Indonesia

Rural Electrification Project

Report Date: October, 2002
Field Survey: July, 2001

1. Project Profile and Japan's ODA Loan

Location Map of the Project

A Small Generator for Isolated Grid System

1.1 Background

1. Rural Electrification

In December 1992, the nationwide village electrification rate[1] in Indonesia was 42.6%. Electrification had progressed mainly on Java Island, and there existed a wide gap between Java Island and outside Java. About 60% of villages were electrified on Java Island, while only a little more than 30% of villages outside Java were. The household electrification rate was around 30% on Java Island, and lower than 20% outside Java.

The Government of Indonesia has prioritized rural electrification with a view to promoting social and economic development in rural areas and to attaining more equitable distribution of developmental benefits. During the period covered by the 5th Five-Year Plan (1989/90- 1993/94), the Indonesian state-owned electricity supply corporation, PLN (Perusahaan Umum Listrik Negara)[2], planned to electrify 11,600 villages, comprising 7,540 villages outside Java and 4,060 villages on Java Island. In addition, at the end of the 5th Five-Year Plan, the Indonesian Government requested that the World Bank and the Japanese Government finance the electrification costs for 1,600 villages and 900 villages, respectively.

2. Scattered Diesel and Mini Hydro

Outside Java Island, diesel power plants were the main source of electricity, comprising 61%, 1,748MW of installed capacity in 1991. This situation was caused by both the difficulty of constructing a power distribution network for widely dispersed locations and by the small scale of demand in each locality. Given these conditions, diesel plants were considered economically efficient outside Java at the time of appraisal.

At the time of appraisal, the total installed capacity of mini hydro power plants outside Java Island was 8 MW, comprising 0.27%. Most plants were located in Sumatra and Sulawesi. Mini Hydro plants were planned for remote areas where it was not feasible to connect to existing diesel plants and where geographical conditions were appropriate. From the perspective of environmental protection, the mini hydro power plant was one of the preferred generating systems.

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[1] Village Electrification Ratio: The number of electrified villages in a certain area to the total number of villages in the area.

[2] PLN is the Indonesian Government-owned electricity supply corporation, which was established in 1969. The corporation and its subsidiaries are responsible for electric power generation, transmission and distribution throughout the country.

1.2 Objectives

To contribute to economic and social development in regional areas through rural electrification, installation of diesel power plants and construction of a mini hydro power plant.

1.3 Project Scope

1. Rural Electrification

   Electrification of 600 villages in twenty-two provinces

   - Installation and Procurement of distribution lines (medium voltage: 2,410 km, low voltage: 1,970 km)
   - Installation and Procurement of distribution transformers with total capacity of 56,150 kVA
   - Procurement and installation of diesel generators with total capacity of 2,160 kW

2. Installation of Scattered Diesel Plants

   Procurement and installation of diesel power plants (6 units of 2.5 MW capacity each) in three locations, namely Tanjung Pandan on Belitung lsland, Barabai on Kalimantan Island and Kendari on Sulawesi Island

3. Installation of Mini Hydro Power Plant

   Construction of a mini hydro power station (1unit of 0.2 MW capacity) in one location, namely Baras, on Kalimantan Island

4. Consulting Services

1.4 Borrower/ Executing Agency

Government of the Republic of Indonesia / Perusahaan Umum Listrik Negara (PLN)

1.5 Outline of Loan Agreement

Loan Amount / Loan Disbursed Amount	8,970million yen / 7,884 million yen
Exchange of Notes / Loan Agreement	October, 1993 / November, 1993
Terms and Conditions Interest Rate Repayment Period (Grace Period) Procurement	 2.6 % p.a. 30 years (10 years) General Untied (Partially Untied for Consulting Services)
Final Disbursement Date	December, 1997

2. Results and Evaluation

2.1 Relevance

During implementation of the 5th Five-Year Plan (1989-1993), PLN planned to increase the average electrification rate in the country from 30.3% to 49.0% by electrifying 11,600 villages[3], and by doing so, narrow the gap between the outer islands and Java Island. From this it is clear that the project objective was consistent with the development policy of Indonesia at the time.

Owing to various efforts to promote electrification in the country, including this project, the nationwide

[3] Breakdown of 11,600 villages are 7,540 villages outside Java and 4,060 on Java Island.

village electrification rate reached 83.6% in March 2001. In particular, the village electrification rate on Java Island was nearly complete (98.2%), and had reached 74.4% outside Java. For more equitable distribution of developmental benefits, the Government of Indonesia is, currently, planning to electrify all villages throughout Indonesia by the end of the 7th Five-Year Development Plan (2000-2004), and to electrify all households by the end of the 10th Five-Year Development Plan (2015-2019). Accordingly, the project objective has been and still is relevant.

2.2 Efficiency

2.2.1 Project Scope

The scope of the "Rural Electrification Project" consisted of three components: rural electrification, installation of scattered diesel power plants and construction of a mini hydro power station. Of the actual project cost of these components, the rural electrification component accounted for 75.4%, while the scattered diesel component and mini hydro component accounted for 22.8% and 1.8%[4], respectively. Thus, the rural electrification component was considered the main component.

a) Rural Electrification

The actual number of villages electrified under the Project reached 851, a 41.8% increase from the planned number, 600 villages.

At the time of appraisal, only province level target was specified, and, thus, the capacity and amount of materials to procure (distribution line, distribution transformer, diesel generator, etc.) for each village level were estimated based on PLN's past electrification projects. When implementing the Project, geographical site conditions and actual demand determined the actual amounts procured. As a consequence, the actual procurement, as compared with the original target, resulted in a 70% increase in total length of distribution line and a 2% capacity increase in distribution transformers. Total capacity of the small diesel generator[5] was also increased by 320%.

b) Scattered Diesel Generators and Mini Hydro Power Plant

The original scope at appraisal was implemented as envisioned, with the exception of the diesel generator's rated capacity, which was modified from 2.5 MW to 3.0 MW.

2.2.2 Implementation Schedule

The Project was completed in June 1997, fifteen months later than the scheduled completion date of March 1996. The completion delay was brought about by delay in mini hydro plant component.

2.2.3 Project Cost

At the time of appraisal, the total project cost was estimated at 10,553 million yen, comprising 1,698 million yen in foreign currency and 150,093 million rupiahs in local currency (8,855 million yen). The actual project cost was contained to 9,127 million yen (cost under-run of 14.0%), comprised of 1,588 million yen in foreign currency (cost under-run of 6.5%) and 7,539 million yen in local currency (cost under-run of 14.8%). The local cost under-run in yen terms can be attributed to the depreciation of the local currency over the project implementation period (1.0 rupiah= 0.059 yen at appraisal; 1.0 rupiah= 0.044 yen at the time of implementation).

The actual Japan's ODA loan disbursement was 7,884 million yen, which covered 86.8% of total project costs and was 12.1% less than the amount originally approved (8,970 million yen).

2.3 Effectiveness

2.3.1 Rural Electrification

The PLN's electrification projects in rural areas consist of (i) grid transmission systems and (ii) isolated systems. The former receives energy from an existing main grid (see Figure-1), while the energy source for

[4] At appraisal, the rural electrification component, the scattered diesel component and the mini hydro component occupied, respectively, 68.2%, 30.7% and 1.1% of total estimated project cost.

[5] Capacity of procured diesel generators: 40 kW, 100 kW, and 220 kW.

the latter is a small diesel generator within the electrified area (see Figure-2).

The rural electrification component of the Project was carried out using both grid transmission and isolated systems, electrifying 861 villages in total. For grid transmission systems, the Project covered construction of medium/low voltage-distribution lines, transformers and wiring to individual consumers. For isolated systems, installation of diesel generators was included.

2.3.2 Operational Performance of the Six Diesel Generators and One Mini Hydro Power Station

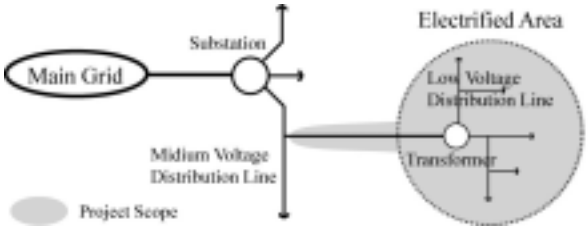

Figure-1: Grid Transmission System

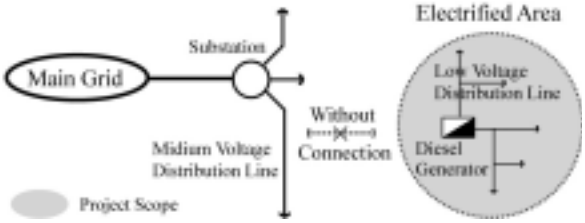

Figure-2: Isolated System

a) Operational Performance of the Diesel Generators

Six diesel generators were installed in three locations (two units each), on Sulawesi Island, Kalimantan Island and Belitung Island. All of the generators were connected to isolated systems serving urban areas, and utilized as base load facilities[*6] at their inception. Two units installed in Tanjung Pandan City, Belitung Island, are still operating as base load facilities.

Figure-3: Location of Diesel Generators and Mini-Hydro

The two units in Kendari City, Sulawesi, were connected to the isolated system serving the area around Kendari, the capital city of South Sulawesi. They were utilized as base load facilities until 1998. Since new diesel generators were commissioned (1999), the units have served as peak load facilities. They remain in good operational condition, so when the base load facility is being overhauled, they are able to serve as base load facilities.

Operational data for two generators in Barabai City, Kalimantan, couldn't be obtained for this evaluation. According to PLN Region VI, there have been no problems with these units. On Kalimantan Island, PLN constructed two 150 kV grid transmission systems, namely the Barito System in the Southern Part and the Mahakam System in the Eastern Part, and several large-scale power stations[*7]. In middle of 1997, the diesel generators installed under the Project and their small isolated systems were connected to the Barito System. Since then, the generators have been operating only during the evening peak time.

Currently, these three areas are experiencing power shortages, particularly during evening peak hours, so it can be assumed that all of these generators still play a significant role in the stable provision of electricity in their respective areas.

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[6] Base load facility: A plant that normally operates at a constant output to take all or part of the base load of a system.

[7] Asam-assam coal-fired steam power station (130 MW) is located within the Barito System and was commissioned in January 2001. Tanjung Batu Combined Cycle power station (60 MW) is connected to the Mahakam System, and was commissioned in 1998.

Table-1: Operational Performance of the Project Facilities

	Date of Commissioning	Generating Capacity		Net Energy Production (GWh)				
		Rated Capacity	Dependable Capacity*	1996	1997	1998	1999	2000
Barabai	July 1996	3.0 MW	2.7MW	N.A	N.A	N.A	N.A	N.A
		3.0 MW	2.7 MW	N.A	N.A	N.A	N.A	N.A
Tanjung	July 1996	3.0 MW	3.0 MW	9.86 (74.4)	15.01 (57.1)	11.76 (44.7)	13.94 (53.0)	15.46 (58.8)
Pandan		3.0 MW	3.0 MW	8.47 (63.9)	17.25 (65.6)	11.01 (41.9)	13.35 (50.8)	14.9 (56.7)
Kendari	July 1996	3.0 MW	2.7 MW	9.98 (75.3)	17.6 (67.0)	18.81 (71.6)	8.42 (32.0)	2.38 (9.1)
		3.0 MW	2.7 MW	9.52 (71.9)	18.04 (68.6)	19.21 (73.1)	8.61 (32.8)	4.01 (15.3)
Baras	June 1997	0.2 MW	0.2 MW	-	0.002 (0.2)	0.033 (1.9)	0.094 (5.4)	0.088 (5.0)

Note: * As of March 2001 Source: PLN Region VI, VI, VIII

Figures in parentheses indicates Plant Load Factor ratio (%) (net energy production/ rated capacity/ hours during designated period)

b) Operational Performance of the Mini-Hydro Power Station in Baras

Under the Project, one mini hydro power station (200 kW) was constructed along the Baras River. The power station was expected to supply electricity to the surrounding villages through the isolated distribution system. However, water flow is considerably weaker than expected, and the power plant generates quite low energy. (see Table-1) In the opinion of PLN personnel interviewed for this evaluation, this situation can be attributed to an insufficient water flow study prior to the construction and also to the illegal intake of water for irrigation upstream.

2.4 Impact

2.4.1 Contribution to Promoting the Electrification Ratio on Outer Islands

Figure-4 indicates the electrification ratio on Java Island and Outside Java (bar graph) and the gap between the two areas in terms of village electrification rate (line graph).

From 1989-90 to 2000-01, rural electrification in the country increased 8.4% annually on average. As a consequence, rural electrification on Java Island is nearly complete. Further, over the same period, the village electrification ratio on the outer islands increased from 34.9% to 74.3%, or by 10.5% annually, which was 4.1-percentage points higher than the rate of increase on Java Island (6.4%). As a result, the gap between Outside Java and Java Island has narrowed progressively.

Upon completion of the Project, 851 villages on the outer islands were electrified by Rural Electrification component of the Project. Thus, the Project, at least, contributed to the electrification of 2.4% to the total number of village in the outer islands (36,291).

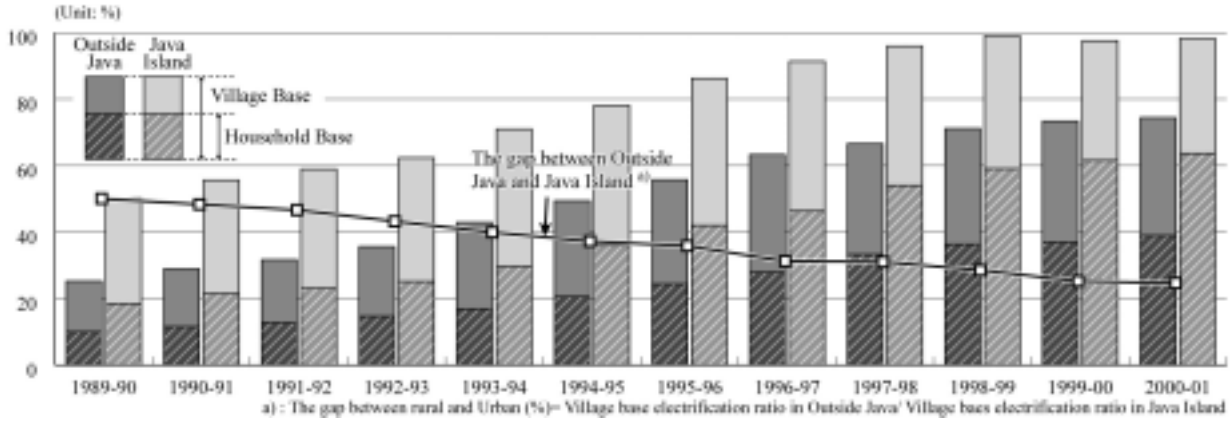

Figure-4: Change in Electrification Ratio (1989/90 - 2000/01) Source: PLN

2.4.2 Social and Economic Impact on the Electrified Villages

As a part of this evaluation, an interview survey was conducted[*8] in August 2001 at four randomly selected villages located on Kalimantan and Sumatra Islands. A sample population of 100 residents was interviewed, with the help of the respective local office of PLN and KUD[*9], in order to identify the Project's effects, impacts and beneficiaries' satisfaction. The respondents were selected randomly and on a voluntary basis from among those who were assumed to have benefited from the Project[*10]. The interviewers made random house calls at the site to interview 25 respondents in each village.

The results of the interview survey indicate that electricity has been utilized for domestic use rather than for commercial purposes. According to the survey, the beneficiaries use electricity mainly for lighting purposes (100% of the respondents), and for TV (84% of the respondents). In addition, electrification increased the wider use of other electrical appliances such as videos (64%), radio-cassette players (60%), electric fans (58%), electric irons (53%), radios (54.8%), water pumps for drinking water (30%), rice cookers (22%), and refrigerators (20%).

a) Increased Job Opportunities and Income

The survey indicates that the rural electrification component of the Project has contributed to creating job opportunities and to raising incomes. 31% of respondents reported an increase in job opportunities and the same percentage reported an increase in income and/or savings as a positive impact of the Project.

For example, one family living in Tenbin Burang village purchased a refrigerator to make ice candy. Initially, only 2 people, two adult women of the household, were engaged in this household industry. After an increase in sales volume, the other family member and his relatives started taking part, and at present 7 people are engaged in this work (See Figure-5).

Figure-5: Example of Household Industry

Another example is a family, living in Semoi village, whose main sources of income are pepper cultivation and the small general store attached to their house, where one of the female members of the family sells various goods. She cooks and packs boiled beans during her spare time to sell at the store. As a result of the Project, she has been able to spend more time doing such piecework and to operate the store even at night. The income of these families has increased because of the electrification. Not only do these families spend this income on consumer goods, they also invest in their small businesses.

Lack of job opportunities in rural villages is considered one of the great causes for migration to urban areas, which often contributes to urbanization problems. Viewed in this light, this Project may have contributed to preventing the outflow of migrants from rural villages by facilitating creation of job opportunities and elevating living standards in rural areas.

b) Saved Expense and Time

Before the Project, 24.0% of respondents used rechargeable batteries for appliances such as TV-sets and radio-cassette players. The family of one respondent living in Tenbin Bulang village, Kalimantan Island, used to possess a rechargeable battery for watching TV. At that time, they had to carry the rechargeable battery, weighing about 5 kg, 5 km away to the lumber mill for charging every week. It took 2.5 hours[*11] and cost 1,000 rupiahs[*12] per charging. In spite of these complications, the family could watch TV only one hour per day. In addition, the family spent about 6,000 rupiahs on kerosene for lighting.

After the Project, the family purchased an electric light, a fan, and an electric iron. Although the family uses these appliances and watches TV for about 6 hours per day, they paid only 7,782 rupiahs per month in

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[8] Prior to the interview survey, a site survey was carried out in two villages benefiting from the project, in order to gain a general understanding of the project's impacts/constraints. Based on this survey, the draft questionnaire used at the time was modified and finalized to meet the situation.

[9] KUD (Koperasi Unit Desa): The KUD are rural multipurpose co-operative institutions at the primary level with a high level of involvement from the rural population, including farmers, farm workers, small traders, and dairy farmers. Some KUD were responsible for part of the operation and maintenance of project facilities. Details will be discussed in Section 2.5 of this report.

[10] Tenbin Burang village and Jirak village in South Sumatra Province, Batua village and Senyiur village in East Kalimantan. Except for Batuah, the villages were electrified by an isolated system.

[11] Consisting of a 2.0 hour walk round-trip, and 30 minutes spent waiting for the battery to be charged.

[12] Just before the project's electrification, April 1996.

2001. When taking the recent rapid price escalation[*13] into consideration, the electricity and lighting expenses for the family are considerably lower than before, and they also were able to save the time they had previously used for charging the battery.

In Jirak village, before the Project, year 1994, 80% of respondents were supplied electricity from a diesel generator provided by a private operator, and used it only for lighting purposes. Although the voltage level of the electricity was unstable and quite low, villagers had to pay as much as 5,000 rupiahs per 10-watt lamp. The survey respondents said they used to pay 30,125 rupiahs for lighting purposes.

After the Project, they had a much more stable supply of electricity through the PLN's isolated system and began using it not only for lighting but also for other electrical devices. They paid an electricity tariff of 16,551 Rupiahs on average in 2001. Some beneficiaries experienced considerable savings as a result of the Project.

c) Improvement in the Living Conditions in the Rural Areas

Other positive impacts mentioned by the respondents include the following:

c)-i Decrease in Burden of Housework

Some beneficiaries were able to replace charcoal irons with electric ones. The addition of household conveniences such as refrigerators, rice cookers, electrified water pumps, and washing machines has lightened the workload of women.

c)- ii Increasing Nighttime Activities

The results of the interview survey show that the times at which respondents eat dinner and go to sleep are 1–3 hours later after the Project, while the time they wake up remains unchanged. Only 5% of respondents said they went to sleep after 22:30 before the Project, while 72% reported doing so after electrification. As a result, there is more time for education, piecework and entertainment.

Also, a well-lit room creates better study conditions for children. Among other activities, beneficiaries visit their friends' houses, receive visitors at night, and enjoy watching TV programs and videos. Such reciprocal visits may explain the answer "improved relations with neighbors" that some respondents suggested as a positive impact in the survey.

c) - iii Improving Security

42% of respondents asserted improvements in the village's after-dark security. In addition, before the Project, most people living in the project area used kerosene lamps, which sometimes caused fires. Hence, electrification by the Project has reduced the probability of future fires.

d) Increase in Debt

13% of respondents mentioned an increase in debt as a negative impact of the electrification. 10 were in debt for less than 2.0 million rupiahs, though this debt level was considered not very serious, as it was less than the repondents' monthly income. However, the other 3 respondents have liabilities of 10.0–50.0 million rupiahs, while their income is less than 5.0 million rupiahs/month[*14].

Of course, these liabilities did not all result from the electricity tariff, even though the respondents pointed to debt as a negative impact of the electrification. According to the interview survey, 79% of respondents believe the electricity tariff to be fair. The validity of the electricity tariff and the detailed observations of respondents concerning the tariff level will be analyzed in a later section. (see Section 2.5.2 *Affordability and Reasonability of Connection Fee and Electricity Tariff for Consumers*)

2.4.3 Environmental Impacts

The rural electrification component of the Project required small land plots for electric poles, and a minimal number of trees were cut down to install feeder lines and transformers. Thus, the environmental impact of the rural electrification component was negligible.

According to regulations of the Central Commission for Environmental Assessment of the Department of Mines and Energy, a river-type hydro power station with a capacity of less than 5 MW or a diesel generator with a capacity of less than 20 MW requires no environmental impact assessment. Accordingly, there is no

[13] According to the International Financial Statistics published by the International Monetary Fund, consumer price of the country was increased by 2.10 times between 1996 and 2000.

[14] Average income of [agricultural employee household ??]in the country was 1.63 million rupiah/ month in 1999.

environmental monitoring system at the project sites, so no quantitative monitoring data are available. There have been no negative environmental impacts reported so far.

2.5 Sustainability

2.5.1 Organization for Operation and Maintenance (O&M) of the project facilities

a) Rural Electrification

In the initial stage of rural electrification, operation and maintenance of facilities were wholly executed by PLN. However, as rural electrification in Indonesia has progressed, PLN has had difficulty in keeping pace with the development, particularly in terms of cost and manpower required for O&M.

In the early 1970's, the Government of Indonesia adopted a policy to promote forming rural cooperative units (Koperasi Unit Desa: KUD)[15] under the Ministry of Cooperatives. The development of KUDs coincided with the increasing need for human resources for the O&M of PLN's generation/distribution facilities in rural areas. The operation, maintenance and management of rural electrification was gradually transferred from PLN to KUDs based on a Mutual Decree of the Minister of Mines and Energy and the Minister of Trade and Cooperatives. By the end of March 1999, PLN had formalized cooperation agreements with 4,480 KUDs, serving 19,193,490 households in 40,716 villages. This accounted for 84.5% of electrified villages in the country (see Figure-6).

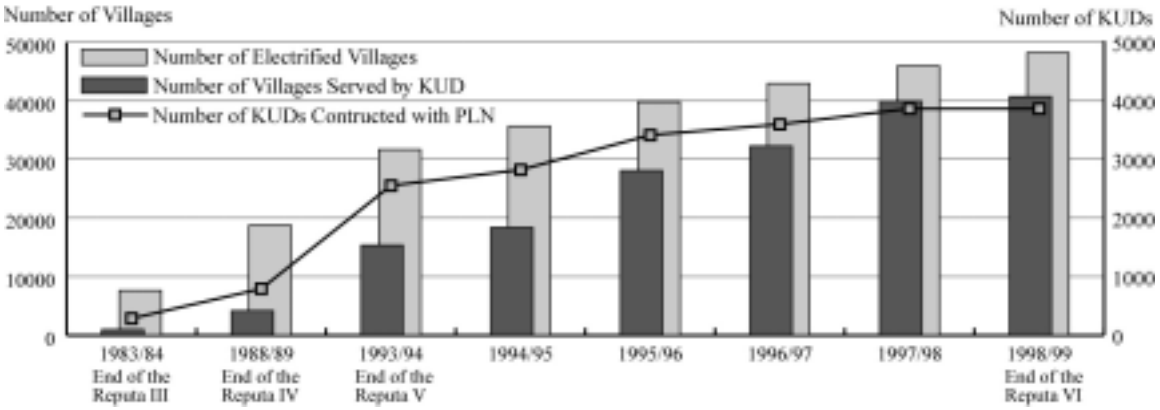


Figure-6: Transfer of Rural Electrification Related Activities to KUDs

Source: PLN

The Decree stipulates five patterns for transferring O&M responsibilities. Table-2 indicates the outline of activities covered by each pattern of transfer. In the case of the MSA (Management Service Agreements), the role of KUD is similar to that of the PLN's lowest operational units (sub-branch of local PLN stations).

[15] KUDs are multipurpose village cooperatives with a high level of involvement from the rural population.

Table-2: Patterns of Transfer and KUD Responsibilities as of March 1999

	Responsibilities of KUD	Number of KUDs	Number of Villages
Pattern I	Electric meter readings, bill collecting, trouble shooting for minor trouble, and network maintenance	3,589	34,530
Pattern II	House wiring, low-voltage distribution network installation, production of electrical devices, rural electrification surveys, and staking out for the distribution network	56	435
Pattern III	Both responsibilities of Pattern I and II	147	1,138
Pattern IV MSA-Grid	Line maintenance, simple fault clearing, trimming and street light maintenance, customer administration	508	4,613
Pattern V MSA-Isolated Diesel	Operation, maintenance and management of isolated diesel generators and distribution system[*16], customer administration	180	
Total		4,480	40,716

Source: PNL

Some problems with the transfer have been reported, including: i) insufficient capability for operation and maintenance of facilities, ii) lack of a sense of responsibility for operation and maintenance, iii) deliberate errors in meter reading, and iv) misappropriation of funds.

In order to ensure the technical capability of KUD staff, PLN has organized a training course and an on-the-job training system. In general, however, budgetary constraints have impeded the proper implementation of this plan[*17].

b) Diesel Power Stations and Mini Hydro Power Plant

Operation and maintenance of the project facilities are implemented by the respective regional sector office of PLN. Routine maintenance for the project facilities is generally implemented on schedule as per instructions in the maintenance manuals, which were supplied by the original supplier. However, overhauling is sometimes behind schedule because of an insufficient budget and the lack of spare parts. These tendencies have become more entrenched since the Asian Currency Crisis and PLN's subsequent financial deterioration. Furthermore, the current serious imbalance between power supply and demand tends to result in delays in and insufficient implementation of overhauling, because shutting down existing generators for overhauling causes load shedding in their service coverage areas.

2.5.2 Affordability and Reasonability of Connection Fee and Electricity Tariff for Consumers

a) Connection Fee

In Indonesia, it was thought that the majority of rural people were capable of paying the monthly electricity tariff. However, some rural residents were not able to pay for the connection fee in cash. Consequently, a high connection fee was considered a constraint on improving household electrification ratios. In order to relieve the burden of a high connection fee, the Government has provided funds in the form of a Rural Electrification Credit since 1982. Terms of the credit are a 12- or 24-month repayment period with a 3-month grace period, and a 12% interest rate.

However, the connection fee for lower capacity electrification (below 450 VA) has remained unchanged since 1992, and, accordingly, the current connection fee for lower capacity electrification is considered inexpensive, considering the recent rapid price escalation in the last 8 years[18]. 34% of interview survey respondents said that they had applied for public/private credit for the connection fee, while the remaining 66% paid the connection fee in cash. In addition, while 21% of respondents felt the connection fee was expensive, 75% responded that it was "fair"; there were no respondents that indicated that the fee was "very expensive".

b) Electricity Tariff

According to the interview survey, the average monthly electricity tariff was 14,527 rupiahs[*19]. Electricity tariff varies depending on the capacity of electrification (ampere). 45% of respondents are

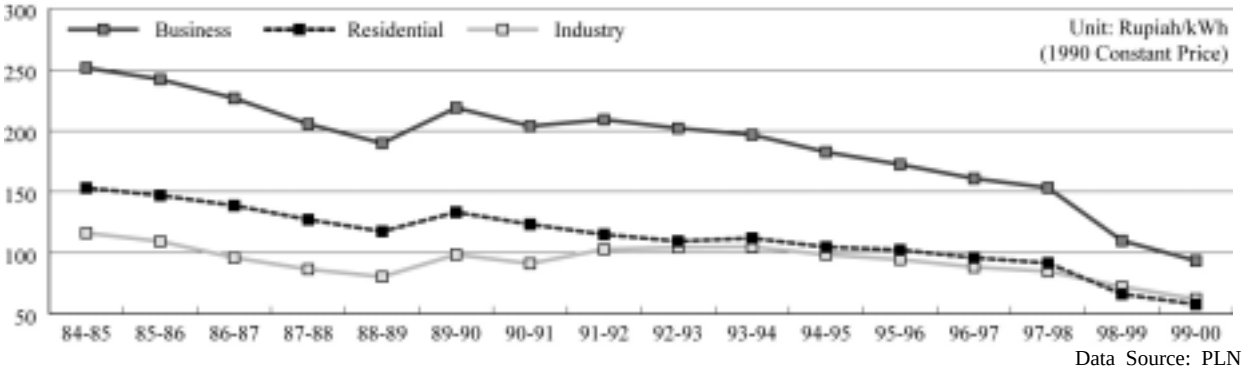
[16] Asset ownership of the facilities is still with PLN.

[17] Funds for these training sessions traditionally came from the government share of 1-5% of the company's profits after taxation. However, since PLN's financial report showed a loss at the end of 1997, PLN only channeled assistance funds originated from its own budget.

[18] According to the International Financial Statistics published by the International Monetary Fund, consumer price of the country was increased by 2.10 times between 1996 and 2000.

[19] 14,527± 1,764 rupiahs with 95% confidence interval (Sample= 100)

contracted for the lowest capacity level (220 VA) and paid a fixed tariff of 7,782 rupiah/month. This tariff level was lower than national average electricity tariff for residential consumers of 16,806 rupiah/month (1999).



Data Source: PLN

Figure-7: Change in Electricity Tariff by Selected Consumer Category

Although, the nominal electricity tariff has increased gradually year by year, the growth rate has not caught up with inflation. Particularly since the Asian Currency Crisis in 1997, the electricity tariff for the three major consumer categories has declined sharply (see Figure-7) in real purchasing power. Accordingly, the current electricity tariff can be considered reasonable, or even cheap, for most consumers. On the other hand, this insufficient tariff increase resulted in the financial deterioration of PLN.

2.5.3 Financial Viability of PLN

PLN's operating revenues originate from electric energy sales, connection fees and other revenues. In the last five years, total operation revenues have increased, but this incremental rise has not been enough to cover the rapid increase in total operation costs. As a result, as shown in the below table, PLN's net income after taxes has been negative since 1997. Moreover, since 1998, operation costs have exceeded operation revenue, widening the gap.

After the Asian Currency Crisis, the value of the Indonesian rupiah against the U.S. Dollar fell rapidly (1.0 dollar= 2,383.0 rupiahs in 1996; 1.0 dollar= 8,025.0 rupiahs in 1999). The depreciation of the Indonesian rupiah resulted in an increase in PLN's operation costs. For example, about 60% of the operation cost was paid in U.S. dollars, including the purchase of natural gas and geothermal steam, electricity purchased from Independent Power Producers (IPPs), spare parts, maintenance and debt servicing.

Table-3: Profit and Loss Statement of PLN (1996-2000) (Unit: million rupiah)

	1996	1997	1998	1999	2000
Operation Revenue	9,645,993	11,126,100	14,036,015	15,997,118	22,556,663
Electricity Sales	9,418,269	10,877,278	13,766,222	15,670,552	22,139,883
Others	227,724	248,822	269,793	326,566	416,780
Operation Cost	7,642,510	9,449,753	16,808,773	21,502,678	27,215,821
Electricity Purchases	77,096	325,162	1,885,963	5,082,703	9,395,365
Fuel & Lubricant Oil	3,361,080	4,338,836	9,408,965	9,691,813	10,375,827
Maintenance	911,267	965,397	924,840	1,497,831	1,610,254
Personnel	886,229	1,068,055	1,018,858	1,335,616	1,802,392
Depreciation	1,886,972	2,250,725	3,074,149	3,224,331	3,229,593
Others	413,726	501,578	495,998	670,384	802,390
Operational Income (Loss)	2,003,483	1,676,347	(2,772,758)	(5,505,561)	(4,659,158)
Non Operating Expense (Net)	(754,541)	(2,255,361)	(6,382,787)	(5,349,229)	(19,331,236)
Net Income (Loss) before Tax	1,248,942	(579,014)	(9,155,545)	(10,854,790)	(23,990,394)
Deferred Tax			(390,077)	(514,293)	(620,975)
Net Income (Loss) after Tax	1,178,415	(579,014)	(9,545,622)	(11,369,083)	(24,611,369)

Source: PLN

PLN is currently undergoing major restructuring. PLN also adopted various strategies such as an Operating Cost Reduction Strategy and a Marketing Strategy with the aim of improving their financial performance. In order to recover the company's profitability, PLN raised electricity tariffs in April 2000 in all consumer categories except for the lower-capacity electricity consumers.

As a result of the above increase, according to PLN's annual report 2000, average electricity sales for all of Indonesia rose to 280 rupiahs/kWh. However, average electricity production costs were 547 rupiah/kWh. Thus, PLN is planning to implement a further increase in the basic electricity tariff, as well as a non-uniform tariff in all territories of Indonesia, depending on the economic capacity and customer purchasing power of each territory.

2.5.4 Future Strategy for Development of Rural Electrification

The financial weakness of PLN and rural residents' decreasing capacity to pay electricity tariffs as a result of macroeconomic deterioration have been slowing down the development of rural electrification (see the Figure-8). In order to revitalize rural electrification projects in the country, PLN has adopted the following strategies:

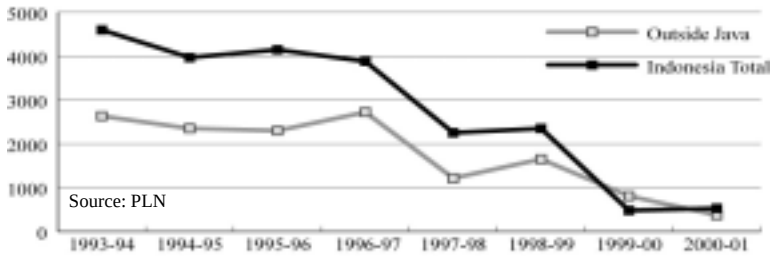


Figure-8: Number of Villages Newly Electrified

- Intensification and extension of medium voltage transmission lines for villages within reach of existing networks. Especially in the case of Sumatra and Sulawesi, 275/150 kV grid transmission systems and large-scale power plants are being developed. Through these systems, PLN aims to reduce unit cost for energy supply as well as to stabilize electricity supply.
- Utilization of locally available renewal energy sources such as mini hydro and geothermal. This would contribute to reducing use of diesel oil, for which PLN has to pay in U.S. dollars.
- Reduction of construction costs through simplification of construction standards and technical specifications, without compromising safety standards

The strategies mentioned above will, to some extent, contribute to activating rural electrification. However, to sustain the positive effects of the rural electrification project, the financial health of PLN is indispensable.

3. Recommendations

PLN may need to enhance its system for inspection and training to increase the KUDs' capacity for operation and maintenance of rural electrification facilities.

Comparison of Original and Actual Scope

Items/Activities	Original Scope (At time of Appraisal)	Actual Scope
I. Project Scope		
1. Rural Electrification		
- Target Area	600 Village (22 Province)	851 Villages
- MV distribution Line (20kV)	2,410 km	3,634 km
- LV distribution Line (220/380V)	1,970 km	3,817 km
- Distribution Transformer (Pole Mounted)	56,150 kVA (Total Capacity)	57,105kVA (Total Capacity)
- Diesel Generator	2,160 kW (Total Capacity)	9,080 kW (Total Capacity)
2. Scattered Diesel		
- Tanjung Pandan	2 Units x 2.5MW	2 Units x 3.0 MW
- Barabai	2 Units x 2.5MW	2 Units x 3.0 MW
- Kendari	2 Units x 2.5MW	2 Units x 3.0 MW
- Civil Works and procurement and installation of elated Equipment/Accessory	One set	As planned
3. Mini Hydro (Baras)		
- Installed Capacity	1 Unit x 200kW	As planned
- Civil Works and procurement and installation of elated Equipment/Accessory	One set	As planned
4. Consulting Service	Professional A: 27M/M Professional B: 40M/M	Professional A: 26 M/M Professional A: 41 M/M
II. Implementation Schedule		
1. Loan Agreement	Oct 1993	Nov 1993
2. Rural Electrification		
- Preparation of bidding to contract singing	Oct 1993 – Dec 1994	Jun 1994 – July 1996
- Manufacturing and Material Delivery	Mar 1994 – Aug 1994	July 1996 – Aug 1996
- Erection	Sep 1994 – May 1995	Aug 1996 – Nov 1996
3. Scattered Diesel Component		
- Preparation of Bidding to contract singing	Aug 1993 – Nov 1994	Aug 1993 – Dec 1994
- Civil Construction	Dec 1994 – Jul 1995	Jan 1995 – Oct 1995
- Manufacturing and Material Delivery	Sep 1994 – Feb 1996	Oct 1994 – Jul 1996
4. Mini Hydro Component		
- Preparation of bidding to contract singing	Mar 1993 – Oct 1994	Mar 1993 – Aug 1995
- Civil Works	Oct 1994 – Mar 1996	Aug 1995 – Jun 1997
- Electro and Mechanical Works	Oct 1994 – Mar 1996	Aug 1995 – Jun 1997
- Land Acquisition	Aug 1993 – Jan 1994	N. A
5. Consulting Services	Apr 1993 – Feb 1996	Dec 1994 – Aug 1995
III. Project Cost		
Foreign currency	1,698 million Yen	1,588 million Yen
Local currency	8,855 million Yen (150,093 million Rupiahs)	7,539 million Yen (171,330 million Rupiahs)
Total	10,553 million Yen	9,127 million Yen
ODA loan portion	8,970 million Yen	7,884 million Yen
Exchange Rate	1.0 Rupiah = 0.059 Yen (April 1993)	1.0 Rupiah = 0.044 Yen (Weighted Average during the period of 1994-97)

Independent Evaluator's Opinion on Rural Electrification Project

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The objectives of the project are relevant and important for rural development in Indonesia mainly in Off-Java islands. The objective to raise rural electrification ratio is partly met by this project hence creating new basis for the rural economic development. More important as stated in Ikhsan and Usman (forth coming), the expansion of rural electricity network will help the poor – where most of them located in rural areas. – to meet their energy demand at the lower cost. They show that an unconnected household has to pay about 6 times higher per kwh effective energy unit compared a connected one. The relevance of the project was maintained with some delay due to the expansion of number of villages.

As stated before, this project has met two objectives (1) increasing rural electrification ratio in Indonesia as a whole and (2) reducing the gap of electrification between Java and off Java villages. Thus it will potentially reduce equality between both areas.

It has also produced the significant economic impact not only by creating new business (economic) opportunities and hence new employment within the villages under this project.

This evaluation also shows that the project has reduced the energy cost paid by the rural residents. This is also consistent with other study like Ikhsan and Usman (forthcoming) as mentioned previously.

However, to raise the effectiveness of the project, the evaluator wants to propose an additional demand management program to complement the similar project in the future. This can be done by (1) reducing connection fees or (2) providing cheap credit for connection fees.

Take in together based on professional judgment. I agree that the project has met and accomplished its intended goal.