewise, I do not include administration costs of NEA and other government agencies engaged in the rural electrification program because joint costs are difficult to impute on particular cooperative. On these aspects, social costs adjustment tends to be understated. On the whole, the estimated PSV are likely overstated because the benefits are adjusted upward while social costs, downward.

Thus PPV and PSV for each cooperative can be computed:

$$PPV = \frac{X_1}{(1+r)^1} + \frac{X_2}{(1+r)^2} + \ldots + \frac{X_n}{(1+r)^n}$$

$$PSV = \frac{V_1}{(1+i)^1} + \frac{V_2}{(1+i)^2} + \ldots + \frac{V_n}{(1+i)^n}$$

where:

$X = R-C$ = net revenue of cooperative

r = loan interest rate

$V = \delta R - \beta C$ = social net benefit of cooperative

i = social discount rate

n = number of year, 1, 2, 3, ..., 11

Moreover, based on USAID-CPA, the BERR of each cooperative can be interpolated by:[15/]

$$BERR = r_1 + r_m \frac{PPV_1}{PPV_1 + PPV_h}$$

where:

r_1 = lower interest rate used in PPV_1

$r_m = r_h - r_1$

r_h = higher interest rate used in PPV_h

PPV_1 = estimated PPV at r_1

PPV_h = estimated PPV at r_h

To compute PPV one can use any loan interest rate, say, based on the actual terms of the loan, i.e., 2-3 percent

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15/ We can also interpolate the Net National Rate of Return (NNRR) by:

$$NNRR = i_1 + i_m \frac{PSV_1}{PSV_1 + PSV_h}$$

i_1 = lower social discount rate used in PSV_1

$i_m = i_h - i_1$

i_h = higher social discount rate used in PSV_h

PSV = estimated PSV at i_1

PSV = estimated PSV at i_h

per annum. But I find it reasonable to use 8 percent annual loan interest rate despite the fact that USAID extended loans at 2-3 per interest. When funds are too limited to finance all projects, the use of higher interest rate should eliminate or postpone the selection of less profitable projects or amortizable loans. Moreover, I should use 8 percent loan interest since additional loans, namely, World Bank loans, are hardly forthcoming. Government projects, particularly electricity projects, with less than 8 percent rate of return have a difficulty in securing loans [NPC 1977 and World Bank 1976]. On the other hand, in the computation of PSV I would use an annual social discount rate of at least 12 percent because substantial evidence stands in favor of higher social opportunity cost of capital in the Philippines.16/

The estimates of PPV, BEER, and PSV are limited up to the 11th year though most facilities and equipment of electric cooperatives have economic life of more than 25-35 years. The terminal values are included as salvage being

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16/The Metra International (assisted by World Bank), for instance, used a 12 percent discount rate (Metra International 1970, p.114). For other evidence on higher than 12 percent opportunity costs of capital in the Philippines see, National Economic Council et al. 1971, I L O 1974, and World Bank 1976. Even in USA,12 percent has been suggested for government projects, see Harberger 1969. Lately, however, social cost of capital has been assumed at about 15 percent.

part of output values during the 11th year.[17/] This limitation is due to the lack of data on years later than the 11th year.

Data Source

The NEA feasibility studies, which are the main sources of financial data, presented estimates on annual total revenues and costs of cooperatives up the 11th year. Costs are presented into four major accounts: 1) power costs, 2) operating and maintenance costs, 3) sales and administrative expenses, and 4) investment outlays.

Since PSV differ from PPV solely with regard to shadow prices, most data on prices, output, and inputs were obtained from the NEA feasibility studies. Preparation of NEA feasibility studies was done in a four-month period by NEA staff assisted by technical advisers from the National Rural Electric Cooperative Association (NRECA/USA) and the Provincial Electric Cooperative Team (PECT). The studies dealt with site selection, base data, mapping, load analysis, system design,

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17/ NEA feasibility studies adopted a 3 percent straight line depreciation assumption. Considering that I have no professional views on the "correctness" of depreciation rate, I accept the NFA assumption which is not indefensible.

system costs, financial and feasibility analysis with project evaluation and recommendation. Five feasibility studies were finished as of June 1971, 37 studies as of December 1972, 58 studies as of 1973, 74 studies as of 1974, and as of 1975 and 1976, 103 studies were completed. Feasibility studies are constantly being updated to reflect more realistic projections.

In effect, it is assumed that NEA data indicate the "best" professional estimate of future prices, output, and inputs, and other factors affecting the feasibility of cooperatives. Though some projections appear questionable,[18/] it can be assumed that they favor a higher PPV and BERR, and in turn an overstated PSV.

For social adjustment, data were obtained from various sources, mostly government agencies. In some cases, value judgments of knowledgeable persons were the basis of quantitative estimates. Prices of electricity charged by private firms for example were taken from the Board of Power and Waterworks (Table 5). Some provinces, however, have no data on prices of private utilities. In such cases, I used as provincial prices the highest or average price in the region where cooperatives would operate.

18/ For example, projected residential demand is based on population projections and nonresidential demand is based on the business plans of enterpreneurs in the area.

On the social cost adjustment, it should be noted that labor costs are not presented in the NEA feasibility studies. Fortunately, however, some shares of labor costs are presented in the major cost items while others were extracted from educated guesses of various experts. Lastly, Philippine shadow wages were taken from Alonzo (1974). For the regional shadow wage adjustment, the estimated shadow wages of town or city in the region were used. In case a region is not represented by any town or city, I used the shadow wages in the towns or cities nearest to the region (Table 12).

I depended heavily on NEA memoranda on personnel requirements and wage structures to adjust wage costs. In regard to operating and maintenance costs, sales and administrative expenses, the NEA-approved employment staffing and salary schedule for various departments of cooperative were used to approximate the wage structures and wage costs.

In contrast, employment and wage schedules were not available for the investment outlays since private firms subcontracted the construction of cooperative facilities including power plants. Only labor costs pertaining to NEA-supervised construction activities such as line construction and right of way clearing have estimates of personnel requirement and labor costs. Because of this, I was forced to use

Table 12.

AVERAGE ANNUAL WAGES OF UNSKILLED LABOR, 1971
(In current pesos)

	Wages	Local-national ratio
Philippines	2,708	-
Manila	2,725	1.01
Bacolod	2,359	0.87
Baguio	2,352	0.87
Butuan	2,701	1.00
Cagayan de Oro	3,979	1.47
Cebu	2,481	0.92
Cotabato	2,285	0.84
Dagupan	2,238	0.83
Davao	2,526	0.93
Dumaguete	2,351	0.87
Iligan	2,248	0.83
Iloilo	2,528	0.93
Laguna	3,367	1.24
Pampanga	3,839	1.42
Naga	2,224	0.82
Quezon	2,080	0.77

NOTE: The national wage is to be adjusted downward by a factor of 20 percent.

SOURCE: Alonzo R. "On Measuring Shadow Wages of Philippine Labor," NEDA Journal of Development First Semester 1974.

the NEA employment and wage schedules to adjust social labor costs in the whole investment outlays.

Lastly, some feasibility studies have no account or estimates of sales and administrative expenses. In my earlier paper, I estimated this cost based on an assumed 33 percent average share of sale and administrative expenses to total revenue. Estimation of the average percentages for all cooperatives with required data, however, shows that the cost ratios greatly vary, vis., 2.4 percent (Cagayan de Sulu) to 36 percent (South Tarlac). Thus, in this paper, I felt it unreasonable to supply the missing expense account. Thus, 16 cooperatives without the sale and administrative expenses in their feasibility studies are excluded in this paper.

Private and Social Profitability

Table 13 presents the estimated total PPV of each of the 81 cooperatives with required data from NEA feasibility studies. For discounting, I use different interest rates: 3, 7, 8, and 9 percent. Three percent is closer to the actual USAID loan interest for most years while 7-9 percent goes with the 8 percent internal rate requirement of the Asian Development Bank and the World Bank. With PPV based on 3 percent, 19 cooperatives display negative total PPVs implying that they would not have rate of return of at least 3 percent. At 7

Table 13

PRESENT PRIVATE VALUE OF ELECTRIC COOPERATIVES
AT DIFFERENT ANNUAL SIMPLE DISCOUNTED RATE

Region/Cooperatives	P P V at 3%	P P V at 7%	P P V at 8%	P P V at 9%
REGION I - ILOCOS				
Ilocos Norte	12,302	6,352	5,190	4,130
La Union	9,416	5,186	4,375	3,643
Abra	1,298	-742	-1,131	-3,502
Central Pangasinan	48,237	28,942	25,225	21,851
Western Pangasinan	9,296	4,306	3,344	2,303
Ilocos Sur	10,203	1,169	-1,627	-33,08
Mt. Province	-889	-1,610	-1,744	-1,862
REGION II - CAGAYAN VALLEY				
Cagayan	9,239	2,155	824	-368
Kalinga-Apayao	2,390	-319	-831	-1,293
REGION III - CENTRAL LUZON				
Zambales	12,671	4,275	2,656	1,229
Pampanga	21,994	21,226	-231	-3,138
Bulacan	39,357	27,873	25,583	23,480
Bataan	23,297	15,159	13,568	12,117
Nueva Ecija	22,594	11,503	9,366	7,431
Tarlac	3,942	423	-240	-834
Southern Tarlac	10,953	5,554	4,850	4,215
Lubang	-446	-1,231	-1,380	-1,514
Lubang II	-1,786	-5,585	-6,129	-6,413
Pampanga	7,681	2,949	2,071	1,228
Bulacan II	4,625	1,280	630	47
REGION IV - SOUTHERN TAGALOG				
Talim, Rizal	6,134	2,722	2,116	1,472
Batangas	325	-7,341	-6,035	-6,772
Quezon	2,459	-2,350	-3,246	-4,049
Mindoro Oriental	3,306	-4,543	-5,985	-7,069
Laguna	24,517	15,218	13,390	11,719
Romblon	6,442	576	-547	-1,563
Palawan	-2,759	-4,614	-4,952	-5,251
Rizal	-5,407	-11,551	-11,815	-12,714
Quezon II	733	-1,349	-1,749	-2,111

Table 13 (Continued)

PRESENT PRIVATE VALUE OF ELECTRIC COOPERATIVES
AT DIFFERENT ANNUAL SIMPLE DISCOUNTED RATE

Region/Cooperatives	P P V at 3%	P P V at 7%	P P V at 8%	P P at 9
REGION V - BICOL				
Catanduanes	5,046	2,598	2,122	1,68
Camarines Sur	8,875	3,290	2,242	1,30
Sorsogon	3,540	-2,423	-3,306	-4,09
Masbate	-8,547	-16,252	-17,626	-18,83
Camarines Norte	3,153	-2,470	-3,528	-4,47
Camarines Sur II	2,122	-3,829	-4,939	-5,93
Camarines Sur	292	-6,682	-7,984	-9,15
REGION VI - WESTERN VISAYAS				
Capiz	1,055	-3,156	-3,543	-3,88
Aklan	-3,994	-6,424	-6,881	-7,29
Antique	9,084	3,311	2,208	1,27
Bacolod Central Negros	15,070	2,556	150	-2,02
Iloilo II	17,608	5,413	3,329	1,33
San Carlos City	-4,391	-7,900	-8,530	-9,08
REGION VII - CENTRAL VISAYAS				
Bohol	-3,990	-5,949	-6,510	-6,85
Negros Oriental	10,245	902	-854	-2,43
Siquijor	534	-2,074	-2,568	-3,01
REGION VIII - EASTERN VISAYAS				
Leyte I	367	-4,257	-5,122	-6,12
Leyte Sur	96	-2,439	-2,912	-3,33
Biliran Leyte	136	-1,760	-2,119	-2,44
Leyte II	46,547	33,178	30,515	28,07
Leyte III	5,942	1,254	341	-49
Leyte IV	11,498	5,014	3,762	2,62
Leyte	4,037	46	-722	-1,41
Samar II	-3,917	-8,333	-9,139	-9,85
REGION IX - WESTERN MINDANAO				
Zamboanga Sur	7,636	1,202	15	-1,09
Zamboanga Norte	12,312	6,332	5,176	4,14
Basilan	2,133	-1,833	-2,566	-3,22
Zamboanga City	-7,960	-10,385	-10,747	-11,10
Tawi-Tawi	-1,511	-2,115	-2,224	-2,31
Alicia	86	-158	-205	-24
Cagayan de Sulu	-169	-397	-437	-47

Table 13 (Continued)

PRESENT PRIVATE VALUE OF ELECTRIC COOPERATIVES
AT DIFFERENT ANNUAL SIMPLE DISCOUNTED RAZE

Region/Cooperatives	P P V at 3%	P P V at 7%	P P V at 8%	P P V at 9%
REGION X - NORTHERN MINDANAO				
Surigao Sur	14,574	9,107	8,072	7,091
Lanao Sur	5,274	675	-189	-964
Lanao Norte	291	-1,976	-2,403	-2,788
Misamis Occidental	-245	-4,000	-4,709	-5,721
Bukidnon	12,512	5,688	4,393	3,229
Surigao Norte	-901	-3,887	-4,446	-4,946
Camiguin	379	-2,645	-2,741	-3,725
Agusan del Sur	-432	-2,423	-2,787	-3,142
Misamis Oriental	5,590	107	-925	-1,847
Agusan del Norte	6,720	1,735	784	-75
Surigao	-203	-3,492	-4,108	-4,861
Misamis Occidental	-2,829	-6,944	-7,705	-8,380
Bukidnon II	3,245	-1,895	-2,863	-3,733
REGION XI - SOUTHERN MINDANAO				
Davao del Norte	2,358	446	-702	-1,148
Cotabato	15,133	7,653	6,226	4,937
Cotabato Sur	14,576	7,266	5,872	4,615
Davao Oriental	1,398	-1,413	-1,943	-2,420
Davao Sur	30,265	17,057	14,498	12,172
Maguindanao	4,803	-1,743	-2,966	-4,052
Sultan Kudarat	2,013	-1,130	-3,226	-2,258
South Cotabato	-78	-214	-238	-257
South Cotabato	25	-5,872	-7,025	-8,078
TOTAL PRESENT PRIVATE VALUE	529,527	79,521	-5,621	-112,027

SOURCE OF RAW DATA: Feasibility Studies, National Electrification Administration

percent interest, 46 cooperatives would earn negative total PPV each, or less than 7 percent BERR. Next, at 8 percent interest rate, 52 cooperatives have negative total PPVs This implies that 52 cooperazives have BERR of less than 8 percent. The interpolated PPVs of the aggregate 81 cooperatives at 7 and 8 percent result to a 7.93 percent BERR; short of the predetermined acceptable feasibility rate for the whole cooperatives.

The number and proportion of cooperatives with less than 8 percent BERR (i.e., negative PPV) vary across the country. In Southern Tagalog, for example, 7 out of 9 cooperatives have negative PPV while in Ilocos only 3 out of 7 have registered negative PPV. Thirty one cooperatives with less than 8 percent BERR are planned to locate in the Mindanao and the Visayas regions, the other 20 unprofitable ones in Luzon. Lastly, it should be noted that among the 51 unprofitable cooperatives some have higher negative PPVs implying that their BERRs are lower than the average 7.9 percent BERR.

Of the 51 unprofitable cooperatives 22 are intended to generate their own power, either totally or partially, and most of the profitable cooperatives would depend on NPC for power supply. This implies that the profitability of self-generating cooperatives depends greatly on the behavior of oil

prices over time since most would have thermal plants. In contrast, though NPC plans to reduce its thermal capacity share from 80.6 percent in 1974 to 52.8 percent of total capacity in 1985, the profitability of most NPC-depended cooperatives depends greatly on NPC power prices and to a lesser extent also on oil prices. As already mentioned, however, NPC power prices, especially in Mindanao and Cebu [NPC 1976, 1977], are too low to earn the NPC's covenanted 8 percent internal rate of return. So unless oil prices and NPC rates can be kept within the assumed power prices in the NEA feasibility studies, I am afraid to say that the financial profitability of many cooperatives may turn on the red.

On the other hand, Table 14 presents the estimated total PSV of each of the 81 cooperatives, at 12 percent social discount rate. For sensitivity analysis, I estimated PSV under different social price adjustment: PSV_1 assumes the regional highest price; PSV_2, the regional average; PSV_3, the provincial highest price; and PSV_4, the provincial average price; and lastly PSV_5, the average of PSV_1-PSV_4 on each cooperative. For comparison, the original estimates, PSV_0 which are based on the highest regional price assumption but used national shadow wage, are presented.

As expected, PSV varies under different assumptions; and the number of cooperatives with negative total PSV also

Table 14

PRESENT SOCIAL VALUE OF ELECTRIC COOPERATIVES AT
12 PERCENT ANNUAL SIMPLE DISCOUNTED RATE

	PSV_1	PSV_2	PSV_3	PSV_4	Average	P S
REGION I - ILOCOS						
Ilocos Norte	9,907	7,071	9,907	9,907	9,198	9,
La Union	12,820	11,431	12,820	11,431	12,126	5,
Abra	2,202	3,978	2,202	3,978	3,090	
Central Pangasinan	40,270	33,183	40,270	33,183	36,727	27,
Pangasinan West	10,773	9,056	19,352	11,321	12,626	7,
Ilocos Sur	8,066	8,751	8,066	8,066	8,237	-2,
Mountain Province	-1,181	-1,427	-1,181	-1,427	-1,304	-1,
REGION II - CAGAYAN VALLEY						
Cagayan	16,274	5,904	3,829	3,829	7,459	40,
Kalinga-Apayao	2,873	109	2,873	109	1,491	7,
REGION III - CENTRAL LUZON						
Zambales	74,771	10,191	74,771	31,434	47,792	61,
Pampanga	340,573	42,855	142,875	100,068	156,593	326,
Bulacan	152,487	26,396	59,073	31,841	67,449	176,
Bataan	84,885	23,347	19,774	11,159	34,791	80,
Nueva Ecija	117,378	15,425	70,649	19,673	55,781	101,
Tarlac	33,957	1,965	632	-702	35,852	27,
Southern Tarlac	52,186	1,995	78	-2,187	13,018	45,
Lubang	7,475	-1,315	-1,315	-1,315	3,530	
Lubang II	25,307	-5,719	12,896	-5,719	6,691	-
Bulacan II	36,547	2,592	12,010	4,154	13,826	27,
REGION IV - SOUTHERN TAGALOG						
Talim, Rizal	97,057	3,468	29,127	3,468	33,280	20,
Batangas	117,857	3,601	22,128	-2,527	35,265	2,
Quezon	67,557	3,091	19,975	4,627	23,813	1,
Mindoro Oriental	65,651	6,420	65,651	29,368	41,773	18,
Laguna	185,163	27,801	86,761	41,484	85,302	63,
Romblon	27,412	-1,657	27,412	-1,657	12,878	1,
Palawan	25,082	1,272	25,082	1,272	13,177	1,
Rizal	32,268	-10,751	11,542	-10,751	3,077	-
Quezon II	18,810	-1,364	-1,939	-788	3,680	3,
REGION V - BICOL						
Catanduanes	2,811	447	2,811	477	1,629	1,
Camarines Sur	9,885	2,053	9,885	4,141	6,491	1,
Sorsogon	18,259	3,013	7,635	3,013	7,980	6,

Table 14 (Continued)

PRESENT SOCIAL VALUE OF ELECTRIC COOPERATIVES AT
12 PERCENT ANNUAL SIMPLE DISCOUNTED RATE

	PSV_1	PSV_2	PSV_3	PSV_4	Average	P
Masbate	-9,530	-14,627	-9,530	-14,627	-12,079	-14
Camarines Norte	19,077	5,481	3,214	3,214	7,747	15
Camarines Sur II	17,687	-4,626	17,687	951	7,925	8
Camarines Sur III	-8,205	-473	-8,205	3,112	-3,443	5
REGION VI - WESTERN VISAYAS						
Capiz	14,891	-9,406	-11,247	-11,247	-4,252	-3
Aklan	6,936	-6,220	-6,809	-6,809	-3,226	12
Antique	15,221	-3,609	5,808	-3,609	3,453	3
Bacolod City (Central Negros)	172,855	13,400	42,393	13,400	60,512	47
Iloilo	15,726	6,176	-7,198	-8,857	1,462	1
San Carlos City	11,122	-7,530	11,122	-7,530	1,796	7
Iloilo II	5,125	536	-4,055	-8,647	-1,760	67
REGIO VII - CENTRAL VISAYAS						
Bohol	-438	-5,522	-4,389	-5,522	-3,968	-5
Negros Oriental	30,872	-3,313	3,524	-3,313	6,943	12
Siquijor	-2,356	-2,356	-2,356	-2,356	-2,356	-6
REGION VIII - EASZERN VISAYAS						
Leyte I	34,081	10,493	8,529	687	13,448	27
Leyte Sur	15,072	2,678	2,678	-2,828	4,400	1
Biliran, Leyte	6,932	116	735	-2,441	1,336	
Leyte II	122,861	52,500	46,424	29,432	62,804	44
Leyte III	32,459	8,549	5,505	537	11,763	8
Leyte IV	40,987	11,133	8,023	1,811	15,489	11
Samar II	10,402	-7,072	10,402	-7,072	1,665	
REGION IX - WESTERN MINDANAO						
Zamboanga Sur	35,357	16,343	35,357	21,642	27,175	9
Zamboanga Norte	38,019	19,914	16,291	16,291	22,629	56
Basilan, Zambo Sur	5,305	-3,254	5,305	-400	1,739	-6
Zamboanga City	10,473	-17	-2,247	-2,247	1,491	
Tawi-Tawi	464	-1,138	464	-1,138	-337	-1
Alicia, Zambo del Sur	-115	-251	-115	-251	-183	
Cagayan de Sulu	6,602	988	6,602	988	3,795	

Table 14 (Continued)

PRESENT SOCIAL VALUE OF ELECTRIC COOPERATIVES AT
12 PERCENT ANNUAL SIMPLE DISCOUNTED RATE

	PSV_1	PSV_2	PSV_3	PSV_4	Average	P
REGION X - NORTHERN MINDANAO						
Surigao Sur	13,093	5,938	9,092	5,938	8,515	10
Lanao del Sur	29,755	5,408	8,116	8,116	12,849	25
Lanao del Norte	16,346	1,410	-2,459	-2,459	3,210	13
Misamis Occidental	10,735	-3,229	1,084	1,084	2,419	17
Bukidnon	46,879	9,561	6,793	6,793	17,507	38
Surigao del Norte	2,349	-3,206	2,349	-3,618	-532	14
Camiguin	7,686	-3,457	7,686	-3,457	2,115	5
Agusan del Sur	16,954	1,546	973	3,256	5,682	15
Misamis Oriental	33,410	5,581	-1,636	-1,636	8,930	25
Agusan del Norte	60,944	13,065	16,612	7,745	24,592	52
Surigao	24,091	1,943	24,091	1,943	13,017	
Misamis Occidental II	36,364	-2,947	-7,317	-7,317	4,696	4
Bukidnon II	42,082	6,121	3,531	3,531	13,816	34
REGION XI - SOUTHERN MINDANAO						
Davao Norte	7,669	4,028	6,264	3,823	5,446	4
Cotabato	18,457	10,116	18,457	13,450	15,120	15
Cotabato Sur	25,959	15,544	13,931	12,186	16,905	16
Davao Oriental	8,356	4,147	7,397	4,147	6,012	5
Davao Sur	58,932	38,253	58,932	46,524	50,664	47
Maguindanao	21,938	11,492	21,938	11,492	16,715	
Sultan Kudarat	8,231	4,522	8,231	4,522	6,377	5
South Cotabato II	17,335	10,549	9,189	7,836	11,227	40
South Cotabato I	47,175	27,569	23,600	19,635	29,495	

*Reported in USAID (1976) Rural Electrification Project Paper (Philippines: USAID/MANILA)

SOURCE OF RAW DATA: Feasibility Studies, National Electrification Administration Board of Power and Waterworks
Alonzo R. (1974) "On Measuring Shadow Wages of Philippine Labor," NEDA Journal of Development, First Semester.

differs. Under the regional highest price assumption (PSV_1), only 6 cooperative register negative total PSV, and under highest provincial price assumption (PSV_3) 16 cooperatives have negative total PSV. In contrast, 25 cooperatives suffer negative total PSV under the regional average price assumption (PSV_2), while 31 have negative total PSV under the provincial average price adjustment (PSV_4). Averaging the PSV of each cooperative, only 11 cooperatives would have negative total PSV each. Under the previous estimates (PSV_0), 12 cooperatives recorded negative PSV each. Thus, depending on assumption used, the number of "socially" uneconomic electric projects varies from 6 to 31 cooperatives.

Evaluation of NEA Implementation

While the 81 cooperatives as a whole, have a national rate of return of more than 12 percent, concessional foreign loans and the government budget are, however, limited. Thus the NEA implementation of the electrification program becomes of utmost importance. On financial profitability, for instance, it is prudent to implement an electric program of cooperative with high financial profit. To a certain extent, the surpluses earned by profitable cooperatives can be loaned to finance less profitable ones. On another angle, social profit criterion, not necessarily inconsistent with private profitability, argues for the scheduling of coop-

eratives in terms of PSV or national rate of return. To find out whether NEA scheduled the phases of cooperatives according to private or "social" profitability, rank correlation analysis should be done to shed some light. In this regard, the analysis focuses on the relation between date of establishment or energization (indicator of implementation phases) and the estimated PPV or PSV (indicator of private and social profitability, respectively) of cooperatives having requisite data.

Table 15 reports the simple rank correlation coefficients between the registration or energization date against the estimated PPV or PSV of 81 cooperatives. Simple rank correlation coefficients ranged from - .12 to .32, all insignificant at the 5 percent level, except the coefficient between PSV_2 and energization date.[20/] The results may imply that the NEA working plan is not scheduled terms of private or "social" profitability. In general, cooperatives with greater private or "social" profits are not given priority compared to less profitable ones.

Of the 81 cooperatives, only 10 are unregistered and 25 unenergized as of this writing. Using a χ^2 test, one can

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20/ This significant coefficient might have been unduly influenced by the take-over of operating profitable utilities. Yet most coefficients are insignificant even at the 20 percent level.

Table 15

SIMPLE RANK CORRELATION COEFFICIENTS OF REGISTRATION AND ENERGIZATION DATES VIS-A-VIS ESTIMATED PPV AND PSV

	DATE OF REGISTRATION		DATE OF ENERGIZATION	
	r	n	r	n
$PPV_{8\%}$	.1440 (1.2088)	71	.0308 (0.2130)	50
PSV_1	-.0148 (0.1246)	71	.0870 (0.6260)	50
PSV_2	.0698 (0.5844)	71	.3219* (2.3400)*	50
PSV_3	.0013 (0.0108)	71	.1059 (0.7668)	50
PSV_4	.0257 (0.2493)	71	.2305 (1.6374)	50
PSV_4	-.0208 (0.1662)	71	.1653 (1.1612)	50
PSV_0 1/	-.1229 (0.9900)	66	.1057 (0.7424)	47

t-values in parenthesis

* Significant at 5% level.

1/ As reported in USAID Rural Electrification Project Paper (Philippines, USAID/Manila, 1976).

see if the registered or energized cooperatives are necessarily the profitable ones, or if the remaining unregistered or unenergized are the unprofitable cooperatives. Table 16 presents the estimated χ^2 which ranges from .0016 to 3.232, almost all insignificant at the 5 percent level.[21/] The results may imply that even as to the choice between profitable against unprofitable cooperatives, NEA seems to have no preference in its implementation phase. In short, the privately and/or "socially" profitable cooperatives are not given priority over the unprofitable ones. In conclusion, based on my estimated PPV and PSV, including the USAID-reported PSV, a lot of opportunities prevail to improve the implementation of rural electrification program.

Perhaps, it can be argued that the scheduling of uneconomic cooperatives ahead of the more profitable ones is appealing and desirable. Such a scheme, for instance, may induce foreign donors to extend more loans, or the government to grant more funds. Obviously, the resulting average profits for the whole program would rise if the profits of the unregistered or nonoperating cooperatives are higher than those of the registered. As it is argued, "What is important is

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[21/] Again, except the χ^2 between PSV_2 and energization status. This might have been due to take-over policy.

Table 16

COMPUTED CHI-SQUARES BETWEEN ESTIMATED PPV AND PSV VIS-A-VIS REGISTRATION AND ENERGIZATION STATUS

+ PPV/ - PPV + PSV/ - PSV	REGISTERED/NOT REGISTERED COMPUTED χ^2	n	ENERGIZED/NON-ENERGIZED COMPUTED χ^2	n
$PPV_{8\%}$	1.2391	81	2.6699	81
PSV_1	0.1125	81	0.02609	81
PSV_2	0.5047	81	3.2320*	81
PSV_3	0.0003	81	0.6940	81
PSV_4	0.9786	81	0.4976	81
PSV_5	0.1259	81	0.0016	81
PSV_0 [1/]	0.1819	75	0.5894	75

*Significant at 5% level.

1/ As reported in USAID Rural Electrification Project Paper (Philippines, USAID/Manila, 1976).

that, on the whole, the cooperatives have a positive social value over time." (USAID 1976, p. 53). In fact, the past implementation scheme has succeeded in getting the release of committed loans particularly USAID loans. In the near future, however, the same scheme may no longer serve the purpose of securing loans, thus NEA can now adopt a scheme based on optimal resource allocation to further improve the foreign loan attraction of its projects.

Be that as it may, the NEA implementation may be cast in terms of its objective: to ultimately achieve total electrification of the rural areas by 1990. This objective, nevertheless, should be viewed within our resource limits. Using its own measure, NEA can schedule cooperatives in such a way that it would cover or energize as much as it can. In terms of covering a greater population, for instance, NEA should schedule cooperatives according to costs per capita. In the past, cooperatives that could cover more persons per given costs were not generally favored against others having lower population coverage. Table 17, for example, shows that rank correlation between costs per capita vis-a-vis registration or energization date of cooperatives are not significant. Further, as already noted, NEA preferred to finance in some areas the take-over of existing electric utilities than to start electrifying areas

Table /7

SIMPLE RANK CORRELATION COEFFICIENTS OF REGISTRATION AND ENERGIZATION DATES VIS-A-VIS DIFFERENT ESTIMATED ECONOMIC VARIABLES

	DATE OF REGISTRATION		DATE OF ENERGIZATION	
	r	n	r	n
°Cost Per Capita (Cost of Project/Population, 1970)	-0.1436 (1.3060)	83	0.0774 (0.5913)	60
°Excess Supply	-0.1220 (0.7168)	36	0.0232 (0.1231)	30
°System Losses	-0.1600 (0.9988)	39	-0.0089 (0.0471)	30
°Total Capacity 1971 Per 1,000 Population (1970)	0.0211 (0.1600)	60	0.0039 (0.0265)	46
°Degree of Electrification (% of Population with Electricity, 1971)	-0.0952 (0.7205)	59	0.1175** (0.7848)	46
°Degree of Electrification (% of Population with Electricity, 1973)	0.0180 (0.1335)	57	0.1580 (1.0700)	47
°Industrial Electricity Consumption (1970)	0.1083 (0.6700)	40	-0.3112 (1.822)	33
°Energy Productivity (1970)	-0.1030 (0.5947)	35	0.0073 (0.0391)	31

t-values in parenthesis

* Significant at 5% level.

without electric services. Such take-overs, though may prove justified on other grounds, say, profitability, have most likely reduced the number of new rural subscribers.

Likewise, NEA can schedule cooperatives according to the demand and supply of electricity across the country. To start with, the quantity or ratio of excess supply differs among regions and even among provinces. Presumably, areas with greater electric shortages should deserve a higher priority in the NEA work plan. In the early days of NEA implementation, excess supply conditions in different areas, seemed not to have influenced the registration or electrification schedule of cooperatives. Again Table 17 reveals insignificant rank correlation of excess supply (proxied by the percentage of system losses of PEPOA members in 1975) with registration or energization date of the first cooperatives established in the province. Also, using 1971 installed total provincial capacity per capita (as proxy for pre-NEA electric supply conditions), the rank correlation with registration or energization date of the first provincial cooperatives yields insignificant coefficient. Moreover, NEA apparently did not favor provinces with more population without electricity. Rank coefficient between the degree of electrification in terms of population coverage vis-a-vis registration or energization schedule is insignificant at the

5 percent level (Table 17). Given these findings, one can say that NEA can improve its performance by considering supply and demand in the implementation of its program. NEA can greatly reduce the preexisting uneven degree of energization among provinces. In other words, NEA would greatly provide electricity to a greater number of rural population with a better implementation program.

Lastly, with respect to energy conservation or profitable energy use, NEA apparently overlooked this criterion in its Phase I of implementation. To start with, NEA stated that Phase II would deal "mainly with profitable utilization of electricity" (NEA 1973-74, p. 25). Yet, as noted, energy profitability differs among provinces. This makes it feasible and desirable to consider it in Phase I instead of postponing it until Phase II. In the past, NEA seemed to have established cooperatives with little regard to energy productivity. On this, Table 17 indicates that the date of registration or energization of the first provincial cooperatives is insignificantly correlated with industrial energy consumption or productivity across provinces in 1970. It appears, therefore, that the "energy crisis" which seems to have recently justified rural electrification, can be taken into account in the future work plan of NEA program.

To summarize, NEA seems to have performed with little regard to the variables so far considered. This does not mean, however, that NEA was carrying out its program without some rational criteria. It is probable that NEA was concerned not with a single variable but with a matrix of weighted variables (which may include some of the variables mentioned here). Or perhaps some factors like political and social (mostly unmeasurable) factors might have occupied a higher priority rank in NEA implementation such that the past performance might actually be in the right thrust. Based on the above findings, however, substantial improvement can be derived with a better working scheme of NEA projects. Proper timing (and waiting) of profitable projects may eventually turn rural electrification effective, feasible, and economical compared to other rural projects (say, land reform, education, and family planning). Finally, with a flexible implementation schedule that takes important minimum requirements and with good energy pricing policies, rural electrification can greatly demonstrate our government's concern over the welfare of all citizens.

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