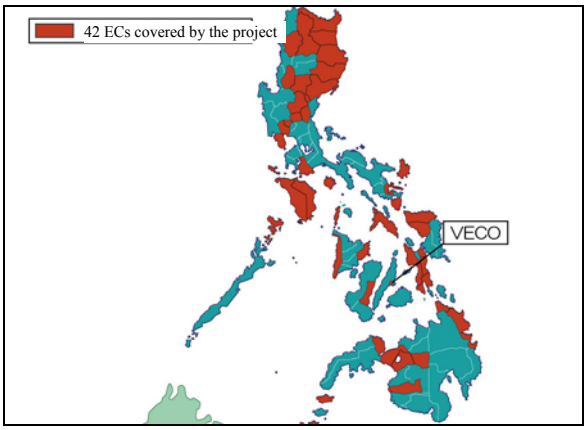
The Philippines

NEA・VECO Rural Electrification Project

Field Survey: July 2003

1. Project Profile and Japan's ODA Loan



Project Site


Beneficiaries, left, a wattmeter installed under the project, right

1.1 Background

In the Philippines, rural electrification started with the establishment of the National Electrification Administration (NEA) in 1969. Before that, private companies supplied electricity, which was therefore concentrated in urban areas with high economic efficiency and large populations. As a result, there was a widening gap between urban and rural areas in electrification. NEA was committed to promoting rural electrification through Rural Electrification Cooperatives (RECs) established under Republic Act No. 6038.

As of 1991, there were 120 Electric Cooperatives (ECs)[*1] all over the Philippines and approximately 3 million households in 22,194 barangays[*2] and 1,324 municipalities had been electrified. ECs distribute electricity supplied by the National Power Corporation (NPC) to residents in each service area. In remote areas and islands that cannot be connected to NPC's transmission network, ECs supply electricity using their own power sources such as diesel power or mini hydroelectric generators. The household electrification rate, which was 18% when NEA was established, had increased to 56% by the end of 1991. However, the overall degree of electrification was still low and there were gaps among regions.

Visayan Electric Company, Inc. (VECO) is a private company that provides electricity to the metropolitan area of Cebu Island. In the service area of VECO, the seaside region centered on Metro Cebu had been electrified, while the mountainous regions had not. It was difficult for VECO as a private company to electrify these regions where residences are scattered and the electric business is unprofitable.

[1] Rural Cooperative Cooperatives (RECs) changed their name to Electric Cooperatives (ECs) in 1993.
[2] Barangay: the smallest local administrative unit in the Philippines

1.2 Objectives

The objectives of the project are to repair, expand, and improve the maintenance of the power distribution facilities of the target 44 Electric Cooperatives (ECs), while promoting electrification by Visayan Electric Company, Inc. (VECO) in mountainous regions and rehabilitating and increasing their distribution facilities in order to improve people's livelihood in unelectrified regions and strengthen the rural electrification system.

1.3 Output

a) Rehabilitation and expansion of existing facilities, such as transmission lines, and electrification in the regions covered by 44 ECs, where the project is expected to achieve economic efficiency
b) Procurement of materials and equipment necessary for the regional offices of NEA to maintain distribution facilities
c) Electrification, reduction of power distribution losses and system reliability improvement in the service area of VECO
d) Consulting service for the above activities, including construction supervision and project management

1.4 Borrower/Executing Agency

Government of the Republic of the Philippines/National Electrification Administration (NEA)

1.5 Outline of Loan Agreement

Loan Amount / Loan Disbursed Amount	11,433 million yen / 9,740 million yen
Exchange of Notes / Loan Agreement	July 1994 / August 1994
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 3.0% 30 years (10 years) General untied
Final Disbursement Date	October 2001

2. Results and Evaluation

2.1 Relevance

2.1.1 Relevance of Project Plan at Appraisal

a) NEA Portion

Since its establishment, NEA has focused on expanding power distribution facilities to achieve the goal of "full electrification" and put priority on social benefits. They expanded electrified areas without regard for economic efficiency sometimes. However, this strategy accelerated the deterioration of the financial conditions of ECs, which have many distribution areas with low profitability, as well as the deterioration of distribution facilities. Also, as more ECs failed to repay

NEA loans, the amount of nonperforming loans held by NEA increased. Therefore, the system for rural electrification was becoming increasingly ineffective.

In its long-term plan for rural electrification (December 1992), NEA tried to correct its tendency of attaching too much importance to the expansion of electrification and shifted its strategy to realize sustainable electrification. Specifically, it drew up an active investment plan to reinforce the management base of ECs by reducing distribution losses, strengthening the maintenance system, and implementing profitable programs. This project is considered relevant according to government policy at that time as it aimed to promote electrification in regions where economically viable and reduce distribution losses by rehabilitating and expanding existing facilities. Coincidently with this project, the United States Agency for International Development (USAID) and the World Bank also offered assistance for rural electrification in the Philippines in the fields of organizational reform, electrification planning and implementation of electrification. This project was to cooperate with these assistance organizations in promoting electrification in the Philippines. The target areas of each project were determined so they would not overlap and would complement each other.

b) VECO Portion

Among the 218 barangays in VECO's service area, 172 were electrified as of 1993 and VECO set the goal of achieving a 100% electrification rate by electrifying the remaining 46 barangays. However, it was difficult to maintain the economic viability of the electrification project in unelectrified mountainous areas with low user density. This project was to help electrify those unprofitable regions by providing low-interest ODA loans while enhancing profitability by reducing distribution losses and enhancing the reliability of existing facilities. Therefore, it was consistent with the policy of the government and VECO at that time.

2.1.2 Relevance of Project Plan at Present

a) NEA Portion

Under the Expanded Rural Electrification Program (EREP) developed by the Department of Energy in April 2003, NEA set the targets of achieving a barangay electrification rate of 100% by 2006 and a household electrification rate of 90% by 2017. Based on this policy, NEA requires ECs to further accelerate electrification. ECs are also required to improve the existing facilities and financial conditions in line with the Performance Improvement Program (PIP) and Rehabilitation and Efficiency Plans (REP) under the Restructuring Program for Electric Cooperatives (RPEC), a related registration of the new electric power act issued in 2001 (see below for details). Therefore, this project is relevant with the current policy of NEA and the government to accelerate electrification and at the same time improve the existing facilities.

b) VECO Portion

As a private company, VECO must maintain profitability. At the same time, it needs to promote the electrification of unprofitable regions according to the government's EREP. In spite of the low profitability of electrification of the regions covered by this project, this project had no negative impact on VECO in terms of profitability because the project was implemented using the funds loaned at a low interest rate of 6% per annum and because of the effectiveness of the distribution loss reduction program implemented at the same time. Therefore, this project is relevant according to the

current policy of VECO and the government aimed at accelerating electrification while making a profit.

2.2 Efficiency

2.2.1 Output

In the NEA portion, 3 ECs were excluded from the initial target 44 ECs and 1 EC was added based on the financial conditions of each EC. As a result, 42 ECs were covered by the project. [*3]

With regard to transmission lines, the length of rehabilitated sections totaled 1,176cct-km against the planned 684cct-km (cct-km: a unit of length of transmission and distribution lines), and the constructed and extended sections totaled 1,858cct-km against the planned 4,893cct-km. This means that the rehabilitated section substantially increased from the original plan whereas the newly electrified and extended sections were reduced. One reason behind this is that the Philippine Government shifted its policy on ECs from electrification of unelectrified areas to rehabilitation of existing facilities. In addition, existing EC customers strongly requested better services.

The NEA portion of the project was completed without procuring wooden poles due to a problem procuring materials and equipment (see below for details). Some materials and equipment to be used together with the wooden poles were kept at NEA headquarters because the poles were not procured. They were supplied to the target 42 ECs as well as other ECs that wanted them.

In the VECO portion, the output increased because of the expansion of the target households. For example, although a section of 42cct-km of the existing high-voltage lines was planned to be replaced with thick wires at appraisal, 149cct-km was actually replaced. Also, a total of 1,217cct-km of distribution lines was built and expanded against the planned 241cct-km.

2.2.2 Project Period

In the NEA portion, procurement of materials and equipment was to be completed by May 1997 and construction of distribution lines, etc. was to be completed in December 1997. However, the loan term expired in October 2001 before all materials and equipment were procured due to the delay in procurement. With regard to the procurement of wooden poles, rebidding was conducted because the initial supplier defaulted. After the rebidding, a failed bidder filed a lawsuit alleging NEA's fraud, but the lawsuit did not come to a conclusion before the loan term expired. Therefore, the ODA loan was not used to procure the poles. ECs continued construction using wooden poles procured with their own funds and equipment procured with the ODA loan. By April 2002, they had electrified nearly all of the number of households planned at appraisal (97.7%).

Bidding for the VECO portion began in June 1996, one year and 7 months behind schedule due to the delay in preparing the bidding documents caused by the increase in the target households. In order to make up for the delay of the start of the project, the work of this portion was accelerated and completed in December 2000. The project period, beginning with the signing of the ODA Loan Agreement, was 77 months against the initially planned 71 months.

[*3] ALECO、LANECO and LASURECO were excluded because they could not afford to share the local currency portion of the project cost, and BOHECO II was added.

2.2.3 Project Cost

At the time of appraisal, the estimated total project cost was 13,898 million yen. The ODA loan was to cover the entire foreign currency portion of 11,433 million yen, or 82.3% of the total cost. The foreign currency portion was for the materials and equipment as well as the consulting service. The local currency portion equivalent to 2,465 million yen to cover construction, land acquisition costs, taxes, etc., was to be supplied by the Philippine Government and VECO's own funds.

The actual project cost totaled 10,486 million yen. As initially planned, the ODA loan covered the foreign currency portion, which was 9,740 million yen or 85.2% of the approved loan amount. The actually used loan amount was less than estimated because it became impossible to use the ODA loan to purchase wooden poles in the NEA portion, which was estimated at 2,306 million yen at appraisal time. As for the local currency portion, 1.98 million pesos were used for the NEA portion, which had been estimated at 3.1 million pesos, and the VECO portion cost 1.52 million pesos, which was less than the estimated 1.92 million pesos.

2.3 Effectiveness

2.3.1 Increase in Electrification Rate

This project covered 42 out of 120 Electric Cooperatives (ECs) all over the Philippines and Visayan Electric Corporation (VECO), a private power distribution company. As shown in Fig.1, the project area extends all over the Philippines including the Visayas Region, composed of the northern part of Luzon Island, Cebu Island and many other islands.

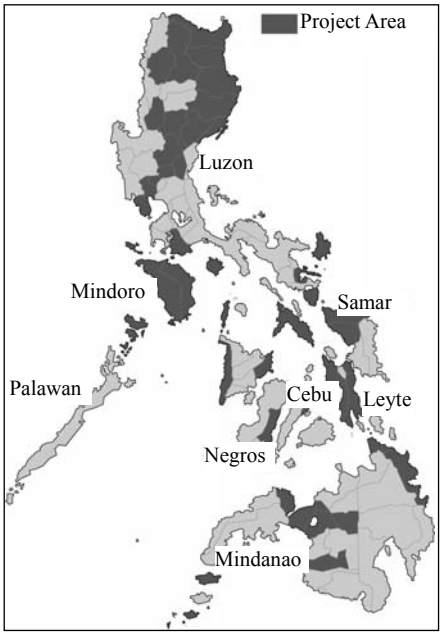


Fig.1: Project Area (42 ECs and VECO)

a) NEA Portion

The project had the goal of electrifying 299,724 households. According to the executing agency report, 292,760 households had been electrified by April 2002, and according to the data obtained for evaluation this time, 461,211 households had been electrified by August 2003, well exceeding the target.

The average barangay electrification rate in the service areas of 42 target ECs increased from 63.0% (December 1993) to 84.5% (May 2003), and the household electrification rate grew substantially from 49.4% to 68.6% in the same period.

b) VECO Portion

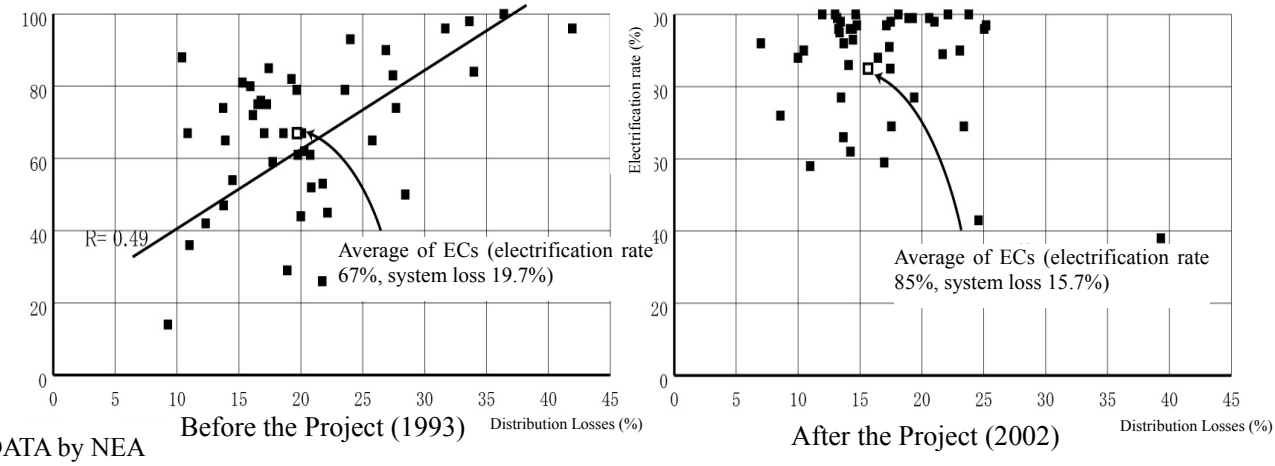
VECO is a private power distribution company that supplies electricity to Cebu City, the center of Cebu Island, and 7 towns. Before the project started (1996), 189 among 232 barangays in its service area had been electrified. The barangay electrification rate was 81.5%, and the household electrification rate was 71.8%. As a result of the project, 6,219 households, well exceeding the target 4,743 households, and 46 barangays were electrified. Thus, a barangay electrification rate of 100% was achieved in 2001, and the household electrification rate had increased to 82.3% (see Fig.3).

2.3.2 Reduction of Distribution Loss Rate through Rehabilitation and Expansion of Existing Facilities

a) NEA Portion

The distribution loss rates of 42 target ECs as of the end of 1993 and the end of 2002 are plotted in Fig. 2. All values shifted to the left, indicating that the loss rates have been reduced. Comparing the range of distribution loss rates of the target ECs as of the end of 1993 and as of the end of 2002, most values except for the highest and lowest 10% samples fell between 12-32% with an average of 19.7% in 1993, while the values in 2003 concentrated in the lower 11-24% range with an average of 15.7%.

The distribution loss rate of BENECO, which covers Benguet Province, for example, fell from 16.9% in 1993 (appraisal) to 6.3% in 2003. The project's rehabilitation of the existing distribution facilities is considered to have played a great role in reducing the distribution loss rate.



Source: DATA by NEA

Fig.2: Changes in Electrification Rate and Distribution Loss Rate of Target ECs Before and After the Project

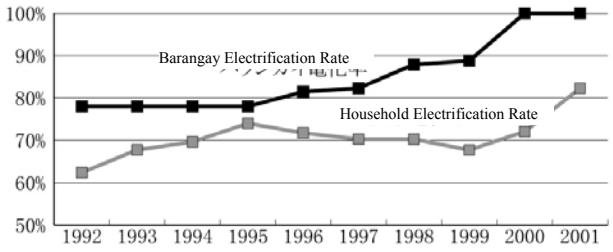
b) VECO

Under this project, VECO extended and converted 69kV lines of its trunk electric system to a loop system. Also, it replaced the existing low voltage lines of 4.13kV and 13.8kV with high voltage lines of 23kV[*4]. In addition, 4 transformers were installed near the demand area.

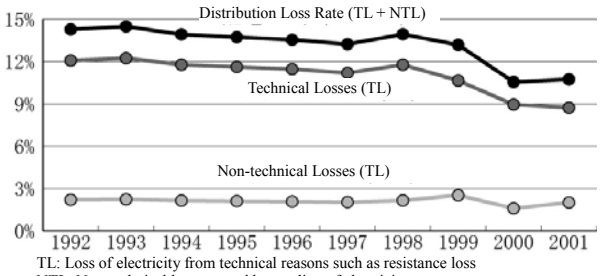
One of these four 25MVA transformers was installed in the new substation built in Cebu Business Park (CBP), which houses the offices including ones of communications companies as well as a large-scale shopping mall. The transformer was installed to deal with the increase in power demand in CBP. It also helps reduce distribution losses by transforming high-voltage electricity to lower voltages at the point nearest the demand area before supply. As a result, VECO's distribution loss rate fell from 14.3% at the time of project appraisal (1992) to 10.8% in 2001 after the project was completed (see Fig.3). Among distribution losses, the rate of non-technical losses including the loss of stolen electricity decreased only slightly from 2.2% (1992) to 2.0% (2001), while the rate of technical losses such as resistance losses of distribution lines and transformers fell substantially from

[*4] Transmission and distribution losses are inversely proportional to the square of voltage. The voltage of VECO's high–voltage transmission lines (Primary Line) has been changed from 4.13kV to 13.8kV and then to 23kV to reduce the loss rate. At appraisal time, high-voltage lines of 13.8kV were to be constructed. However, as 23kV lines were introduced to reduce distribution losses in the mid-1990s, 23kV instead of 13.8kV distribution lines were constructed under this project.

12.1% to 8.8%. Generally speaking, lower distribution losses directly reduce electricity purchase costs and increase the supply to residents, which greatly improves the profitability of the distribution company. In the case of VECO, a 1% reduction in distribution losses would lower electricity purchase costs by 56 million pesos[*5].



*The household electrification rate from 1996 to 1999 declined due to the increase in the number of target households as a result of the expansion of the target area and people moving to the area.
Source: Data by VECO



TL: Loss of electricity from technical reasons such as resistance loss
NTL: Non-technical losses cased by stealing of electricity, wattmeter errors, etc.
Source: Data by VECO

Fig.3: Changes in Electrification Rate (left) and Distribution Loss Rate (right) of VECO

2.3.3 Achievement of Both Increase in Electrification Rate and Decrease in Distribution Loss Rate

Generally, the distribution loss rate tends to increase in remote barangays in spite of low user density and small power consumption because distribution line resistance increases in proportion to the distance the line is extended.

The left graph of Fig.2, which shows the situation before the start of the project, suggests a correlation between the electrification rate and the distribution loss rate. It shows that the distribution loss rate tends to increase as electrification in remote areas advances.

On the other hand, the graph on the right shows no correlation between the electrification rate and the distribution loss rate after the completion of the project, indicating that the increase in the electrification rate and decrease in the distribution loss rate were achieved at the same time. This is considered a result of this project, which rehabilitated and expanded existing facilities while promoting electrification in selected regions where the electrification was expected to be economically effective.

Also in the VECO portion, as shown in Fig. 3, the barangay electrification rate increased from 81.5% to 100.0% during the project implementation period (1996-2001) and at the same time the distribution loss was reduced from approx. 13.5% to 10.7%. Thus, the project achieved both an increase in the electrification rate and decrease in the distribution loss rate.

2.3.4 Improvement of Reliability of Power Supply

VECO introduced the Supervisory Control and Data Acquisition (SCADA) System under this project. SCADA monitors the demand at each feeder of each substation from the central control room and operates substations by remote control. Before the system was introduced, problems were detected only after local residents informed VECO of an

Photo 1: Terminals of SCADA System

[*5] Calculated for a case in which distribution losses are reduced 1% based on the electricity purchase cost and distribution loss rate, which were 5,042 million pesos and 10.74%, respectively, in FY2001.

outage and VECO conducted a field survey to identify the cause. SCADA has enabled VECO to view from its headquarters network conditions in real time and promptly pinpoint the cause of the problem.

Also, after breakers were installed in each region, it became possible to prevent a power failure from affecting a wider area in the event of a problem in the distribution system by isolating the trouble spot from the system by remote control. As a result, the System Average Interruption Duration Index (SAIDI; average power interruption duration experienced by one consumer in a year) decreased from 81.6 hours/year before the project to (1996) to 16.1 hours/year (2001), far below the standard 45 hours/year set by the Department of Energy of the Philippines.

As for the NEA portion, quantitative evaluation was impossible because individual ECs did not make available data on power supply interruptions.

2.3.5 Acquisition of Inexpensive and Safe Light Source

Before electrification, most households used kerosene lamps for lighting. According to the survey conducted for this evaluation[*6], 78% of households used portable kerosene lamps and 2% used pressure kerosene lamps for lighting before electricity became available. Pressure lamps were used by relatively wealthy households or on special occasions such as having guests because the lamps consume more fuel, though they give off brighter light than portable lamps. Since electrification, 20W-40W fluorescent lamps and 40W-60W incandescent lamps have generally been used.

Table 1 compares 60W incandescent lamps and pressure/portable kerosene lamps in brightness and cost. A 60W incandescent lamp is 7-70 times brighter than a kerosene lamp and costs only 1/2 to 1/9 per hour.

Kerosene lamps sometimes caused fires when they fell down, and the smoke from kerosene lamps smelled bad and caused health problems such as coughing and itchy eyes and soot everywhere in the room. In the survey, 24% of respondents regarded the smoke from kerosene lamps as a problem. Among them, 3 out of 4 persons felt discomfort from soot. After the project was implemented and residents began to use fluorescent lamps and electric bulbs, problems caused by the smoke from kerosene lamps were eliminated. In addition, 31% of the beneficiaries say there is no need to worry about kerosene lamps causing fire.

[*6] See “2.4 Impact” for details of the survey.

2.3.6 Strengthening of Operation and Maintenance System

NEA constructed regional warehouses to store repairing equipment in 10 locations all over the country (5 in Luzon Island, 3 in Bisayas and 2 in Mindanao Island) as small ECs cannot afford to own such equipment themselves. The spare parts for repair and maintenance equipment procured under the project were distributed to these 10 warehouses.

Table 1: Comparison of Brightness and Cost by Type of Lighting

	60W incandescent lamp	Pressure kerosene lamp	Portable kerosene lamp
Shape			
Brightness	700 lumens*a	40 – 100 lumens*a	10 – 15 lumens*a
Fuel Efficiency	60 Wh/hour*a	0.11– 0.17l/hour*b	0.04– 0.06l/hour*c
Fuel Expenses	4.95 pesos/kWh*a	16 pesos/kWh*d	
Cost	0.30 pesos/hour	1.78– 2.67 pesos/hour	0.64– 0.96pesos/hour

*a: Source: International Association for Energy-Efficient Lighting
*b: Calculated based on the survey conducted during the field survey
*c: Average of ECs all over the country as of 2001; Source: Rural Electrification Chronicle
*d: Costs of kerosene as of 2001 (interview with NEA)

Initially, 12 vehicles for maintenance of distribution facilities were to be procured and rented out from NEA to ECs when needed. These vehicles are equipped with a hydraulic arm that enables work in high places, digging drills, measuring instruments of various kinds, and tools. As these vehicles are frequently used for construction of facilities and operation and maintenance activities, a total of 75 vehicles were procured for 33 ECs in response to strong demands from each EC. In addition to use for daily operation and maintenance activities, these vehicles are helping to promptly resolve problems in distribution facilities.

These efforts to strengthen the operation and maintenance system resulted in the improvement of SAIDI as mentioned in "2.3.4 Improvement of Reliability of Power Supply."

2.3.7 Recalculation of Internal Rate of Return

a) Financial Internal Rate of Return (FIRR)

At the time of appraisal, this project's Financial Internal Rate of Return (FIRR) was 7.7% for the NEA portion and 10.4% for the VECO portion. It was calculated on the assumption that the benefit is income from electricity sales, that the costs include the project cost, operation and maintenance cost, and the cost for purchasing electricity from the National Power Corporation and independent power producers, and that the project life is 15 years.

For this evaluation, FIRR was recalculated only for the VECO portion because we could not obtain the data for recalculating the FIRR of the NEA portion. In the recalculation, the same assumptions as

the appraisal were used except that the effect of the distribution loss rate reduction[*7], which is an important component in the VECO portion, was added as the benefit. As a result, the FIRR of the VECO portion was recalculated as 9.0%.

If the abovementioned component had not been included in the benefits, the current benefits would have been negative and the FIRR could not have been calculated. This indicates the financial difficulty of electrifying remote areas. The effect of the distribution loss rate reduction, which accounts for nearly 70% of all benefits, pushed up the profitability of the entire project. It can be concluded that, as far as the VECO portion is concerned, this project was profitable as a result of the efforts to reduce the distribution loss rate, which were conducted along with electrification of unprofitable regions.

b) Economic Internal Rate of Return (EIRR)

The Economic Internal Rate of Return (EIRR) of this project was 8.5% at appraisal time. This value is for the entire project, including both NEA and VECO portions. Since benefit components had to be taken into consideration, we recalculated the EIRR of the VECO portion for which data were available. The EIRR was recalculated as follows.

The project cost, operation and maintenance cost and electricity purchase cost were accounted for as costs and the increase in consumer's surplus[*8] resulting from the switch to lamps that cost less per quantity of light than portable kerosene lamps with high fuel costs was accounted for as an economic benefit. As a result, the EIRR for the VECO portion was calculated as 24.8%.

This calculation was an attempt to extract the effect of acquiring an inexpensive light source enabled by rural electrification as the only benefit. Here, some economic benefits of rural electrification were converted to monetary value. The result proves that rural electrification alone can generate economic benefits.

2.4 Impact[*9]

2.4.1 Positive Impact of Project

For this evaluation, a survey was conducted to study the positive and negative impacts of this project on local residents. We interviewed by questionnaire a total of 195 households in the regions electrified under this project, 65 each in the service areas of VECO and the ECs of LEYECO and ABRECO. According to the results, 47% of the residents say they are very satisfied with the project and 46% say they are satisfied for a total of 93% who are satisfied with the project.

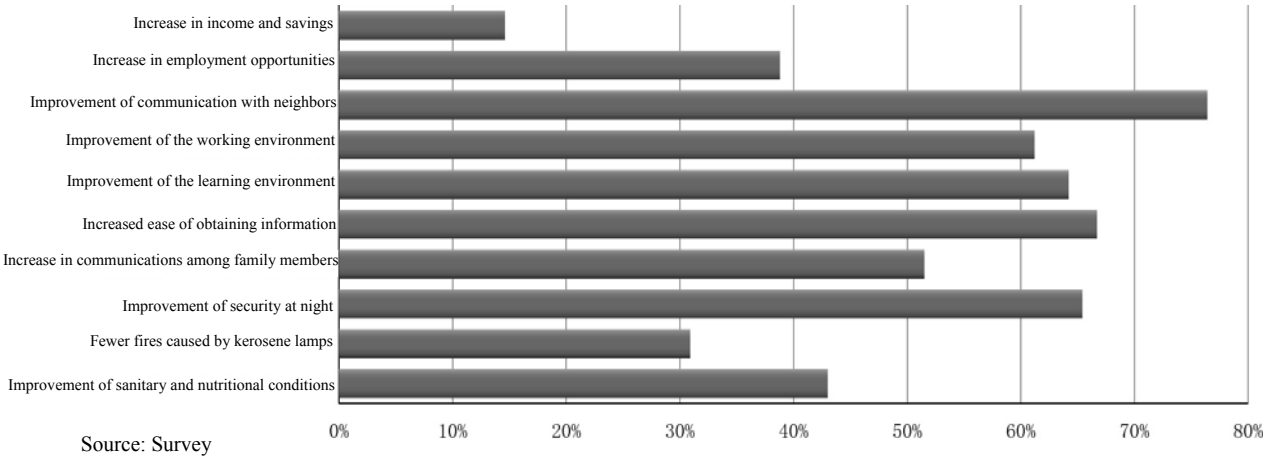
Fig. 4 presents the percentages of the respondents who agreed when asked what impacts of electrification they recognized. It shows that the project not only provides pastimes and convenience brought about by lighting and other electric appliances but also has various impacts such as fewer fires, improvement of the working and educational environment, and improvement of communications among family members and neighbors. As the negative impacts of this project, 13% of the households

[*7] The benefit of distribution loss reduction was calculated using the following formula. LWO is the technical loss rate in 1995 before the project started ("without" case) and LWH is the actual value of the technical loss rate ("with" case). Benefit of distribution loss reduction＝electricity purchase income of entire VECO×{1-(1- LWO)/(1- LWH)}.

[*8] Consumer's surplus is defined as the benefit received by consumers by paying the market equilibrium price in spite of their willingness to pay a higher price. It is obtained by integrating the area enclosed by the market equilibrium price curve and demand curve.

[*9] According to an NEA staff member, this project contributed to the safe and security of conflict areas in Mindanao.

had higher debts because they bought home electric appliances and because of electricity charges, and 3% think their traditional sense of values has been lost.



Source: Survey

Fig.4 Impact of the Project (percentages of survey respondents who agreed to each survey item)

a) Increase in employment opportunities and income

In the barangays electrified under the project, some residents started new businesses or increased their income by utilizing electricity.

For example: it became possible to open a grocery store until late at night; a resident started making ice lollies in the refrigerator and selling them; and a new bakery was opened. According to the survey, 17% (28 households) do businesses using electricity, although 18 of these households use electricity merely for lighting.

At present, 39% of the households interviewed say that employment opportunities increased after electrification, while only 15% say that income and savings increased. However, considering that 97% of the interviewed households were electrified after 2000, income increase is expected to become apparent in the coming years.

Case 1: Increase in income in Cebu Barangay Magsico

Lordes Obaob (56) in Barangay employs women in the neighborhood to sew cloth for factories in urban areas. They are paid on a piece work basis. Before electrification, she used a treadle sewing machine and paid 1-2 women in the neighborhood to help her out when she was busy or tired. After electrification, she bought an electric sewing machine, which she uses along with the existing machine. She asks for help more frequently than before. Before electrification, she could not continue working after dark even when the delivery date was drawing near. Working in the dusk caused eyestrain and physical fatigue. Since electrification, the electric sewing machine has allowed her to work more efficiently and she feels less tired because she can work in a well-lighted room in the evening and at night. Also, as she can work until 11 at night in order to meet delivery dates, her income has increased.

Photo 2: Working with an electric sewing machine

b) Improvement of the educational environment

The project electrified not only general households but also educational institutions in barangays such as nurseries and primary schools. In 16 barangays where the survey was conducted, 13 nurseries and primary schools and 4 high schools were electrified. As each household came to use fluorescent and incandescent lamps, which are much brighter than the formerly used kerosene lamps, it became possible to study at night. In the survey, 64% households said that the learning environment had improved.

■ Case 2: Barangay Lantawan Nursery and Magsico National High School in Cebu Island

The nursery in Barangay Lantawan in Cebu Island was electrified in March 2001 under the project. A 40W fluorescent light and a two-port wall socket are installed in the room. As the approximately 16.5 ㎡ room has many windows, the electric light is used only on rainy or cloudy days. The room is brighter than before electrification, making reading and writing easier. Since electrification, the children have been practicing dancing and singing using a radio-cassette recorder.

Photo 3: Inside the classroom

Magsico National High School in Barangay Magsico, Cebu Island was established in 1994 and has about 700 students. The classrooms are dark because the windows are not so large and there are eaves over the hallway side. Before electrification, students felt eyestrain when looking at the blackboard or books or taking notes on cloudy and rainy days.

Since electrification, 1-2 40W fluorescent lights have been installed in each classroom and are used even during the daytime on fine days. Although the classrooms still seem a little dark, students say that the learning environment has improved greatly. The school is considering introducing computers in the classrooms and using them in teaching.

c) Improvement in convenience and increase in leisure activities

According to the survey, most households (93%) bought electric lighting equipment such as fluorescent lamps or light bulbs after electrification. In addition, they bought home electric appliances that increase convenience and ease the burden of household chores such as refrigerators (26%), irons (16%), washing machines (8%), electronic rice cookers (5%), and electric pumps for domestic water (4%). They also bought entertainment goods such as TV (54%), videocassette recorder (24%), radio/radio-cassette recorder (30%), karaoke machine (13%) and video game (2%).

The result of the interview survey shows that most residents stay up later at night than before the project, although they get up at almost the same time as before. The percentage of households whose members go to bed after 9 o'clock at night increased from 32% to 71% after the completion of the project. When we interviewed local residents in the field survey, they told us that before electrification they used to work in the field in the daytime, go home after dark, and go to bed. Since electrification, their life pattern has changed and many of them enjoy talking under the lights or visiting their neighbors to watch TV or videos or sing karaoke together. In the survey, too, many households say communication among family members and neighbors have improved (76% and 52%, respectively).

2.4.3 Environmental Impact

Prior to the implementation of the project, an Environmental Compliance Certificate (ECC) was issued for the NEA portion in May 1993 and for the VECO potion in December 1992 by the Environmental Management Bureau of the Department of Environment and Natural Resources. The land necessary for the project was only small plots of ground, mostly along existing roads, to construct electric poles. Although the minimum number of trees was cut down to build distribution lines, the project had almost no impact on the environment.

2.5 Sustainability

2.5.1 Executing Agency

The electric power supply system in the Philippines is composed of the National Power Corporation (NPC) and Independent Power Producers (IPPs), which develop power sources and generate electric power, the National Transmission Corporation (TRNASCO), which transmits electric power, 26 private companies that distribute electric power including Manila Electric Company and Visayan Electric Company, Inc. (VECO), and 120 Electric Cooperatives (ECs) that promote rural electrification with the support and guidance of local governments and the National Electrification Administration (NEA).

Among them, 42 ECs covered by the project and VECO, a private distribution company, are in the power distribution business using the distribution equipment installed under the project and operation and maintenance of facilities.

a) Electric Cooperatives (ECs)

ECs were founded to accelerate rural electrification in the Philippines. They take out long-term loans from NEA and invest them in power distribution equipment and distribute electricity to users in each service area. ECs promote electrification in line with the rural electrification policy decided by NEA, the executing agency of this project. Also they receive technical, managerial and financial assistance from NEA concerning rural electrification.

At present, there are 120 ECs in the Philippines, and they have electrified 30,803 barangays and 5,914,373 households. The electrification rate is 85.4% for barangays and 69.9% for households.

b) Visayan Electric Ccompany, Inc. (VECO)

VECO is a private electric company that supplies electricity to the central area of Cebu Island, including Metro Cebu, the largest urban area next to Metro Manila. Its service area covers 672km^2 around Cebu City, which has approximately 1.3 million residents. Under the project, VECO achieved a 100% electrification rate for baranagays by the end of 2000. The household electrification rate as of the end of 2001 was 85.2%, far higher than those in EC service areas.

Technical Capacity / Operation and Maintenance System

No specific problem has been pointed out with the technical capacity and operation and maintenance system of the executing agency.

Financial Status

a) Financial conditions of ECs

The average collection rate of electricity charges of all ECs in FY2002 was as high as 95%. However, the management base of many ECs is weak because their business scale is too small to be economically viable and the distribution loss rate is so high that it is difficult to reflect distribution losses in electricity charges. 65 ECs, or about half of all ECs, posted deficit for FY2002. The balance of current account of all ECs was in deficit of 90.3 million pesos (ordinary income to net sales ratio: 0.3%). These ECs with accumulated deficit tend to be low in their repayment rate of loans from NEA. Many of them are trapped in a vicious circle in which they are not capable enough of raising own funds and obtaining loans and therefore they cannot maintain facilities in a sufficient manner and, as a result, they cannot take additional steps to reduce distribution losses.

The basic electricity rates and additional charges of ECs are determined by the Electricity Regulatory Commission (ERC). The basic electricity rates of each EC have not been raised since 1996 and the reasonable price level has been maintained by collecting various types of additional charges. For example, increase in the cost for purchasing electricity from NPC is automatically reflected to the retail price in the form of an additional charge. [*10]

The distribution loss adjustment charge is one of additional charges. In the case of ECs, it is calculated assuming a 14% distribution loss rate regardless of the actual loss rate. Therefore, if the actual loss rate is lower than this figure, the difference will generate income of each EC. On the contrary, if the actual distribution loss rate is higher than 14%, ECs will post a deficit. For ECs that do not have users in manufacturing and other industrial sectors and supply electricity to mountainous areas with low user density, they have high distribution losses for technical reasons. This situation is one of the factors causing deterioration of their financial status. Among 120 ECs, only 51, or less than half, achieved a distribution loss rate lower than 14%.

b) Financial status of NEA

The financial status of the executing agency NEA is adversely affected by the deteriorated financial conditions of ECs.

NEA procures long-term funds from its own funds provided by the government and foreign loans and extends long-term loans to ECs. NEA's revenue source is the interest on loans to ECs, which cover the operating expenses of NEA, such as the payment of interest on procured funds and personal expenses.

Table 2 shows the financial indicators of NEA for the past 5 years. The collection rate of interest on loans extended to ECs, which constitutes the income of NEA, declined from 91% in 1999 to 78% in 2002. With the decline, sales of NEA have been decreasing and the current deficit has been increasing. Both the ordinary income to total assets ratio and capital turnover, which shows the degree of capital utilization, are extremely low. These data indicate that NEA is becoming unable to collect a sufficient rate of loans provided to ECs.

Because the net profit has been negative each year, the equity capital has halved over the past 5 years, resulting in an annually declining equity capital ratio.

[*10] According to the interview survey conducted this time, 22% of the interviewed households think electricity charges are "very expensive" and 29% think "expensive". 9% of the households experienced suspension of power supply due to the delay in paying electric charges, although power supply was resumed after they paid the bill.

Table 2: Changes in Financial Indicators of NEA over Past 5 Years (unit: million pesos)

	1998	1999	2000	200 年	2002
Total Capital	20,999	20,992	20,617	21,199	20,602
Equity Capital	7,190	6,543	5,773	4,664	3,543
Current Assets	3,494	3,164	3,466	4,665	4,016
Current Liabilities	6,712	7,175	8,064	9,701	10,152
Sales	804	850	776	700	615
Ordinary Profit	▲149	▲228	▲440	▲742	▲803
Net Profit	▲202	▲329	▲472	▲753	▲581
Interest Collection Rate	82%	91%	88%	83%	78%
Ordinary Income to Total Assets Ratio	-0.71%	-1.09%	-2.13%	-3.50%	-3.90%
Ordinary Income to Net Sales Ratio	-18.53%	-26.82%	-56.70%	-106.00%	-130.57%
Capital Turnover	0.04 times	0.04 times	0.04 times	0.03 times	0.03 times
Equity Capital Ratio	34.24%	31.17%	28.00%	22.00%	17.20%
Current Ratio	52.06%	44.10%	42.98%	48.09%	39.56%

Source: Data by NEA

In order to improve NEA's financial condition, it is necessary to have ECs improve their financial conditions and increase the collection rate of loans to ECs. (Measures to improve the financial conditions of EC will be discussed in detail later).

c) Financial Status of VECO

VECO is a private company that purchases electricity from NPC and 2 Independent Power Producers (IPPs) and earns income by selling electricity to users in its service area. 33.9% of the income from electricity sales comes from general households and 62.8% from manufacturing and other industrial sectors.

As Table 3 shows, it has been making a profit for the past 4 years. The high ratio of ordinary income to total assets and that of ordinary income to net sales show the profitability of the company. In terms of capital structure, the capital ratio is adequate. The financial stability of the company has been increasing every year.

Table 3: Changes in Financial Indicators of VECO over Past 4 Years (unit: million pesos)

	1998	1999	2000	2001
Total Capital	3,412	3,694	4,190	4,792
Equity Capital	2,017	2,151	2,418	2,896
Current Assets	1,143	1,259	1,366	1,631
Current Liabilities	493	562	610	697
Income from Sale of Electricity	3,978	4,158	5,146	6,615
Operating Income	240	199	214	378
Ordinary Income	114	249	90	206
Ordinary Income to Total Assets Ratio	3.34%	6.74%	2.15%	4.30%
Ordinary Income to Net Sales Ratio	47.50%	125.13%	42.06%	54.50%
Capital Turnover	0.07 times	0.05 times	0.05 times	0.08 times

Equity Capital Ratio	59.11%	58.23%	57.71%	60.43%
Current Ratio	231.85%	224.02%	223.93%	234.00%

Source: Data by VECO

2.5.3 Measures to Improve Financial Conditions of ECs

In association with the Electric Power Industry Structural Reform Act (2001), which is aimed at improving the financial and operating conditions of ECs, the Philippine Government requires all ECs to develop and implement a Rehabilitation and Efficiency Plan (REP) and a Performance Improvement Program (PIP). NEA has already approved the REPs and PIPs submitted by each EC.[*11]

NEA will monitor more than 50 indicators specified in the REPs and PIPs for the improvement of organizational, technical, financial and operational aspects (distribution loss rate, electricity charge collection rate, cost management, electricity charges, financial indicators, etc.) NEA will provide technical and financial support, too. For those indicators, final and interim goals have been established for the 5 years from 2002 to 2006. Whether these targets are achieved or not will affect the amount of long-term loans for electrification and rehabilitation of the existing facilities.

2.5.4 Operation and Maintenance Status

No specific problem has been pointed out relating to the operation and maintenance of the project.

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

（For the executing agency and the Philippine Government）

It is advisable to devise measures to reduce distribution losses, such as reviewing the standard distribution loss rate or increasing incentives.

ECs in remote areas with low user density naturally have higher distribution loss rates than ECs in urban areas. In other words, the current system of determining the sales price of electricity assuming a uniform 14% distribution loss rate is clearly disadvantageous for ECs in remote areas, which are more likely to post losses than those in urban areas. Therefore, the standard distribution loss for each EC should be determined separately based on user density and the topography of the service area.

For example, in Bangladesh, each EC sets an annual target for the reduction of distribution losses and bonuses are paid to ECs that achieve their own targets. It would be possible to introduce a similar incentive program in this project.

[*11] According to NEA, the financial situation of each EC is being improved in 2004.

Comparison of Original and Actual Scope

Item	Plan	Actual
I. Output		
a) Electric Cooperative Portion		
- Newly electrified households	299,724 households	461,211 households
- Rehabilitation of high-voltage and low-voltage distribution lines	684 cct-km	1,176 cct-km
- Construction and extension of high-voltage and low-voltage distribution lines	4,893 cct-km	1,858 cct-km
- Installation of transformers for distribution	5 MVA: 16 units; 10 MVA: 6 units	5 MVA: 22 units; 10 MVA: 12 units
- Maintenance vehicles	12 vehicles	75 vehicles
- Construction and maintenance equipment	1 set	As planned
b) VECO Portion		
b-1) Rural electrification		
- Newly electrified households	4,743 households	6,219 households
- Replacement of high-voltage lines with thick wires	42 cct-km	149 cct-km
- Construction of high-voltage and low-voltage distribution lines	241 cct-km	1,217 cct-km
b-2) Reduction of distribution losses		
- Voltage increase of distribution lines	11 sections	As planned
- Replacement of high-voltage lines with thick wires	111 cct-km	153 cct-km
- Monitoring meters for pole transformers	1,600 units	As planned
b-3) Improvement of system reliability		
- Installation of disconnectors	30 units	38 units
- Installation of transformers for distribution	1 location	4 locations
- Construction of 69kV transmission lines	5 km	37 km
- Mini SCADA System （computers and dedicated software）	1 set	2 sets
b-4) Others		
- Deposit of equipment	1 location	As planned
II. Project Period		
a) NEA Portion		
- Consultant and materials and equipment procurement agreement	Feb. 1994 – Apr. 1996	Jul. 1995 – Oct. 2001
- Delivery and conveyance of materials and equipment	Dec. 1994 – May 1997	Jan. 1997 – Jan. 2002
-Construction and civil engineering works	Jun. 1995 – Dec. 1997	Jun. 1997 – Apr. 2002
b) VECO Portion		
- Procurement of materials and equipment	Nov. 1994 – May 1996	Jun. 1996 – Sep. 1996
- Delivery and conveyance of materials and equipment	Jan. 1995 – Jun. 1997	Sep. 1996 – Mar. 1999

- Construction and civil engineering	Jul. 1995 – Jun. 1999	Jan. 1997 – Dec. 2000
III. Project Cost		
Foreign Currency	11,433 million yen	9,740 million yen
Local Currency	2,465 million yen	746 million yen
（In terms of local currency）	(493 million pesos)	(350 million pesos)
Total	13,898 million yen	10,486 million yen
ODA Loan Portion	11,433 million yen	9,740 million yen
Exchange Rate	1 peso = 5.0 yen (Jan. 1993)	1 peso = 2.13 yen (Sep. 2001)

Third Party Evaluator's Opinion on
NEA-VECO Rural Electrification Project

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Impact and Sustainability

A serious effort in rural electrification in the Philippines started in 1969 with the establishment of the National Electrification Administration (NEA). From a low coverage of 18% of households, the rate of electrification increased over time to 56% in 1991, and by 2000, 68% of the 15.3 million households all over the country were using electricity. However, even with this temporal increase, the rate of electrification varies across regions and shows positive link with regional GDP. This electrification gap between the prosperous urban areas and the depressed rural areas is one factor that contributes to the problem of weak integration of the country that, in turn, slows down national development. It is in this light that the impact and sustainability of the NEA-VECO Rural Electrification Project should be considered.

The post evaluation report enumerated three key impacts. These are: (1) increase in employment opportunities and income of affected households; (2) improvement of the educational environment; and (3) improvement of convenience and increase in recreational activities. The impact on employment and income as well as the impact on the quality of life reinforce existing data that connect electrification with the value of economic activities in the locality. Electricity is not only an important input for widespread production and enhanced consumption but can also support poverty reduction programs in many regions. The impact on education, on the other hand, addresses the problem of inadequate educational facilities, including the lack of water and electricity, especially in remote areas. With electricity, schools in the rural areas are now able to enjoy better classroom environment that can enhance learning. Given more resources, the availability of electricity together with the provision of computers, schools may be able to access the instructional and informational wealth of the internet.

The expanded income and employment in the locality generated by this electrification project, in turn, can be a factor in the sustainability of the project by making sure of the financial health of Electric Cooperatives (ECs). However, since almost half of ECs included in the projects are not able to generate sufficient revenues to pay their loan obligations with NEA due to "their small business scales and difficulty reflecting distribution losses in their charges" there is a need to address this issue of sustainability.

To improve the financial performance of ECs, the government requires them to develop and implement a Rehabilitation and Efficiency Plan and a Performance Improvement Program. These requirements are steps in the right direction. In addition, the recommendation of giving incentives to ECs that are able to meet their targeted reduction in distribution losses should be given serious consideration. Aside from addressing the problem from the supply side, the issue of sustainability can likewise be tackled by expanding activities in the locality that can enhance demand for electricity. Specifically, this electrification project should be integrated with the overall rural development projects and loan programs of the JBIC and other funding agencies in the region. As a consequence, other rural development projects can support the financial viability of this project by creating greater economic activities in the locality that can increase the demand for electricity. In turn, this electrification project can sustain other rural development programs by providing a necessary input for all activities, economic and otherwise, at an affordable price.