REPORT ON THE RESULTS AND METHODOLOGY

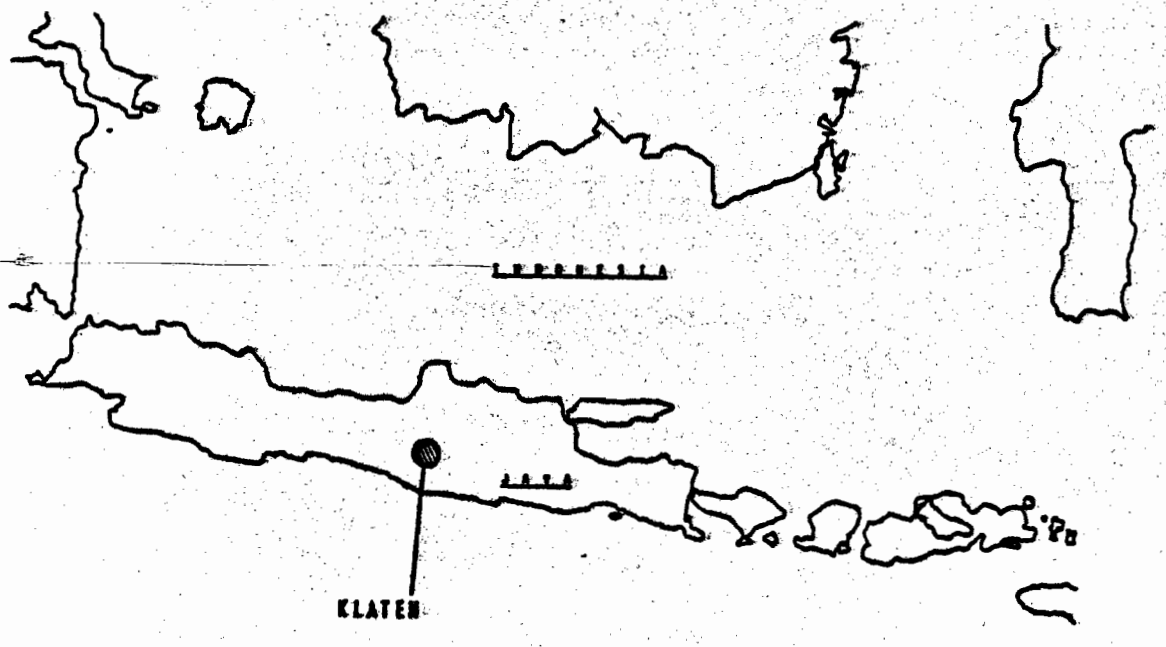
KLATEN AREA SURVEYS

ON COSTS, USES, AFFORDABILITY, AND QUALITY OF SERVICE OF ELECTRICITY

NOVEMBER 1980

PART OF THE CONTINUING ACTIVITIES IN THE

EVALUATION OF RURAL ELECTRIFICATION IN INDONESIA



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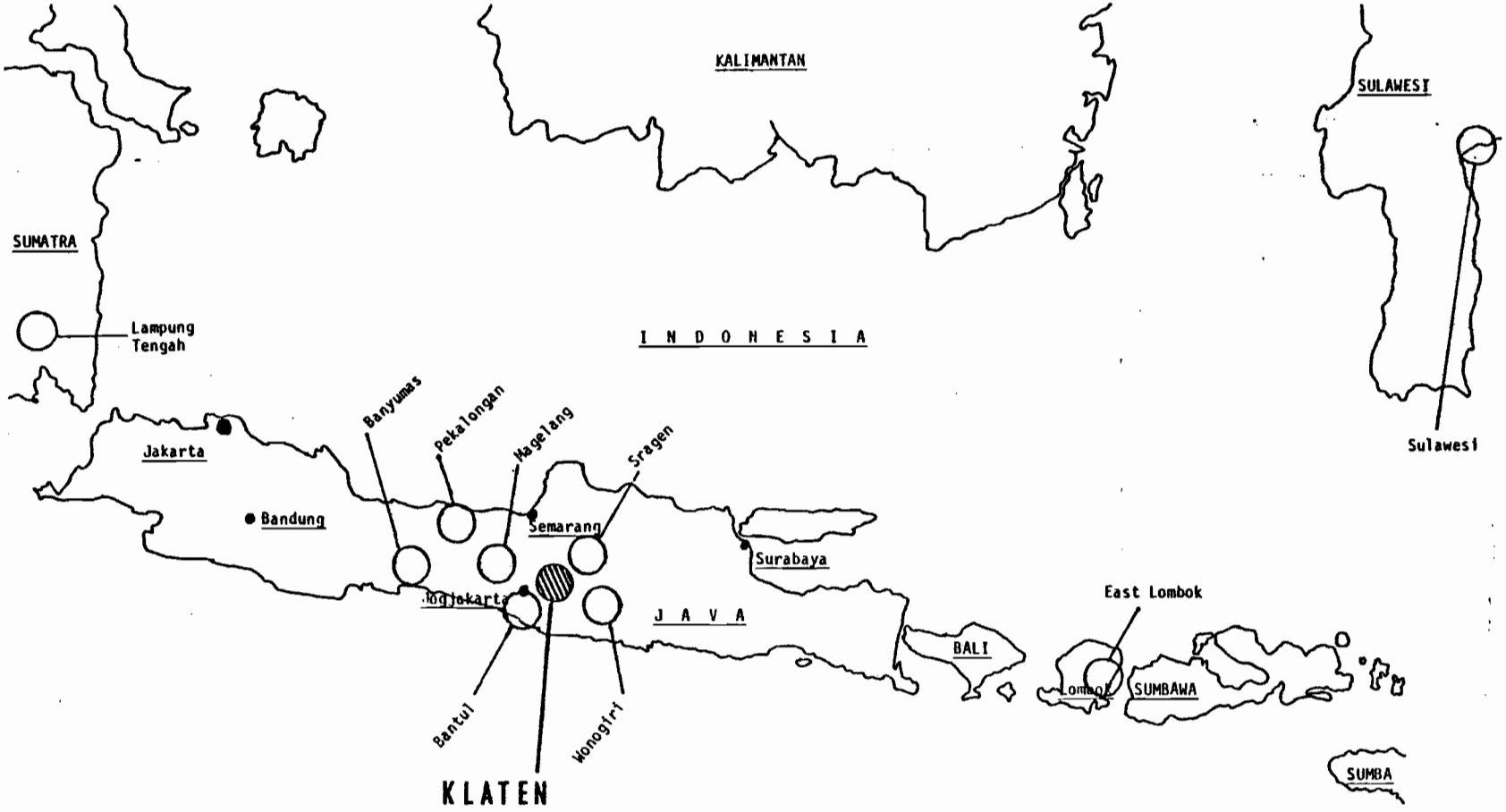

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PREFACE

The study summarized in this report is one of several evaluation activities being conducted by the Surveys and Evaluation Unit of the International Statistical Programs Center, U.S. Bureau of the Census (BuCen) under a RSSA with the U.S. Agency for International Development. In developing and conducting the surveys documented in this report, BuCen staff has had the support and direction of the Evaluation Division of the AID/Asia Bureau Office of Development Planning and USAID/ Indonesia.

The primary mission of the Surveys and Evaluation staff is to help host-country professionals, primarily those in government service, to develop skills in survey design and planning and the associated data collection, processing and analysis efforts. The projects are designed to utilize available in-country resources and to develop the skills of host-country professionals and their organizations so that they can carry out future data collection efforts without major outside assistance. This mission is accomplished through the provision of technical assistance, training and documentation.

Technical assistance is provided in two ways: working with the sponsoring agency and its missions on data needs and strategies; and working on project surveys and evaluations with host-country counterparts. The staff works closely with the sponsoring agencies to understand their goals for program needs, policies and strategies. Much of the staff time is devoted to arriving at a consensus about the goals and purposes of the data collection as well as the level of resources to be expended on the effort. This is usually done through the development of scopes of work which detail the data collection and analysis components of projects, the schedule of events and the amount of staff time required for these activities. This is usually accomplished as part of a team effort with team members representing a wide range of disciplines.

The Surveys and Evaluation staff provides technical assistance in data collection to their host-country counterparts in the areas of conceptualization, planning, designing, implementation, analysis and evaluation of programs, projects and sector studies. This covers the full range of survey methods and design, from questionnaire design, sampling, field operations, experimental design and data processing through tabulations specification, analysis and publication. The primary purpose of this work is to develop survey techniques and methods appropriate in the developing country context.

Training is the common theme running through all the activities of the Surveys and Evaluation staff assistance. Short courses and on-the-job training in survey design and planning, field data collection, data processing and analysis have been accomplished in host countries. These sessions are tailored to specific needs of the host-country institution and are occasionally developed in conjunction with a local university and incorporated into their regular scholastic program. Long-term training is done by the Training and Information Services staff at headquarters in Washington. The short, tailored courses can be developed and conducted in Spanish, French and occasionally, in other languages. The on-the-job training is a mixture of classes and structured tasks leading to a

completed survey effort and is usually done in-country. Occasionally intensive short-term, on-the-job training for project leaders and/or data processors takes place at Census headquarters. By the end of the data collection project, counterparts usually have the capability to conduct a data collection and analysis effort with a minimum of outside technical assistance.

Documentation of all the work undertaken is an important aspect of every project the staff undertakes. It contributes to the institutionalization of capabilities by providing a record of the procedures used. Generally, a series of methodological, statistical and analytical documents are produced which provide a procedural history for each project as well as suggestions for improvement, descriptions of data files, statistical tables and other relevant information.

ACKNOWLEDGEMENTS

The U.S. Bureau of the Census (BuCen) became involved in the evaluation of this project during mid-1979. At that time, the USAID Indonesia project manager, David Devin, requested that BuCen assist the Project implementing agencies, the National Electric Power Company (PLN) and the Directorate General of Cooperatives (DGC) in designing, planning and implementing a comprehensive impact evaluation of the Rural Electrification Project. Under this association, the PLN and the DGC appointed staff members who worked with the BuCen staff.

This report summarizes the results and methodology of two surveys conducted in November 1980 as part of this evaluation.

The evaluators from the DGC and the PLN participated in the formulation of the issues of the surveys, the development and testing of the questionnaires, implementation of the sampling plans and conducting the surveys. The evaluators were:

From the PLN	- Ir. Soemarto Soedirman	(Chief of RE Operation Division)
	- Mrs. W.S. Muhardi	(Staff of RE Planning Division)
	- Ir. Agung Gantha	(Staff of RE Operation Division)
	- Drs. Sri Koentjoro	(Staff of RE Operation Division)
	- Ir. Marnoto	(Staff of RE Construction Divison)
	- Ir. Santoso Widagdo	(PLN Regional Office XIII)
	- Ir. Bartien Sayogo	(PLN Central Java Project Office)
From the DGC	- Col. Sugiyartono	
	- Ms. Indrarty Buchari	

The evaluators functioned as coordinators and supervisors of the data collection exercises. Two data processors from the PLN, Ir. Agung Gantha and Ang Hardjono, developed the programs necessary for processing of the household survey data. The evaluators also participated in the analysis of the data from the household and business surveys and wrote a summary report in Indonesian. They were assisted in all of the above tasks by BuCen staff members, including Project Leader Steve Tourkin, Karen Stanecki, Mary K. Friday, Susanne Bacon, Bill Stuart and Luis Garcia. Questions regarding this report may be directed to Steve Tourkin or Mick Hartz, Chief of Evaluative Studies Branch, at the International Statistical Programs Center, Bureau of the Census, Washington, D.C. 20233. Phone: (301)763-1380.

I. INTRODUCTION

A. The Project

The AID-supported Rural Electrification I Project (#497-0267) was begun in FY 1977 and projected to end in FY 1982. The initial budget called for an AID loan of $42 million and a grant of $6 million. The borrower is the Government of the Republic of Indonesia (GOI). The recipient agencies are the National Power Company (PLN), the Peoples Bank of Indonesia (BRI) and the Directorate General of Cooperatives (DGC). The total GOI direct contribution was estimated to be $22.7 million.

According to the Project Paper, the overall goal of the Rural Electrification Project is to improve the standard of living and increase productivity of the rural population in the project areas. The major purpose of the project is to demonstrate that electricity can be provided to the rural areas of Indonesia at a price which the majority of the people can afford through systems which are technically sound and financially viable. A second purpose is to demonstrate that the introduction of electricity to the selected areas will bring about a significant increase in production and improve the quality of life of the rural poor. A subsidiary purpose is to train a sufficient cadre of Indonesian experts in all phases of rural electrification to manage and expand their rural electric systems.

Through this project it is estimated that 600 villages in Indonesia eventually will be electrified. Approximately 400 of these villages are in Central Java and will be served from the existing PLN power grid, while approximately 200 villages in the Outer Island districts of Central Lampung, East Lombok and Luwu will be served by member owned and managed electric cooperatives under the DGC.

A combined population of over two million people exists in these 600 villages. The villages are mostly small and rural and totally without electrification except for a few private generators. The Rural Electrification I Project was designed to introduce electric power to these rural areas of Indonesia for household, commercial and public uses. It was intended that this power be provided at an affordable price and be available to a majority of area residents.

During the project, ten separate electric distribution systems will be constructed and put into operation -- seven by the PLN and three by the DGC.

B. The Evaluation

The BuCen was originally requested to assist the PLN and the DGC in conducting a comprehensive evaluation of the Rural Electrification Project. Under this arrangement, the BuCen staff would have first provided training and assistance to the PLN and DGC evaluators in evaluation design and then assisted them in accomplishing specific tasks during the life of the study. These tasks would have included data collection, data processing

and analysis of data. BuCen would also provide expertise in evaluation and experimental design, and sampling.

It was projected that the host-country evaluators would receive training for approximately 9-12 months during quarterly visits by BuCen staff, and, during that time, assemble a list of issues for the study, construct an evaluation plan, and prepare for data collection.

If this course of events had been followed, the evaluation counterparts would have begun work on selecting issues for the study and designing a plan for the evaluation of the entire rural electrification project. This course would have probably led to baseline and follow-up surveys and would have resulted in a final report on the impacts of the project in 4-5 years. An evaluation of this type would have allowed the measurement and analysis of long-term changes (project impacts) at the household and business levels resulting from electrification.

In actuality, however, the course was interrupted, as the USAID Mission became more interested in obtaining quick results from areas that already had been electrified. In response to this expressed interest, the scope of the evaluation effort was changed so that results would be available in April 1981. This smaller scale study would, of necessity, deal with measurement and analysis of short-term effects of electrification at the household and business levels. It has since been decided that planning for the comprehensive evaluation of the areas funded under the Rural Electrification I project would be postponed until FY 1982.

The areas of interest for the smaller-scale study were three "demonstration" villages that were electrified by PLN in June 1979. The villages, located in the Klaten Kabupaten of Central Java, are Karang Anom, Jonggrangan and Gergunnung. A fourth village, Belang Wetan, from the same area, which had not yet been electrified, was also included in the study.

The surveys were designed to measure and analyze the effects of electrification on households and businesses in the 16 months since the three villages were electrified. Since electricity had been introduced into the three demonstration villages at the time the study was designed, it was decided to conduct an "ex-post"[1] examination of the project effects. The study was designed and implemented by a team from the U.S. Bureau of the Census (BuCen) and by evaluation teams from the PLN and the DGC. The first task facing the evaluators was to gather and list the issues of interest. In May 1979, BuCen and the host-country evaluators listed the key issues as follows:

- Can the majority of the people in the project areas afford electricity and will they subscribe?

- Can the power companies provide reliable electricity to households and businesses?

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[1]Since no "baseline" measure of the variables of interest was taken prior to the electrification, a before-after study was not possible. This study looks at the Klaten area at one point in time only - 16 months after electrification.

- How will electricity be used at the household, business and community levels?

As the evaluation strategy developed, the first and third issues were further defined to be:

- Is electrification affordable at various levels of household income?

- How is electricity being used at the household, business and community levels; do household uses vary by income level?

The surveys conducted in November 1980 in Klaten suggest some answers to these questions. However, these surveys are only the beginning of formal impact evaluation activities that will begin in FY 1982 in other project areas.

In addition to other surveys as part of the impact evaluation, it appears that it could be profitable to repeat the surveys of businesses and households and the public facilities inquiries in the Klaten villages after additional time has passed. In this manner, it would be possible to follow the effects of electrification on these villages and produce a more comprehensive view of what has occurred since electrification.

Section VII of this report contains suggestions for further analysis of the survey data.

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II. SUMMARY OF SURVEY RESULTS

Indonesia Rural Electrification I, Project #497-0267

The surveys conducted in Klaten could not address all questions about Rural Electrification in the Indonesian context. Rather, the evaluators from the U.S. Bureau of the Census (BuCen), the Indonesia National Power Company (PLN) and the Directorate General of Cooperatives (DGC) designed the surveys so that conclusive answers to the specific questions of affordability, subscription rates, quality of service, and uses of electrification by households, commercial establishments and public facilities, could be found.

Two surveys and one set of village inquiries were conducted. The evaluators designed and conducted a stratified sample survey of 338 electrified and 192 nonelectrified households from a total of approximately 2700 households in the four study villages, three electrified under the Project and one nearby nonelectrified village. They also designed and conducted a survey of all commercial establishments in the three electrified villages and interviewed the village chiefs of the electrified villages concerning use of electricity in public facilities in their villages.

The surveys were conducted during November 1980. A summary of the results of these surveys and interviews follows.

Subscription Rates

Will the majority of households and businesses subscribe?

In Klaten, 16 months after electrification more than 85 percent of the households in the electrified villages were subscribing to electrical services. About three-fourths of the lowest income households were connected and nearly all (98 percent) of the highest income households were connected. Half the households that had not yet been connected desired electricity and many of these indicated that they could afford it.

Eighty-eight percent of all commercial establishments in the three electrified villages subscribed to electrical service. Six of the 10 nonelectrified businesses felt that they could make effective use of PLN electricity. Only two of these, however, expressed willingness to pay the connection charge.

In the three electrified villages, electricity was being used in 15 of the 26 schools and in all three clinics.

Quality of Service

Is the service reliable?

In Klaten, electrified households experienced an average of one service interruption per month, lasting one or 2 hours. Less than 1 percent of the households rated their level of satisfaction with the performance of the PLN system as "low". About two-thirds of the households rated PLN's

system performance as "fair" and about one-third expressed a "high degree of satisfaction". Service interruptions were not a major problem, and we cannot say why there was a predominance of "fair" responses.

Electrified businesses also reported an average of one electric interruption per month that lasted about one or two hours. Almost half of the businesses (49 percent) rated their degree of satisfaction with the performance of PLN as "high". Forty-two percent rated their performance as "fair" and only eight percent as "low".

Employment, Income, Productivity

Has electrification had an impact?

Nearly half of the electrified businesses reported use of electric lighting enabled them to "do more work" than they did prior to electrification.

Sixteen percent of the electrified businesses used PLN electricity to operate equipment or tools used for production.

Electrification enabled 31 percent of the electrified businesses to increase the level of their production, sales or service. Thirty-two percent of the businesses reported increased hours of operation due to electrification and 22 percent reported increased income due to electrification.

Twenty-eight percent of the electrified businesses felt that they could make greater effective use of PLN electricity in the future. The major reason cited for not currently doing so was lack of money or capital. About one-quarter of the households in the study villages had home businesses. Over half of these households used electric lighting for "doing more work" than they did prior to electrification, and about 12 percent used electricity for equipment or tools used for production.

More than one-third of the nonelectrified households with home businesses in all four villages felt that they could make productive use of electricity in their home business.

Uses of Electricity

What uses are being made of electricity at the household, business and community levels?

Not surprisingly, all the electrified households used electricity as their major energy source for lighting. All the nonelectrified households - used kerosene as their major source for lighting. Sources other than electricity were still used for cooking and boiling water in both electrified and nonelectrified households.

More than one-third of the electrified households used electric irons. About one-quarter of the electrified households used electric radios, and about one-quarter used televisions. Other individual electric appliances were used in only 3 percent or less of the electrified households. More than 80 percent of the electrified households which operate home businesses used electric lighting for security.

Electricity was used for lighting, appliances, refrigeration and pumping of water in the area schools but for lighting only in the area hospitals.

Affordability

Can households and businesses afford electricity?

The subscription rates showed that the majority of the households in even the lowest income group were subscribing.

On the average, electrified households spent about the same proportion (9 percent) of their income on all energy sources as nonelectrified households. At the two lowest levels of income, electrified households spent slightly more for energy than nonelectrified households, but at the two highest levels of income the total energy expenditures were approximately the same.

In the nonelectrified village studied, three-quarters of the households desired an electric connection. The actual current average monthly bill in the electrified villages was $2.50 (Rp. 1565). Almost 90 percent of the households in the nonelectrified villages were willing to pay a monthly bill of $3.20 (Rp. 2000). More than one-quarter of these households were willing to pay $4.80 (Rp. 3000) or more per month. And, 85 percent of the households that desired electricity felt that they could afford to pay the additional connection charge (23 percent could pay the total amount -- $96.00 (Rp. 60,000) in cash and 62 percent could pay an additional $2.08 (Rp. 1300) per month as a monthly installment).

Benefits of Electrification

What did the electrified households perceive as the benefits of electrification?

Almost all the electrified households (98 percent) felt that the greatest benefit of electricity was improved lighting. A major reason for their use of light at night was for security. More than 90 percent of the electrified households used lighting during the night for security as compared to 75 percent of the nonelectrified households. Electrified and nonelectrified households did not differ significantly, however, in the use of lighting in the evening for reading, doing chores or for use in home businesses.

Substitution of Electricity for Kerosene

At all levels of income, as households electrified they substituted electricity for kerosene. Only 60 percent of the electrified households used any kerosene at all, while nearly all the nonelectrified households did. The average monthly consumption among electrified households was 21 KWH of electricity and 15 liters of kerosene while the average nonelectrified household consumed 26 liters of kerosene.

Income Levels in the Study Villages

Are the study villages representative of other project villages?

Since the Klaten area villages studied here were not chosen by random methods, the evaluators cannot state conclusively that they are or are

not representative of the areas to be electrified by this project. We can, however, provide one indicator which may be used for comparison. It is useful to compare monthly per capita income for households in this survey with those for all of rural Indonesia as calculated by the Indonesian Census Bureau (BPS). The BPS derives monthly per capita income from extensive questionnaires on household income, expenditures and farm consumption. The BPS advises that if all three questionnaires cannot be completed, household expenditures and farm and garden consumption provide the best data for rural areas. Therefore, the monthly per capita income figures for this survey were calculated on the basis of expenditures and farm and garden consumption reported in the household interview. The Klaten area survey utilized an abbreviated form of the BPS questionnaires.

The BPS reports that monthly per capita income for persons in rural areas of Indonesia was $6.25 (Rp. 3909) during 1976. If we inflate this figure to late-1980 values using the consumer price index available from the International Monetary Fund in October 1980, we get a resultant per capita monthly income figure of $10.89 (Rp. 6806). Similarly, the households in the Klaten survey had a monthly per capita income of $10.59 (Rp. 6617).

Our income calculation was actually done to allow us to group households into income groups rather than to estimate an income figure for the areas. However, if we do compare our figure of $10.59 to the BPS figure we cannot conclude that there is a significant income difference between the study villages and the average rural Indonesian village.

III. DISCUSSION OF RESULTS

Subscription rates in the surveyed villages are very high, ranging from 98 percent for the highest income group to 75 percent in the lowest income group. Since the survey was conducted 16 months after electrification and households had an opportunity to disconnect, these figures are impressive. It was expected that the more wealthy households would subscribe at a high rate, but the high subscription rates of even the lowest income group households is encouraging. Also, in the nonelectrified study village, a large proportion of nonelectrified households desired electricity. The major reasons for subscription given by households were practicality and better lighting. But we should note that 26 percent of household subscribers initially connected to "obtain higher status" and 10 percent because the village chief ordered them to connect.

The business survey showed that an impressive 88 percent of all commercial establishments in the area had been electrified, including high percentages of commercial, sales and manufacturing establishments. Of the schools in the area, 58 percent were electrified along with all three of the health clinics. Unquestionably, the majority of households and businesses in the surveyed areas subscribed to the electric service.

The quality of electric service in the study villages seems to be quite satisfactory, with households and businesses reporting only one service interruption per month, usually lasting 1 or 2 hours. The vast majority of households and businesses also rate their levels of service as "high" or "fair."

A major issue in the evaluation of rural electrification is its effect on productivity and employment. This study was not designed to provide a conclusive statement on this issue. However, it does provide some indications of potential future effects in these areas.

The business survey reveals that nearly one-third of electrified businesses reported that electrification allowed them to increase their level of production, sales or service. The scale of the increase was not quantified. Nearly one-third of electrified businesses report increased hours of operation, although only 4 percent report using more employees since electrification. We did not ask whether employees had been displaced since electrification.

Forty-five percent of businesses also indicate that use of electric lighting allows them to do more work than before electrification. One assumes that increased use of power tools will result in increased productivity. The business survey indicates that of all commercial establishments, 16 percent use electricity for equipment or tools.

Since about one-quarter of area households operated home businesses, it is important to look for the effects of electrification on them. Over half of these households reported that electric lighting allowed them to do more work in their home businesses. It is not known how much more work. Also, 12 percent of these households used electricity for production equipment or tools and 5 percent for refrigeration or cooking.

Another major issue of interest considered by the household survey was household use of kerosene. The GOI currently subsidizes kerosene at a cost of nearly $400 million per year. The survey clearly demonstrates that households which had been electrified used only about half as much kerosene as nonelectrified households.

What are the effects of electrification on the average household? The household survey points out that the most important benefit of electrification to households is electric lighting. In all electrified households, the major energy source for lighting was electricity. Almost all electrified households use electric lighting for security. This compares to approximately three-fourths of nonelectrified households which use primarily kerosene lighting for security. In the Klaten context, this means security from natural and supernatural intrusions.

Nearly three-fourths of the electrified households use electric lighting for reading, writing or studying. Fourteen percent use it for social activities, and 13 percent for home businesses. At the same time however, an identical percentage of nonelectrified households indicate that they use nonelectric lighting (again, primarily kerosene) for reading, writing and studying approximately the same amounts of time. This indicates that in the short run, electrification has not affected the frequency of these actvities in the household.

In the electrified households the most common electrical appliance is the iron (35 percent of households), followed by television (26 percent), and radio (23 percent). Less than three percent of households use any other particular electrical appliance. Improved lighting is certainly the major benefit of electrification at the household level.

Affordability of electricity is also a major issue. The subscription rates give one indication of the affordability. Also, the household survey asked nonsubscribers what they would be willing to pay for electricity. In the nonelectrified village, 89 percent of the households indicated that they would be willing to pay more for electricity than the current average household bill in the electrified villages. A high percentage of currently nonelectrified households in the electrified villages also indicated this willingness and it is not known why they were not subscribing. A very high percentage of nonelectrified households in both electrified and nonelectrified villages indicated that they could also afford the connection fee if it were collected in monthly installments.

The average household in the study villages spent $4.40 for all energy sources during the month prior to the survey. As income increased, the amount spent on energy also rose. Electrified households in the lower two income groups spent slightly more for energy than nonelectrified households, but households in the upper two income groups spent approximately the same amount whether or not they were electrified. Households with home businesses spent more on total energy sources than the nonbusiness households. But electrified households with home businesses did not spend more for energy than nonelectrified households with home business. The average electrified household in Klaten spent $2.50 for 31 KWH of electricity during the month before the survey. This gives an average cost of 8 cents

per KWH which compares with 6 cents per KWH, the average for the United States private consumer in 1980[2].

In summary, what do the survey results tell us about the effects of electrification in the Klaten area? First, most of the households and businesses reported they are willing to pay for electricity, and indeed, most are subscribing. Second, the level of service appears to be acceptable and reliable. Third, we see some evidence to suggest that it would be profitable to continue to investigate potential effects of electrification on productivity and possibly on employment, although employment has not yet changed significantly. Fourth, the major effect on the average inhabitant is better lighting in the households which has increased the use of security lighting but has not affected other uses of lighting in the home.

In terms of the Project's Goal, "to improve the standard of living and increase productivity", we can say that there is some evidence that a productivity impact may occur although it was not investigated in the survey. As far as the effect on the standard of living is concerned, electricity is being used in the households mainly for lighting as a substitute for kerosene. The most common use of lighting is for security, and a sense of security could certainly be considered a quality of life variable.

The Project's major purpose is to demonstrate that electricity can be provided to rural Indonesia at a price which the majority of people can afford. This study shows that the vast majority of households in the Klaten study villages can certainly afford electricity at the current prices.

A second project purpose is to demonstrate that the introduction of electricity to the selected areas will bring about a significant increase in production and improve the quality of life of the rural poor. There is some indication from commercial and home businesses that electricity could have an impact on production in the future, and in fact, is already having an effect on production in the Klaten study villages. It is still quite early in the project to investigate impacts. A repetition of these surveys at a later time and in other areas could give an insight into the impacts of rural electrification.

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[2]Based on information obtained from the United States Department of Energy

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IV. SURVEY AND STATISTICAL METHODOLOGY

A. Description of the U.S. Bureau of the Census Involvement in the Study

The U.S.Bureau of the Census (BuCen) involvement in the Rural Electrification Project began in mid-1979 primarily as an institutional development effort planned to provide the DGC and PLN with evaluation design and implementation training and experience. At that time, the International Statistical Programs Center of BuCen, under their RSSA with AID, was requested to provide training to Indonesian counterparts in designing and implementing an impact evaluation of the Rural Electrification Project. A group of approximately 20 professionals from the DGC and PLN (the project implementing agencies) was identified to form an evaluation team.

The original plan called for BuCen to train the team and provide technical assistance in identifying issues for the evaluation, designing an evaluation plan and preparing for baseline and end-of project surveys to gather the essential data for the evaluation. Classes were begun in Jakarta in August 1979 and were to have continued on a quarterly basis, with training-related assignments to be completed between classes. A baseline survey was planned to take place some time before large scale electrification began.

Early in 1979, the decision was made by the Mission to preempt long-term training in favor of an immmediate evaluation of short-term electrification effects in the demonstration areas. Although the training provided between August 1979 and February 1980 had not been oriented toward a short-term effort, the PLN evaluators were able to play a major role in the surveys of the demonstration areas. Together with BuCen staff, they formulated issues as defined for operational purposes and developed and pretested questionnaires and sample plans. They effectively served as field coordinators and supervisors during the data collection effort. After the surveys were conducted, two computer programmers from PLN worked with BuCen staff to develop the programs necessary to process the household survey data. Although this short-term evaluation did not provide the impact data or the comprehensive training originally planned, the institutional development demonstrated by PLN's successful participation in this effort is a major and valuable by-product of the effort that led to this report.

B. Study Design

1. Specific issues addressed:

In order to fully address the issues of interest, the surveys were designed to pose a variety of questions pertaining to households, home businesses, commercial enterprises and the community. This section contains a detailed listing of the variables proposed by the evaluators and covered by the surveys.

Households and Home Businesses

a. Income level of households in the study area by electrification status.

b. Types of energy sources used by households, by electrification status and by income group. Sources of energy used by households with home businesses.

c. Common sources of energy used by households for lighting, cooking and boiling water, by electrification status.

d. Kerosene consumed by households each month, by electrification status.

e. Amount spent by households on energy each month, by electrification status.

f. Purposes for which households use light in the evening, by electrification status.

g. Reasons why electrified households desired electricity.

h. Amount of electricity consumed by households and amount households pay for electricity each month, by income group.

i. Uses of electricity in the households. Types of electric appliances being used. (Are households that used battery operated appliances before electrification using electric appliances now?)

j. Greatest benefit of electricity as perceived by electrified households.

k. Frequency of household electric service interruptions.

l. Length of electric service interruptions.

m. Customer rating of the service of the electric company.

n. Reasons nonelectrified households desire electric connections.

o. Amount nonelectrified households are willing to pay for electricity, by income group.

p. Potential uses of electricity by nonelectrified households with home businesses.

Commercial Establishments

a. Percentage of business which use electricity.

b. Amount of electricity businesses consume and how much they spend for electricity.

c. Uses made of the electricity.

d. Effect of electricity on business users' levels of production, sales or service. (Is there an increase in the income of the electrified business?)

e. Effect of electricity on the users' hours of operation.

f. Frequency of electrical service interruptions.

g. Length of interruptions.

h. Business customer satisfaction with electric service.

i. Business' feelings on whether they could benefit from increased use of electricity.

j. Interest of nonelectrified businesses in obtaining electricity.

k. Willingness of nonelectrified businesses to pay the present connection charge.

Community Level

a. Types of public facilities which use electricity.

b. Amount of electricity being consumed by public facilities.

c. Purposes for which public facilities use electricity.

2. Experimental Design Used in this Study

Two surveys were conducted -- a survey of households and a survey of commercial establishments. A series of interviews with village chiefs (Lurahs) concerning uses of electricity within public facilities was also done. The surveys and interviews were conducted during November 1980, approximately 16 months after the demonstration villages had been electrified.

The analysis took the form of an examination of selected variables (listed in the preceeding section) in electrified households, commercial establishments and public facilities in the three demonstration villages. In order to get some indication of the magnitude of the effects of electrification on subscribers, nonsubscribers in the three villages were also examined. Because of the high subscription rates in the demonstration villages, it was necessary to examine some households in a nearby nonelectrified village in order to have a sufficient number of nonelectrified households for purposes of comparison. A comparison of the study variables was then made between electrified and nonelectrified elements. For selected variables, it may seem tempting to compare all households in the electrified villages to those in the nonelectrified village. However, the sampling plan was not designed with this comparison in mind and it would be inappropriate.

Preliminary examination of the study villages indicated that home businesses were scattered randomly throughout the areas. We therefore assumed that a probability sample of households would yield a fairly reliable sample of home businesses.

3. Survey Sample Design

The universe for the household survey was defined as all households in the three demonstration villages: Gergunung, Jonggrangan and Karang Anom, and in the nonelectrified study village of Belang Wetan. The universe for the business survey was defined as all businesses located in the three demonstration villages. Since local records indicated that there were only 93 businesses in the three villages, all of these were interviewed.

For purposes of the surveys, a household was defined as a group of persons that occupy the same dwelling unit and share living expenses.

A home business was defined as an enterprise at the location of a house (structure) operated by household members. This definition includes small-scale businesses that manufacture, provide services or sell items.

A commercial establishment (business) was defined as an enterprise operated in a structure other than a dwelling unit for the purpose of manufacturing, selling products or providing a service.

There were 21 project maps covering the demonstration villages and three maps covering the nonelectrified village. The location of all households was shown on the maps with meter numbers indicated for the connected houses. Thus, the maps constituted a complete listing of the universe and was used as the sampling frame.

Offices, mosques, schools and hospitals were deleted from the universe and thus were not included in either of the surveys.

The households were stratified into electrified and nonelectrified households. The sample of households was drawn systematically from each list using two different random starts. In order to obtain about 600 interviews, a sampling interval of 5 was used to generate the list of households to be surveyed.

The entire universe of 93 businesses in the three demonstration villages was surveyed.

C. Data Collection Methodology

1. Field Materials

After the specific questions for the study were formulated, analytical table plans were constructed containing data in a format that would allow the evaluators to address each question during the analysis. Questionnaires were then designed to obtain the necessary data from households and businesses to produce these tables. Some of the key variables of the study required operational definitions. A summary of these operational definitions follows.

a. Income - The income figures in this report are derived from average monthly household and per capita expenditures and farm and garden consumption. The intent of the income data was to allow separation of the Klaten area households into four groups.

Data on average income are collected by the Biro Pusat Statistik (BPS the Indonesian Census Bureau), which administers a questionnaire that covers income, expenditures and consumption. Because the BPS household interview takes three hours to complete (which was well beyond the budget for the Klaten survey) a different method was used for this study. The BPS advised the evaluators that the best indicator for household income in rural areas such as Klaten is the sum of total cash expenditures and home consumption from the farm and garden. It was decided to use a short series of questions on household level expenditure and consumption that would contain the same basic elements as the BPS questionnaire, but in less detail.

b. Affordability (households) - In addition to the questions used to obtain income data, questions regarding the willingness of nonelectrified households to pay monthly bills of $3.20 (Rp. 2000), $4.00 (Rp.2500), and $4.80 (Rp. 3000) were included. Questions of this kind are susceptible to response distortion resulting from the order in which the monetary categories are presented. This is because respondents tend to choose the first category presented to them. Based on a study of the effect of question form on gathering information of this kind[3], the questions were designed and ordered in an attempt to minimize the effects of this bias.

Questions regarding households' perceived ability to afford the current PLN connection charge of $96.00 (Rp. 60,000) were also included in the household questionnaire.

An interviewer's manual for household and business surveys was developed for interviewer training and fieldwork. The manual contained sections on general interviewing techniques (how to ask questions,record answers, etc.), how to locate households and businesses, specific instructions for each item on the questionnaires, and guidelines on how to check and edit the questionnaires. Definitions of all concepts in the questionnaires were contained in the manual. Copies of the manual are available on request.

Other materials developed for the surveys include a verbatim training guide on general interviewing procedures and editing, and a manual covering procedures for supervising survey fieldwork and coding and editing questionnaires after the fieldwork.

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[3]William B. Locander and John P. Burton, "The Effect of Question Form on Gathering Income Data by Telephone," Journal of Marketing Research, Vol. XIII (May 1976), pp. 189-192.

2. Survey Fieldwork

a. Training - Twenty-three interviewers from the PLN district office were trained by evaluation team members over a six day period. The trainers (who later supervised the interviewing) utilized the verbatim training guides prepared by the evaluators and administered several practice interviews.

b. Fieldwork - Interviewing was accomplished over a 2-week period. The male household head was most often the respondent, although in some cases a woman was interviewed. In cases where more than one family resided together, one household head was usually able to answer all the questions, because a household in this study was defined to include more than one family only when living expenses were shared.

During the fieldwork, meetings of the interviewers and supervisors were held during the mornings and afternoons to prepare interviewer assignments and discuss any problems that occured in the field. In these meetings, the supervisors pointed out errors they had found while reviewing completed questionnaires. Interviewers were required to return to households or businesses, as necessary, to verify any questionnaires that were not completed satisfactorily.

Interviews were completed for 89.5 percent of the designated sample households (69 noninterviews of the 600 total) and for 90.3 percent of the businesses (9 noninterviews of the 93 total). The adjusted response rates[4] were, however, 97.4 percent for households and 98.8 percent for businesses.

3. Quality Control Procedures

Quality control procedures were implemented at every stage of the surveys.

First, a pretest was held to test the adequacy of the questionnaire and interviewer procedures. Revisions were then made to the materials before the actual survey fieldwork was begun.

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[4]Adjusted response rates were calculated by excluding vacant and misclassified sampling units, (55 households, 8 businesses) as these should not have been included in the original universe. Thus, the non-interview proportions became [69-55]/[600-55] and [9-8]/ [93-8].

During the first days of fieldwork, interviews were observed and procedures that were not being followed uniformly were reviewed during the daily sessions. In addition, key items from the first 100 interviews were tabulated to check for indications of interviewer bias[5]. In the few cases where this seemed to occur, questionnaires were returned to the field for verification at the household or business.

Both interviewers and supervisors reviewed the completed questionnaires for completeness and accuracy and households and businesses were revisited as necessary. After the fieldwork, additional editing was accomplished by office staff in Jakarta. Finally, range and consistency checks were accomplished by computer prior to the production of tables for the household survey. The business survey was edited and tabulated by hand.

D. Statistical Analysis of Household Survey Data

1. Weighting the Household Data

Since the household survey was a sample survey, the data were weighted in order to produce estimates for the entire population of the four study villages. Also, adjustments were made for the noninterviews and for the misclassified households.

On the available maps, households were identified as electrified or not electrified. The systematic sample selection process of choosing every fifth household was accomplished according to this classification. However, during the course of the fieldwork some households were found to have their electrification status misclassified. The total universe size of electrified and nonelectrified households was adjusted according to the percent of misclassified units found in the sample.

A large proportion of the noninterviews were due to out-of-scope sample units. That is, some vacant structures, schools, and businesses were erroneously selected as households. Again the total universe was adjusted for the out-of-scope sample units.

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[5]Items are susceptible to interviewer bias if they are worded in such a way so that the intonation of the interviewer can suggest that one answer is preferable to another or if the question requires additional explanation by the interviewer. Despite a thorough pretest, intensive training and explanations provided in the interviewers manual, this kind of bias can occur. If assignments are arranged so that each interviewer has a sample of the same type of respondents (rich, poor, etc.) and regional differences between assignments are minimized, the patterns of responses to a particular question for one interviewer's batch of questionnaires should be similar to another interviewer's. Thus, tabulating key items by interviewer can provide an indication of interviewer bias when one interviewer's pattern of responses differs significantly from the other interviewer's response patterns.

CLASSIFICATION OF HOUSEHOLDS BEFORE SAMPLE SELECTION AND AFTER FIELDWORK

Originally Classified	Reclassified after Fieldwork			
	Electrified	Nonelectrified	Noninterview	Out-of-Scope
349 electrified	322	2	6	19
251 Nonelectrified	16	190	9	36
530 interviews completed	338	192		

A total of 349 electrified households were selected to be in the sample. Of these, two were actually nonelectrified, six were noninterviews and 19 were out-of-scope. There was a total of 251 nonelectrified households selected for the sample. Of those, 16 were actually electrified, nine were noninterviews and 36 were out-of-scope.

As a result, the actual number of electrified households in the survey was 322 + 16 + 6 = 344. The total number of nonelectrified households in the survey was 190 + 2 + 9 = 201. The sampling interval for sample selection was five. In order to adjust for the misclassifications, noninterviews and out-of-scope cases, the weights were recalculated.

The adjusted universe size for electrified households became 344 X 5 = 1720 and for nonelectrified households 201 X 5 = 1005. Hence, the adjusted weight for electrified households is:

$$W_1 = \frac{1720}{338} = 5.09$$

and the adjusted weight for nonelectrified households is:

$$W_2 = \frac{1005}{192} = 5.23$$

where 338 and 192 are the completed number of interviews for electrified and nonelectrified households, respectively.

2. Assessing the Reliability of the Household Data

Standard Errors of the Estimates

As previously indicated, the household survey results contained in this report and used in preparation of the analytical findings are estimates. The estimates are subject to error arising from the fact that they were obtained from a sample survey rather than from a complete census. The particular sample used is one of a large number of possible

samples of equal size that could have been used applying the same sample design and selection procedures. Estimates derived from different samples would differ from each other. The standard error of a survey estimate is a measure of the variation among the estimates from all possible samples and is, therefore, a measure of the precision with which the estimate from a particular sample approximates the average result of all possible samples. The estimate and its associated standard error may be used to construct a confidence interval, having a prescribed probability that would include the average result of all possible samples. The chances are about 68 out of 100 that the survey estimate would differ from the average results of all possible samples by less than one standard error. Similarly, the chances are about 90 out of 100 that the difference would be less than 1.6 times the standard error; about 95 out of 100 that the difference would be less than 2.0 times the standard error; and 99 out of 100 chances that it would be less than 2.5 times the standard error. The 68 percent confidence interval is defined as the range of values given by the estimate minus the standard error and the estimate plus the standard error; the chances are 68 in 100 that a figure from a complete census would be within that range. Likewise, the 95 percent confidence interval is defined as the estimate plus or minus two standard errors.

In addition to sampling variability, the survey estimates are subject to nonsampling errors. In a survey such as this, nonsampling errors may result from inaccurate or incomplete reporting of data by respondents, systematic inaccuracies introduced by interviewers, and improper coding and processing of data. All such nonsampling errors, however, also are inherent in complete censuses.

Standard Error of the Difference

The standard error of the difference between two survey estimates is approximately equal to the square root of the sum of the squares of the standard error of each estimate considered separately. This formula will generally overestimate the true standard error. If the standard error of the difference is less than the difference itself, the difference between the two estimates is statistically significant at the 68 percent confidence level; moreover, if twice the standard error of the difference is less than the difference, then the difference is significant at the 95 percent confidence level.

To illustrate the calculation of the standard error of the difference between two estimates, assume that each of two groups of households had two different levels of expenditures for energy sources. One group spent \$3.49 a month with a standard error of 29¢ and the other group spent \$2.72 a month with a standard error of 16¢. The standard error for the difference between the two estimates would be expressed as: $\sqrt{(29)^2 + (16)^2}$ and would equal 33¢. Since twice the standard error of the difference (66¢) is less than the difference between the two estimates (77¢), statistical significance at the 95 percent confidence level can be attached to the difference in size between the two groups. Throughout this report, this method was used to assess whether apparent differences between data cells were significant at the 95 percent level.

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VI. DETAILED SURVEY RESULTS

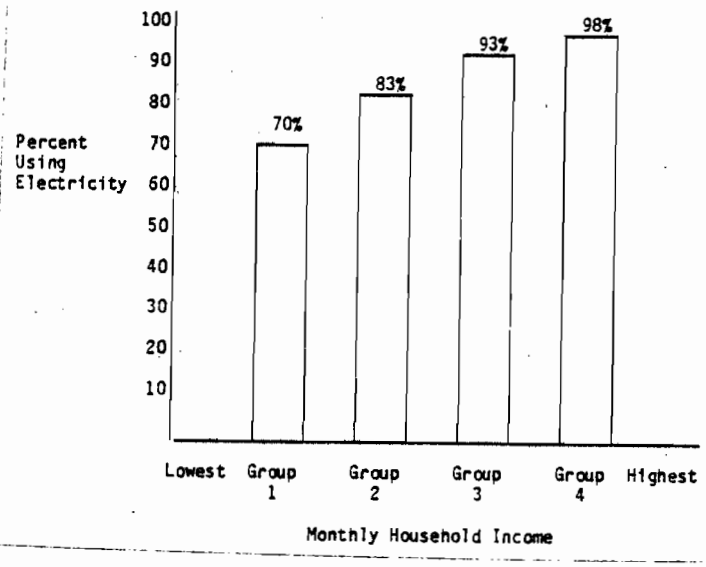
SUBSCRIPTION

Household Subscription Rates

Generally, households subscribing to PLN for electrical service were wealthier than nonelectrified households. In the demonstration area the wealthier households electrified at a higher rate than the less wealthy. As shown in figure 1, 98 percent of the households in the highest income bracket subscribed while 70 pecent in the lowest income bracket subscribed.

Figure 1

All Households in Electrified Areas: Percent Using Electricity by Household Income



Subscription

Eighty-eight percent of the businesses in the demonstration area electrified. This included every commercial and sales establishment, 83 percent of the industrial and manufacturing, 81 percent of the service providing and 50 percent of the agricultural establishments. The following table summarizes the connection status of the businesses.

Table 1

All Businesses: PLN Connection Status by Type of Business

Type of Business	Total All Businesses	Using PLN Electricity	Not Using PLN Electricity
	Number	Percent	Percent
All Businesses	84	88	12
Industrial/ Manufacturing	23	83	17
Commercial/Sales	33	100	-
Service Providing	26	81	19
Agricultural	2	50	50

Public Facility Subscription

In the Klaten demonstration area only the schools and health clinics use PLN electricity. Fifty-eight percent of the 26 schools in the demonstration area and all three health clinics electrified. Guard houses and public water houses existed in the demonstration areas, but they did not electrify, as shown in table 2.

Table 2.

All Public Facilities: Use of Electricity

Type of Facility	Electrified Demonstration Villages			Nonelectrified Village
	Number	Number Electrified	Percent Electrified	Number
Schools	26	15	58	7
Hospitals or Clinics	3	3	100	-
Libraries	-	-	-	1
Guard Houses	33	-	-	3
Public Water Houses	6	-	-	6

QUALITY OF SERVICE (SYSTEM PERFORMANCE)

Number and Length of Interruptions

Households

The number and length of electrical interruptions are two indicators of the performance of the electrical system. As shown in table 3, 97 percent of the households had three or less interruptions in the previous month. Specifically, 4 percent had three interruptions, 15 percent had two, 63 percent had one and 15 percent had no interruptions.

Table 4 summarizes the average length of electric interruptions. One-third of the households that reported interruptions said the average interruption was less than one hour and 48 percent said the average interruption was 1 to 2 hours. While 18 percent reported interruptions averaged "from 2 hours to all night," only one percent reported that interruptions averaged more than one day.

Table 3

All Electrified Households: Number of Interruptions in the Previous Month

Number of Interruptions	Percent of Households*	Cumulative Percent	Percent of Businesses	Cumulative Percent
0	15	15	15	15
1	63	78	45	60
2	15	93	19	79
3	4	97	14	93
4 or more	3	100	7	100

*Data was missing for 1 percent of the households and 1 percent of the businesses and was allocated to the other categories.

Table 4

All Electrified Households Reporting Electric Interruptions: Average Length of Electric Interruptions in Previous Month

Length of Interruption	Percent of Households*	Cumulative Percent
Less than 1 hr.	33	33
1-2 hours	48	81
From 2 hrs. to all night	18	99
More than 1 day	1	100

*Data was missing for 1 percent of the households and was allocated to the other categories.

Number and Length of Interruptions

Businesses

As shown in table 3, 15 percent of the businesses reported that they had not had any electric interruptions during the previous month. Forty-five percent had one interruption, 19 percent had two, 14 percent had three and 7 percent had four or more. Thus, 92 percent of all businesses had three or less interruptions in electrical services the month prior to the survey.

Table 5 illustrates that one quarter of the businesses that reported interruptions said the average interruption the previous month was less than one hour, 48 percent reported the average interruption was 1 to 2 hours, 11 percent 3 to 4 hours and 16 percent 5 or more hours.

Table 5

All Electrified Businesses Reporting Electric Interruptions: Average Length of Electric Interruptions in Previous Month

Length of Interruption	Percent of Households*	Cumulative Percent
Less than 1 hr.	25	25
1-2 hours	48	73
3-4 hours	11	84
5 or more hours	16	100

*Data was missing for 3 percent of the businesses and was allocated to the other categories.

Warning of Interruptions

Respondents in all of the electrified households and businesses were asked whether the electric company warned of interruptions before they occurred. Table 6 summarizes their responses. The majority of those interviewed (86 percent of the households and 89 percent of the businesses) had never received advance warning of an electric interruption. However, 3 percent of both households and businesses always received notification, 6 percent of the households and 4 percent of the businesses sometimes received notification and 5 percent of the households and 4 percent of the businesses hardly ever received notification.

Table 6

All Electrified Households and Businesses: Frequency PLN Gave Advance Warning of Electric Interruptions

Frequency of Warning	Percent of Households	Percent of Businesses
All of the time	3	3
Sometimes	6	4
Hardly Ever	5	4
Never	86	89

Overall Satisfaction

More than one-third of the households (36 percent) rated the PLN performance as "high" while the majority of the households (62 percent) rated it "fair." Less than 1 percent of the households rated the performance of PLN "low". This is shown in table 7.

Approximately half of the businesses (49 percent) reported a high degree of satisfaction with the electric company's performance. Forty-two percent of the businesses reported a fair degree of satisfaction and 8 percent a low degree of satisfaction. This is also shown in table 7.

Table 7

All Electrified Households and Businesses: Degree of Satisfaction with Performance of PLN

Degree of Satisfaction	Percent of Households*	Percent of Businesses*
High	36	49
Fair	63	43
Low	1	8

*Data was missing for 1 percent of the households and the businesses and were allocated to the other three categories.

EMPLOYMENT, INCOME AND PRODUCTIVITY

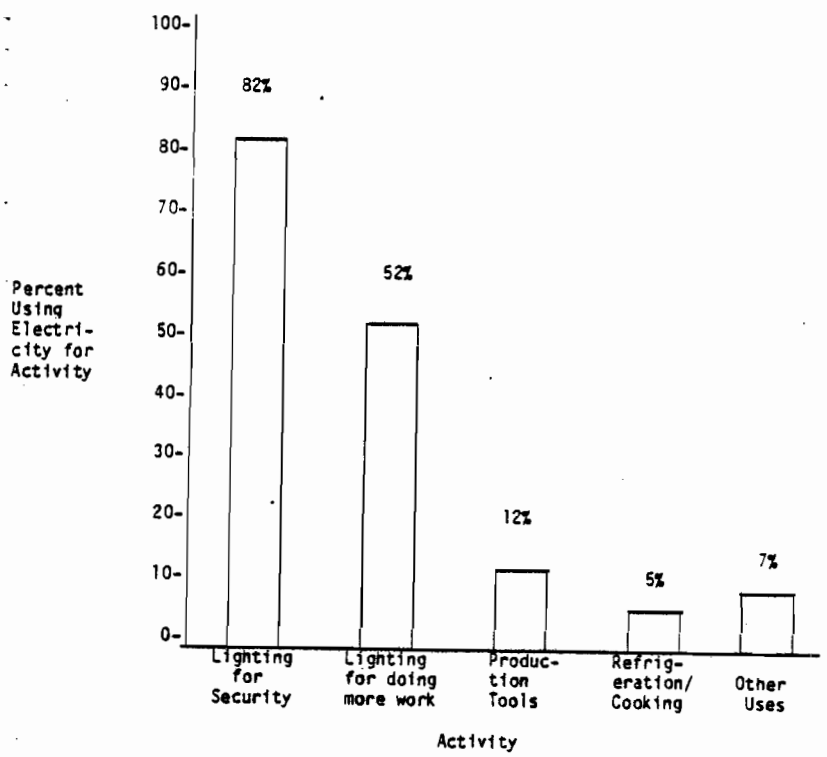
Home Businesses

The effects of electrification on employment, income and productivity were measured by investigating both home businesses and commercial establishments.

About one-quarter of the electrified households (26 percent) in the survey had home businesses. Eighty-two percent of these used electricity for lighting for security. Over one half (52 percent) of the electrified households with home businesses used electricity for lighting for doing more work than before electrification. Twelve percent used electricity for production equipment or tools, 5 percent used it for refrigeration or cooking and 7 percent used it for other purposes. This is illustrated in figure 2.

Figure 2

All Electrified Households with Home Businesses: Uses of Electricity by Type of Activity



Commercial Establishments

Of the 84 commercial establishments, 74 had electrified. Forty-five percent of these used electricity for lighting for doing more work than prior to electrification. Sixteen percent used electricity for running production equipment or tools and 3 percent used it for refrigeration or cooking equipment.

As shown in table 8, electrification enabled 31 percent of the electrified businesses to increase their level of production, sales or service. Service providing businesses benefitted the most as 48 percent increased their level of service, while 32 percent of the industrial and manufacturing businesses increased their level of production, and 21 percent of the commercial and sales businesses increased their level of sales.

Seventy percent of the businesses that increased their levels of production, sales or service also were able to increase their income. Eighty-six percent of the commercial and sales, 80 percent of the service providing, and 33 percent of the industrial and manufacturing businesses increased their income.

Table 9 indicates that 50 percent of the largest users of electricity increased their level of production, sales or service. The majority (63 percent) of these also increased their income. Thirty percent of the smallest users of electricity increased their level of production with 82 percent of these businesses increasing their income. Finally, 19 percent of the users in the middle range increased their level of production, sales or service; half of them also increased their income.

Table 8

All PLN Electrified Businesses: Effects of PLN Electricity on Level of Production, Sales or Service and Income by Type of Business

Type of Business	Total Number of Businesses	Percent of Businesses: Total Increased Level of Production/Sales/Service	Increased Production/Sales/Service with Increased Income	Increased Production/Sales/Service with No Increased Income	Increased Production/Sales/Service, Income change unknown	Without Increase In Level of Production/Sales/Service
All Businesses	74	31	22	8	1	69
Industrial/Manufacturing	19	32	11	16	5	68
Commercial/Sales	33	21	18	3	-	79
Service Providing	21	48	38	10	-	52
Agricultural	1	-	-	-	-	100

Table 9

All PLN Electrified Businesses: Effects of PLN Electricity on Level of Production, Sales or Service and Income by Level of KWH Consumption

Level of KWH Consumption	Total Number of Businesses	Percent of Businesses: Total Increased Level of Production/Sales/Service	Increased Production/Sales/Service with Increased Income	Increased Production/Sales/Service with No Increased Income	Increased Production/Sales/Service, Income change unknown	Without Increase In Level of Production/Sales/Service
All Businesses	74	31	22	8	1	69
0-50 KWH	37	30	24	5	-	70
51-100 KWH	21	19	10	10	-	81
More than 100 KWH	16	50	31	12	6	50

As shown in tables 10 and 11, 32 percent of the businesses said that PLN electricity allowed an increase in the hours of operation. The quantity of electricity the businesses used the previous month did not affect this, as the proportion increasing hours of operation was constant among small, medium and large users. However, the proportion increasing hours of operation varied according to type of business. Approximately one-third (32 percent) of the industrial, one-quarter (24 percent) of the commercial and sales and one-half (48 percent) of the service providing businesses increased their hours of operation.

Only commercial and sales businesses hired more employees because of electrification. This included two of the smallest and one of the largest users of electricity.

Table 10

All PLN Electrified Businesses: Effects of PLN Electricity on Level of Hours of Operation and Employment by Type of Business

Level of KWH Consumption	Total Number of Businesses	Percent of Businesses: Total Increased Hours of Operation	Increased Hours of Operation with More Employees	Increased Hours of Operation with No More Employees	Not Increasing Hours of Operation
All Businesses	74	32	4	28	68
Industrial/. Manufacturing	19	32	0	32	68
Commercial/ Sales	33	24	9	15	76
Service Providing	21	48	0	48	52
Agricultural	1	0	0	0	100

Table 11

All PLN Electrified Businesses: Effects of PLN Electricity on Hours of Operation and Employment by Level of KWH Consumption

Level of KWH Consumption	Total Number of Businesses	Percent of Business: Total Increased Hours of Operation	Increased Hours of Operation with More Employees	Increased Hours of Operation with No More Employees	Not Increasing Hours of Operation
All Businesses	74	32	4	28	68
0-50 KWH	37	32	5	27	68
51-100 KWH	21	33	0	33	67
More than 100 KWH	16	31	6	25	69

ELECTRIC USAGE

Lighting

One-hundred percent of the electrified households reported that electricity was their major energy source for lighting. The survey asked about lighting uses in the evening for reading, writing or studying, doing household chores, home businesses, security and for social activities.

As shown in table 12, 85 percent of the households used electricity for lighting for security. Security, as defined in the Klaten area, includes protection from both human and spiritual intrusions. Ninety-five percent of these households used security lights for 9 or more hours per night.

Reading, writing or studying was the next most frequent use of lighting. Of the households that used lighting for these activities, approximately one-third participated one hour, one-third 2 hours and one-third 3 or more hours per evening in these activities.

Lighting for home businesses, social activities and household chores was used by 15 percent, 14 percent and 8 percent of the households respectively.

A significantly greater proportion of electrified households than nonelectrified households used lighting for security.

However, electrified households did not use lighting for reading, writing or studying for a significantly different length of time than nonelectrified households.

Although differences existed between electrified and nonelectrified households for the other activities, these

differences were not tested for statistical significance because of the small percentage of households that participated.

Table 12

All Households: Number of Hours Using Lights in the Evening by Activity and Electrification Status

Percent Using	Percent of Households		
	All Households	Electrified	Nonelectrified
Security			
Total†	85	92	75
1-4 hours/evening	2	2	2
5-8 hours/evening	2	2	2
9 or more hours/eve.	81	87	71
Reading, Writing, Studying			
Total†	68	69	66
1 hour/evening	23	23	22
2 hours/evening	25	23	27
3 hours/evening	14	15	13
4 or more hours/eve.	6	7	4
Home Business[1]			
Total†	15	-	-
1 hour/evening	9	-	-
2 hours/evening	3	-	-
3 hours/evening	4	-	-
4 or more hours/eve.	5	-	-
		-	-
Social Activities[1]			
Total†	14	-	-
1-10 hours/month	13	-	-
11-20 hours/month	1	-	-
21 or more hours/mo.	1	-	-
Household Chores[1]			
Total†	8	-	-
1 hour/evening	9	-	-
2 hours/evening	3	-	-
3 hours/evening	3	-	-
4 or more hours/eve.	2	-	-

†Categories may not equal total due to rounding.
[1]Because of the small percent of households that participate in each of these activities, use of lights has not been displayed by electrification status.

Appliances

Overall, more than one-third of the electrified households used electric irons and about one quarter used radios and televisions each. All other electrical appliances were used by 3 percent or less of the households. This is summarized in the table below.

Table 13

All Electrified Households: Use of Electric Appliances

Type of Electrical Appliance†	Percent Using Appliance
Iron	35
Television	26
Radio	23
Fan	3
Refrigerator	2
Sewing Machine	2
Phonograph	2
Water Pump	2
Power Tools	*
Hair Dryer	*
Other Appliances	*
Stove	-

† Note that these are all electric appliances. Although more people use televisions than radios powered by PLN electricity, a much greater percent have radios, most of which are powered by batteries.
* Less than one percent.

Electrification caused some households to convert from battery to current-run appliances. As shown in table 14, approximately 16 percent of the households converted from battery to electric current operated radios and 7 percent from battery to electric televisions. Also, 7 percent of the households not previously using battery operated radios began using electric current radios, and 19 percent began using electric televisions. This represents the net gain thus far in the number of radios and televisions being used since electrification.

Table 14

All Electrified Households: Battery and Electric Current-Run Appliance Usage Before and After Electrification

Type of Appliance	Total Usage after Electrification	Percent Using battery before and after electrification	Percent Converted from battery to current run	Percent Began current run - no usage before
Radio	73	50	16	7
Television	27	1	7	19
Phonograph	23	21	1	1
Power Tools	31	31	*	-

*Less than one percent

Business Uses

Table 15 summarizes the different activities for which businesses used electricity. As mentioned, 74 of the 84 businesses electrified. All of them used electricity to provide lighting for security. Forty-five percent of these also used electricity for lighting for doing more work than prior to electrification, 16 percent used electricity for production equipment or tools, 3 percent for refrigeration or cooking and 16 percent for a variety of other uses including operating televisions, tape recorders, fans, water pumps, and irons.

There are a few differences in the uses of electricity between businesses with different functions. Electricity to run "lights for doing more work" was used almost twice as often among service providing businesses (62 percent or 13) as in commercial and sales (36 percent or 12) or industrial and manufacturing businesses (37 percent or 7). Electricity for running equipment or tools used in production was also much more common in service businesses (38 percent or 8) than in commercial (6 percent or 2) or industrial (11 percent or 2) businesses.

Table 15

All PLN Electrified Businesses: Activities for Which PLN Electricity Is Used by Type of Business

Type of Business	Percent of Businesses: Activities for Which PLN Electricity is used				
	Lighting for Security	Lighting for doing more work than before	Equipment or tools used	Refrigeration or cooking	Any other use
All Businesses	100	45	16	3	16
Industrial/ Manufacturing	100	37	11	5	-
Commercial/ Sales	100	36	6	3	24
Service Providing	100	62	38	-	19
Agricultural	100	100	-	-	-

To see if the purposes for which electricity is used differs between small, medium and large users, businesses were grouped according to the number of kilowatt hours of electricity that they consumed. This is displayed in table 16. Forty-five percent (33) of all of the electrified businesses used electric lighting for doing more work than prior to electrification. This included 35 percent (13) of the smallest users of electricity (0-50 KWH of electricity monthly), 57 percent (12) of the medium users and 50 percent (8) of the largest users.

Sixteen percent of the businesses used electricity to run equipment or tools used for production. This included only 11 percent of the smallest users of electricity and 5 percent of the middle range users, but 44 percent of the largest users.

PLN electricity was used for refrigeration or cooking in only two businesses, both of whom were in the category of the largest users of electricity.

Finally, 16 percent of the businesses used electricity for purposes other than those already listed; this included 11 percent (4) of the smallest users, 24 percent (5) of the middle range users and 19 percent (3) of the largest users. Among these users, televisions and tape recorders were found in the smallest and middle groups, water pumps and irons in the middle and upper ranges and battery chargers and soldering irons only in the upper ranges.

Table 16

All PLN Electrified Businesses: Activites for Which PLN Electricity is Used by Level of KWH Consumption

Level of KWH Consumption	Percent of Businesses: Activities for which PLN electricity is used				
	Lighting for Security	Lighting for doing more work than before	Equipment or tools used for production	Regrigeration or Cooking	Other Uses
All Businesses	100	45	16	3	16
0 - 50 KWH	100	35	11	-	11
51 - 100 KWH	100	57	5	-	24
More than 100 KWH	100	50	44	13	19

Community Uses

In the 15 schools that electrified, (representing 58 percent of all the schools), electricity was used for lighting, appliances, refrigeration and pumping water. In the three community health clinics, all of which electrified, electricity was used only for lighting.[6]

[6]It is interesting to note that the Project Paper listed project goals of installing electrically powered water supply systems, sterilizers, refrigerators and x-ray machines in the clinics.

PERCEIVED BENEFITS OF ELECTRICITY

When asked the major reason why the household decided to obtain electricity, 31 percent said because it was more practical or efficient, 26 percent to obtain higher status, 21 percent to obtain better lighting, 10 percent because the village chief (lurah) ordered them to, 8 percent because it was cheaper than kerosene and 4 percent for other reasons. When the same respondents were asked what the greatest benefit of electricity was to the household, lighting was overwhelmingly cited. Ninety-eight percent said lighting, while one percent said each of home business and luxury items and less than one percent mentioned other benefits.

ENERGY EXPENDITURES AND AFFORDABILITY OF ELECTRIFICATION

Total Expenditures For All Energy Sources

Households

The average monthly expenditure by household for all energy sources was $4.40[7] (Rp. 2750). As shown in the figures below, as household income increases, the amount that a household spends for energy increases significantly. When energy expenditures are compared among groups of households based upon per capita income, energy expenditures increase significantly at all but the lowest levels of per capita income.

Figure 3

All Households: Average Monthly Energy Expenditures by Monthly Household Income

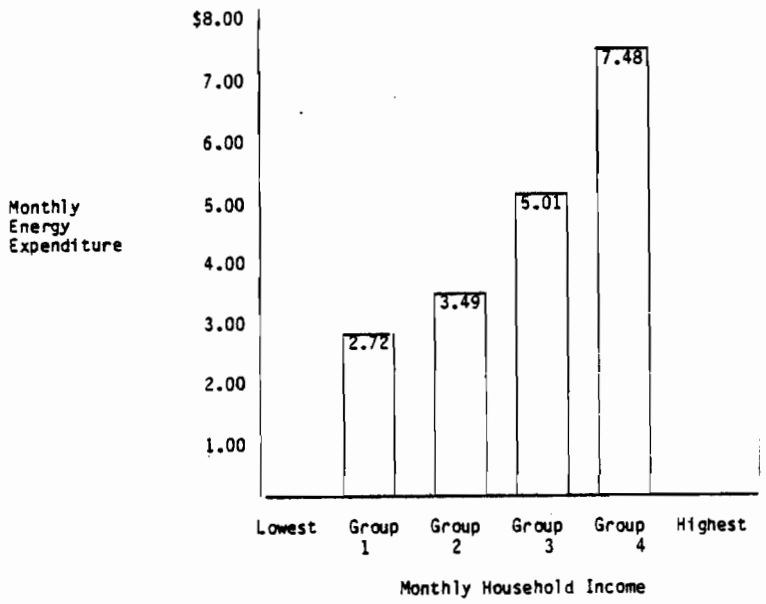
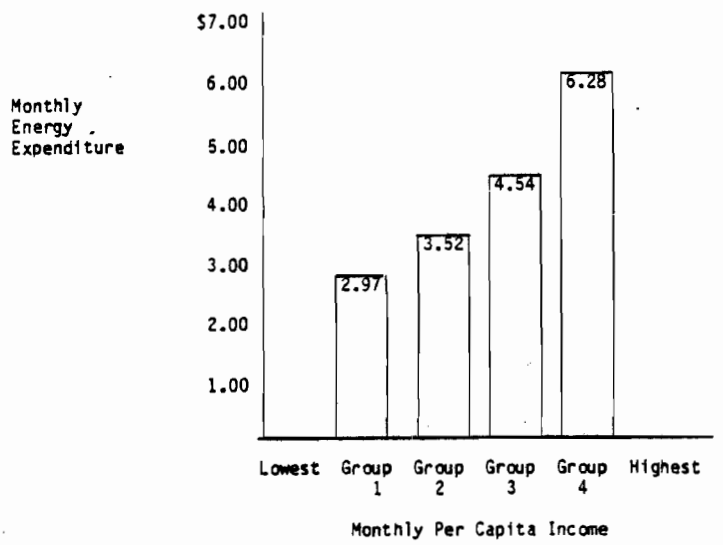


Figure 4

All Households: Average Monthly Energy Expenditure by Monthly Per Capita Income



[7]This average amount is for all surveyed households. It is based on the electric bill for September 1980 (if any) and the amount the household spent for kerosene, charging accumulators, charcoal, firewood, agricultural wastes and other energy sources during October 1980. Many of the electrified households that were granted credit of U.S. $48-96 (Rp. 30,000 - 50,000) also paid an additional $1.60 - 2.10 (Rp. 1000-1300) during September. This amount was not included in the calculation of total energy expenditures.

Overall, and at the two lowest levels of income, electrified households spent significantly more for energy than nonelectrified households. Although at first glance it appears that at the two highest levels of income there may be differences in the amount the households spent for energy, there is no statistically significant difference between the two groups (see table 17).

Figure 5 depicts the distribution of expenditures for all energy sources by the households' electrification status. This is also recorded in table 17. Electrified and nonelectrified households do not differ significantly in their use of fuels other than kerosene and electricity.

Figure 5

All Households: Distribution of Energy Expenditures by Electrification Status

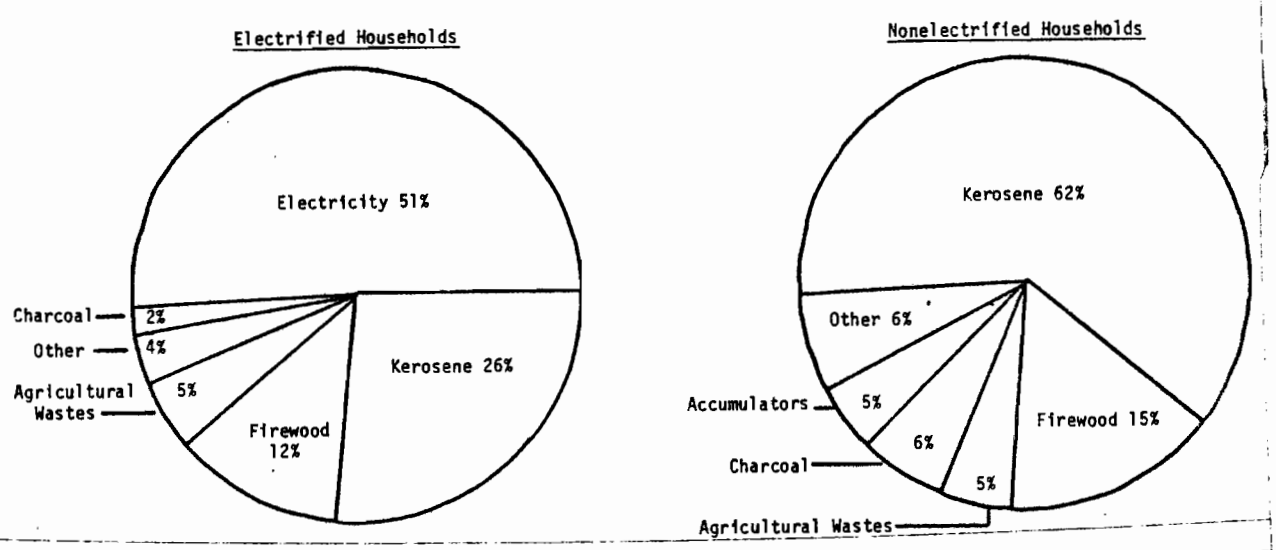


Table 17

All Households: Average Monthly Expenditures for Each Energy Source by Electrification Status and Household Income

Electrification Status and Monthly Household Income	Average Amount Spent in U.S. Dollars for all Energy Sources	Percent of Total Energy Expenditures Spent for Source						
		Electricity	Kerosene	Firewood	Ag. Wastes	Charcoal	Acc.	Other
All Households	$4.40	36	36	13	5	3	2	5
Group 1 - Lowest Income	2.70	39	30	17	7	1	1	5
Group 2	3.50	37	32	12	9	1	1	9
Group 3	5.00	34	36	13	7	4	1	3
Group 4 - Highest Income	7.40	35	42	10	1	6	2	4
Electrified Households	$4.90	51	26	12	5	2	-	4
Group 1 - Lowest Income	3.40	63	12	15	4	1	-	4
Group 2	4.60	47	18	13	11	1	-	10
Group 3	4.90	50	26	14	7	3	-	1
Group 4 - Highest Income	7.00	48	37	7	1	4	*	3
Nonelectrified Households	$3.50	-	62	15	5	6	5	6
Group 1 - Lowest Income	2.10	-	57	19	10	2	4	8
Group 2	1.90	-	79	8	-	3	2	8
Group 3	5.30	-	65	13	8	6	4	5
Group 4 - Highest Income	9.20	-	53	18	1	12	8	7

*Less than one percent

Households With Home Businesses

At the two highest levels of income, as shown in table 18, households with home businesses spent significantly more for energy than households without home businesses. The amount that electrified and nonelectrified households with home businesses spent each month for energy does not differ significantly.

Table 18

All Households: Average Total Monthly Expenditure for Energy by Presence of Home Business and Monthly Household Income

Presence of Home Business	Total	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
	Dollars	Dollars	Dollars	Dollars	Dollars
Total	4.40	2.70	3.50	5.00	7.50
With Home Business	5.90	2.70	4.50	6.40	10.30
Without Home Business	3.90	2.70	3.20	4.40	6.30

Expenditures for Electricity

Households

The average monthly electric bill for the surveyed households was $2.50 (Rp. 1565).[8] This amount does not include a monthly fee for the connection charge ($1.60-2.10; Rp.1000-3000) that some households paid in addition to the amount for electricity consumed.

As illustrated in figures 6 and 7, the group of households at the two highest levels of per capita income paid significantly more for electricity than the groups at the two lowest levels. Expenditures for electricity increased directly with household income except from the lowest to the second lowest level.

Figure 6

All Electrified Households: Average Monthly Electric Bill by Household Income

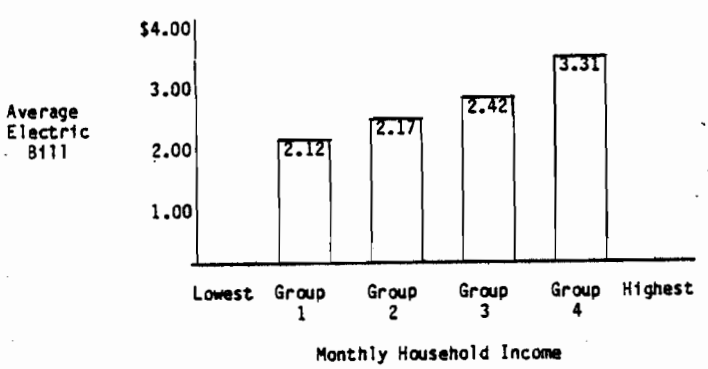
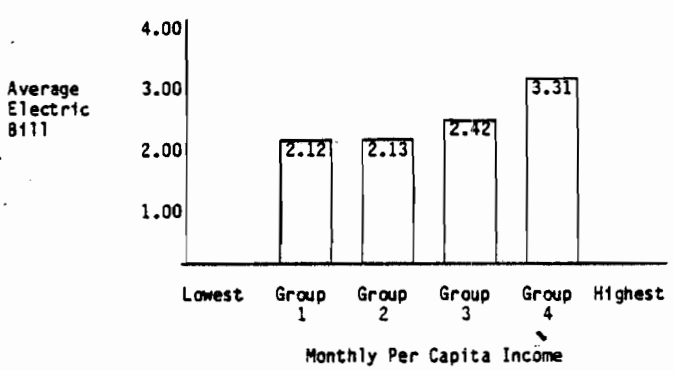


Figure 7

All Electrified Households: Average Monthly Electric Bill by Monthly Per Capita Income



[8]This compares very closely with the $2.60 (Rp. 1609) reported by the PLN and compiled on a handout entitled, "Klaten RE Demonstration Unit - Billing Statistics, 13 Month Period" distributed in April 1980 at the USAID Mission in Jakarta.

The expenditures for electricity did not differ significantly among households with and without home businesses at any income level. This is summarized in table 19 and depicted in figure 8.

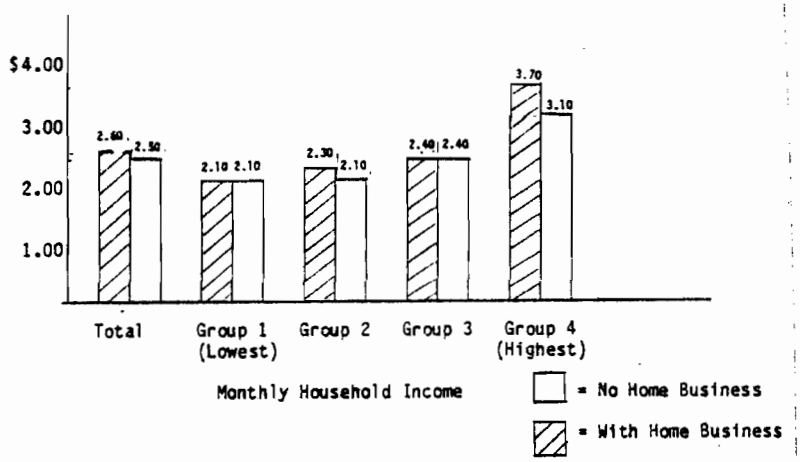
Table 19

All Electrified Households: Average Monthly Electric Bill by Presence of Home Business and Monthly Household Income

Presence of Home Business	Total	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
	Dollars	Dollars	Dollars	Dollars	Dollars
Total	2.50	2.10	2.20	2.40	3.30
With Home Business	2.60	2.10	2.30	2.40	3.70
Without Home Business	2.50	2.10	2.10	2.40	3.10

Figure 8

All Electrified Households: Average Monthly Electric Bill by Monthly Household Income and Presence of Home Business



Businesses

Almost half (49 percent) of the electrified businesses spent less than $3.20 (Rp. 2000) for electricity during the month before the survey. Thirty-four percent of the businesses spent $3.20 to $5.60 (Rp. 2001 to Rp. 3500) while 18 percent spent more than $5.60 (Rp. 3501). This did not vary greatly by type of business as shown in table 20.

Table 20

All PLN Electrified Businesses: Level of Expenditures for Electricity by Type of Business

Type of Business	Number of Businesses	Percent less than $3.20	Percent $3.20 - 5.60	Percent more than $5.60
All Businesses	74	49	34	18
Industrial/ Manufacturing	19	53	32	16
Commercial/Sales	33	45	36	18
Service Providing	21	52	29	19
Agricultural	1	-	100	-

DESIRE AND AFFORDABILITY FOR ELECTRICITY AMONG NONELECTRIFIED HOUSEHOLDS

When asked whether they would like to continue with their energy sources or receive an electric connection, only 50 percent of the nonelectrified households in the electrified villages desired electricity while 75 percent of those in the nonelectrified village desired electricity. This means that if all households wanting electricity received connections, over 92 percent in the demonstration villages and 75 percent in the nonelectrified village would be connected.

Respondents were asked how much they would be willing to pay each month for electricity excluding any connection charges. This is summarized in the table below.

Table 21

All Nonelectrified Households Desiring Electrical Connection: Amount Willing to Pay Each Month for Electricity by Electrification Status of Area

Amount	Percent of Households		
	All Households	Households in Electrified Villages	Households in Nonelectrified Village
Total	100	100	100
Not even $3.20	14	26	11
$3.20-$4.00	52	44	54
$4.01-$4.79	9	11	9
$4.80 or more	25	19	26

Most of the nonelectrified households (86 percent) were willing to pay a monthly bill of at least $3.20 (Rp. 2000). This is more than the current average monthly electric bill of $2.50 (Rp. 1565) reported by the surveyed households. More than one-third were willing to pay $4.00 (Rp. 2500) or more, and of those, most were willing to pay $4.80 (Rp. 3000) or more.

As shown in table 22, significantly more households at the highest two levels of income are willing to pay $4.80 (Rp.3000) or more for electricity than the households at the lowest two levels. As income decreases, these same two groups differ significantly on their unwillingness to pay even $3.20 (Rp. 2000) monthly for electricity.

Table 22

All Nonelectrified Households Desiring Electrical Connection: Amount Willing to Pay Each Month for Electricity by Household Income

Amount Willing to Pay	Percent of Households			
	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Total	100	100	100	100
Not even $3.20	22	24	5	-
$3.20-$4.00	66	48	42	53
$4.01-$4.79	7	10	14	-
$4.80 or more	5	18	39	47

All interviewed households except those reporting that they would be willing to pay $4.80 or more per month for electricity were asked why they would not pay more for electricity.

The answers were classified as either "cannot afford" or "other." The results are shown in table 23. In all areas and at all levels of "willingness to pay," the majority of households reported that they were not willing to pay for electricity because they "cannot afford" to do so.

Table 23

All Nonelectrified Households Desiring Electrical Connections: Reasons Not Willing to Pay More for Electricity by Electrification Status of Area

Description	Percent of Households	
	Electrified Villages	Nonelectrified Village
Not Willing to Pay Even $3.20		
Reason:		
Cannot Afford	61	82
Other	39	18
Willing to Pay $3.20-$4.00		
Reason:		
Cannot Afford	72	59
Other	28	41
Willing to Pay $4.01-$4.79		
Reason:		
Cannot Afford	58	89
Other	42	11

Respondents were also asked if they could afford to pay $96 (Rp. 60,000)[9] in cash, or through a monthly installment of $2.10 (Rp. 1300)[10] which would be added to the electric bill. Overall, 88 percent of the nonelectrified households reported that they could afford to pay for the PLN connection charge. Twenty-four percent felt that they could afford to pay cash, 64 percent felt they could afford to pay in monthly installments and only 12 percent felt they could not afford to pay the connection charge at all (see table 24).

Table 24

All Nonelectrified Households Desiring Electrical Connections: Perceived Affordability for Connection Charge

Affordability for Connection Charge	Percent of Households
Cannot afford at all	14
Can afford to pay in monthly installments of about Rp. 1300	64
Can afford in cash	24

Potential for Using Electricity by Nonelectrified Households with Home Businesses

Among nonelectrified households with home businesses, more than one-third (37 percent) felt that they could make productive use of electricity in their businesses.

[9]The majority of the households that connected during the demonstration project paid $48 (Rp. 30,000) for the connection charge.

[10]Rp. 1300 was a common monthly payment for installation.

ABILITY FOR BUSINESSES TO EFFECTIVELY USE MORE ELECTRICITY

Table 25 shows that 28 percent of the electrified businesses felt that they could make effective use of an increase in their consumption of electricity. Sixteen percent of the industrial, 24 percent of the commercial and 43 percent of the service providing businesses felt that they could effectively use more electricity. The one electrified agricultural business felt that it could effectively use more electricity.

Of the businesses that felt that they could make effective use of an increase in PLN electricity, the majority (62 percent) said that the main reason they did not make greater use was because they lacked money or capital. Another 10 percent said that equipment was too expensive. The other 29 percent did not make greater use of the electricity for a variety of reasons.

Table 25

All PLN Electrified Businesses: Ability to Make Effective Use of an Increase in PLN Electricity by Type of Business

Type of Business	Number	Percent Able to Use More Electricity
All Businesses	74	28
Industrial/ Manufacturing	19	16
Commercial/ Sales	33	24
Service Providing	21	43
Agricultural	1	100

POTENTIAL TO SERVE NONELECTRIFIED BUSINESSES IN THE DEMONSTRATION AREAS

As shown in table 26, only 16 percent of the businesses had not electrified. It is important to determine why they decided not to accept electrical service. Four of the ten nonelectrified businesses said that this was because they could not make effective use of PLN electricity. This included the one nonelectrified agricultural business, two of the three service providing and one of the three industrial/manufacturing businesses.

Of the six businesses that could make effective use of electricity, but had not electrified, two said they were still thinking about it, one said that they just had not asked PLN yet, one had not acquired electrical appliances yet and one said it was because they did not own the building that the business was in. Additionally, only two of these six businesses were willing to pay $256 (Rp. 160,000) for a connection charge and only one of these two would be willing to pay more than this for a more powerful connection.

Table 26

All Nonelectrified Businesses: Ability to Make Effective Use of PLN Electricity by Type of Business

Type of Business	Ability to Make Effective Use of PLN Electricity	
	Number that could make effective use	Number that could not make effective use
All Businesses	6	4
Industrial/ Manufacturing	3	1
Commercial/ Sales	0	0
Service Providing	3	2
Agricultural	0	1

ENERGY USAGE

Overall, the proportion of households in the four villages using each energy source were as follows:

* 74 percent used kerosene
* 63 percent used electricity
* 55 percent used agricultural wastes
* 41 percent used firewood
* 21 percent used charcoal
* 8 percent used accumulators
* 18 percent used other sources

Most of the households reported using more than one energy source. Electrified households differed from nonelectrified households in their use of energy sources. The proportion of nonelectrified households using kerosene, charcoal, and accumulators was significantly greater, in each instance, than the proportion of electrified households using the source. The following table summarizes the use of each energy source by households according to whether or not households were electrified.

Table 27

All Households: Usage of Energy Sources by Electrification Status

Energy Source	Percent of Households		
	Total Households	Electrified Households	Nonelectrified Households
Electricity	63	100	-
Kerosene	74	60	98
Agricultural Wastes	55	55	56
Firewood	41	39	45
Charcoal	21	16	29
Accumulators	8	*	20
Other Sources	18	15	24

* less than .5 of 1%

Energy Usage Controlled for Income

The two highest income groups show a significantly greater proportion using electricity than the two lowest income groups. More households in the two highest income groups used charcoal (a purchased source) and less households used agricultural wastes (usually gathered), than households in the two lowest income groups (see table 28).

Table 28

All Households: Percent of Households Using Each Energy Source by Monthly Household Income

SOURCE	Percent of Households: Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4	Relation of Income to household usage of energy source
Kerosene	70	69	75	86	Positive
Electricity	50	59	70	79	Positive
Agricultural Wastes	60	58	57	39	Negative
Firewood	45	46	38	34	Negative
Charcoal	9	15	36	27	Positive
Accumulators	4	5	9	16	Positive
Other Sources	22	20	19	9	Negative

Energy Usage Controlled for Income and Electrification Status

At each level of income, the proportion of households using kerosene is significantly greater for non-electrified households than for electrified households. Nevertheless, an increasing proportion of electrified households use kerosene as income increases. A significantly greater proportion of nonelectrified households at the two highest income levels use charcoal than those at the two lowest levels of income. Also, the use of accumulators among nonelectrified households increases significantly with income, except from the lowest to the second lowest level of income. This is shown in table 29.

Table 29

All Households: Use of Energy Sources by Monthly Household Income and Electrification Status

SOURCE	Percent of Households: Lowest Income Group 1		Group 2		Group 3		Highest Income Group 4	
	Elec.	Nonelec.	Elec.	Nonelec.	Elec.	Nonelec.	Elec.	Nonelec.
Kerosene	42	98	51	96	64	100	82	100
Electricity	100	--	100	--	100	--	100	--
Agricultural Wastes	64	55	55	62	60	50	34	55
Firewood	45	46	45	47	35	46	33	40
Charcoal	5	12	13	18	26	60	17	65
Accumulators	--	8	--	11	--	30	1	70
Other Sources	18	25	19	20	17	25	7	20

Energy Use Controlled for Home Businesses

As shown in table 30, the only significant difference between households with home businesses and those without is that a greater percentage of households with home businesses used "other sources," such as benzine, sawdust, rice hulls, or candles.

The presence of a home business does not affect the energy sources used when comparisons are made between electrified and nonelectrified households. That is, the observed difference between electrified and nonelectrified households with home businesses is similar to the difference between all electrified and nonelectrified households.

A greater percent of the nonelectrified households with home businesses used kerosene, accumulators and charcoal. Although the presence of a home business does not seem to bear any relation to the sources of energy used, there may be differences in the quantity of energy consumed. However, the survey did not cover this topic.

Table 30

All Households: Use of Energy Sources by Presence of Home Business and Electrification Status

SOURCE	Percent of Households					
	Households with Home Businesses			Households without Home Businesses		
	Total	Elec.	Nonelec.	Total	Elec.	Nonelec.
Kerosene	74	60	100	74	59	97
Electricity	63	100	--	63	100	--
Agricultural Wastes	46	49	41	58	56	61
Firewood	46	40	55	40	39	42
Charcoal	26	17	41	20	16	26
Accumulators	13	--	35	6	*	15
Other Sources	27	21	35	16	13	20

Use of Energy For Lighting

Table 31 demonstrates that the energy source used for lighting was highly related to electrification status. All the electrified households used electricity for lighting and 95 percent of the nonelectrified households used kerosene for lighting.

Table 31

All Households: Major Energy Source Used for Lighting by Electrification Status

SOURCE	Percent of Households	
	Electrified Households	Nonelectrified Households
Electricity	100	*
Kerosene	--	95

* Five percent of the nonelectrified households reported using electricity for lighting. These households must have either used battery accumulators or illegal PLN connections or misunderstood the question.

Use of Energy for Cooking

Table 32

All Households: Major Energy Source Used for Cooking by Electrification Status

Source	Percent of Households		
	Total Households[1]	Electrified Households[1]	Nonelectrified Households
Agricultural Wastes	38	38	37
Firewood	34	30	40
Kerosene	25	30	19
Charcoal	*	*	--
Other Sources	3	2	4

[1] Data was missing for less than one percent of the cases and was allocated to the other categories.
* less than one percent

None of the surveyed households used electricity as their major energy source for cooking. Ninety-seven percent of the households used agricultural wastes, firewood or kerosene as their major source for cooking (see table 32). Electrified households showed a significantly higher use of kerosene and a significantly lower use of firewood for cooking.

As shown in table 33, at the two highest levels of income a significantly greater percentage of households use kerosene for cooking. At the highest level of income, a smaller percent of households used agricultural wastes.

The extent to which secondary energy sources are used for cooking is unknown. For example, as shown in table 27, 21 percent of the households used charcoal as an energy source. Charcoal is primarily used for cooking, but was reported as the major source of energy for cooking in less than 1 percent of the households. Therefore, although unconfirmed, it is likely that charcoal is a secondary source of energy for cooking in as many as 20 percent of the households.

Table 33

All Households: Major Energy Source Used for Cooking by Monthly Household Income

SOURCE	Percent of Households			
	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Agricultural Wastes	47	38	39	20
Firewood	37	40	31	23
Kerosene	12	17	28	55
Charcoal	--	--	--	*
Other Sources	5	5	1	--

* less than one percent

Use of Energy for Boiling Water

The primary source of energy used for boiling water is almost identical to that used for cooking. This is indicated by tables 34 and 35. Most households used either agricultural wastes, firewood or kerosene. No households used electricity. More of the electrified households used kerosene for boiling water while more of the nonelectrified used firewood. At the highest level of income, a greater percentage of households used kerosene for boiling water and a smaller percentage used agricultural waste.

Table 34

All Households: Average Liters of Kerosene Consumed Per Month by Electrification Status and Monthly Household Income

Electrification Status	Liters of Kerosene Consumed				
	All Households	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Total	19	10	13	22	37
Electrified	15	5	10	14	31
Nonelectrified	26	14	18	40	62

Table 35

All Households: Major Energy Source Used for Boiling Water by Monthly Household Income

SOURCE	Percent of Households			
	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Agricultural Wastes	48	37	39	19
Firewood	37	37	30	22
Kerosene	12	21	30	56
Charcoal	--	--	--	1
Other Sources	5	5	1	--

Kerosene Consumption

As shown in table 36, on the average, households consumed 19 liters of kerosene per month. Nonelectrified households consumed significantly more kerosene (26 liters per month) than electrified households (15 liters per month). Both electrified and nonelectrified households used more kerosene in each successive income grouping. This trend was found to be statistically significant except between income groups one and two.

Table 36

All Households: Average Liters of Kerosene Consumed Per Month by Electrification Status and Monthly Household Income

Electrification Status	Liters of Kerosene Consumed				
	All Households	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Total	19	10	13	22	37
Electrified	15	5	10	14	31
Nonelectrified	26	14	18	40	62

Overall, and at the two highest levels of income, households with home businesses consumed more kerosene than households without home businesses, as shown in table 37.

Table 37

All Households: Average Monthly Kerosene Consumption by Presence of Home Business and Monthly Household Income

Description	Liters of Kerosene Consumed				
	Total	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
With Home Business	25	9	17	29	45
Without Home Business	17	10	12	19	34

Electrical Consumption

Households

Table 38 summarizes the average monthly kilowatt hour (KWH) consumption of the surveyed households. For all households consumption was 31 KWH per month. Consumption was significantly greater among households at the two highest levels of income than at the lowest levels of income. The amount of electricity consumed did not differ significantly between households with and without home businesses. However, at the highest level of income, households with home businesses consumed significantly more electricity than households without home businesses.

Table 38

All Electrified Households: Average Monthly KWH Consumption by Presence of Home Business and Monthly Household Income

Presence of Home Business	Monthly KWH Consumption				
	Total	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Total KWH	31	23	23	29	50
With Home Business	33	21	25	29	58
Without Home Business	30	23	23	29	47

Businesses

As shown in table 39, half of the businesses used 0-50 kilowatt hours of electricity, 32 percent used between 51 and 100 KWH and 18 percent used more than 100 KWH of electricity during the month prior to the interview. The amount of kilowatt hours consumed did not vary greatly by the type of business.

Table 39

All PLN Electrified Businesses: Kilowatt Hours of Electricity Consumed

Type of Business	Number of Businesses	KWH Consumption		
		0-50 KWH	51-100 KWH	More than 100 KWH
		Percent	Percent	Percent
All Businesses	74	50	32	18
Industrial/ Manufacturing	19	53	32	16
Commercial/Sales	33	48	33	18
Service Providing	21	52	29	19
Agricultural	1	-	100	-

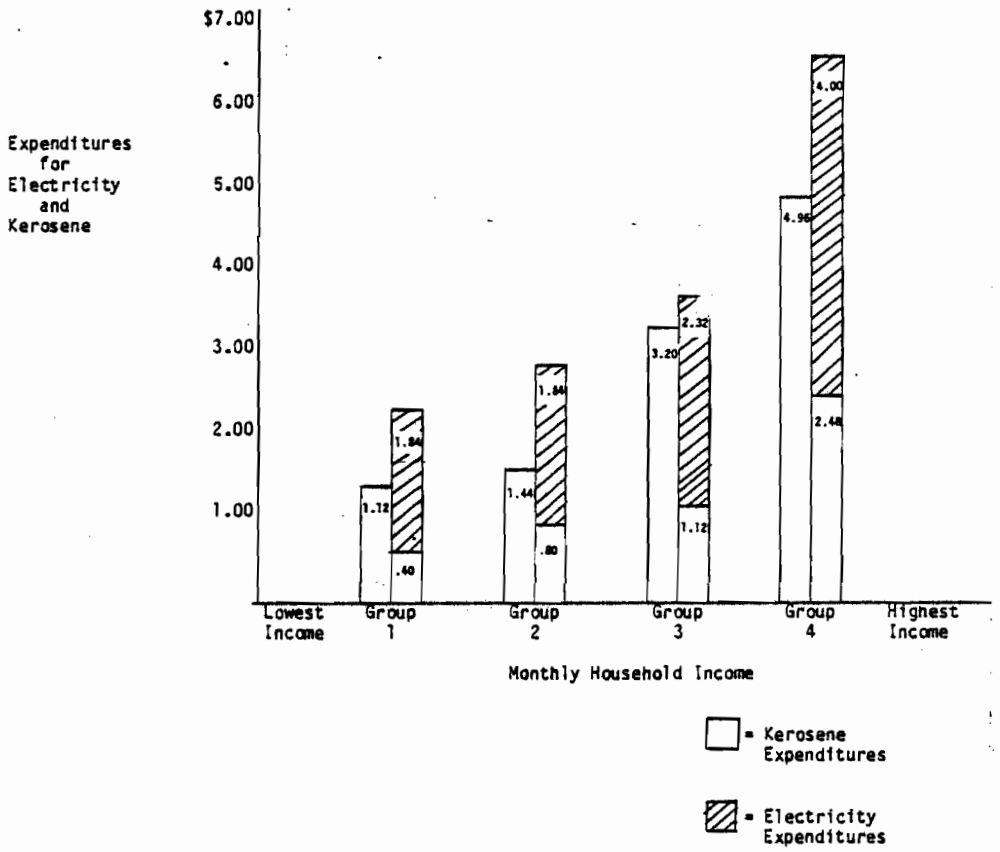
Substitution Effect of Electricity for Kerosene

Figure 9 illustrates the substitution effect of electricity for kerosene in terms of expenditures. The information presented was derived by assigning cash values to the quantities of kerosene and electricity that the households consumed (see tables 36 and 38). The average price for one kilowatt of electricity or one liter of kerosene was $.08 (Rp. 50).

At all levels of income households substitute electricity for kerosene after becoming electrified. Since this survey only looks at different usage patterns at one point in time, we cannot be precise about the exact nature of the substitution effect. Based on the information presented in figure 9, we have been able to estimate that overall, households tend to use 2.8 liters of kerosene less for each kilowatt hour of electricity that they consume. Households with home businesses use approximately 1.7 liters of kerosene less for each KWH of electricity they consume, while households without home businesses use approximately 3.8 liters less.

The data also seem to indicate that the two highest income groups replace less kerosene for each KWH of electricity they use than the two lowest income groups. There are two possible reasons for this. First, the data indicate that households generally substitute electricity for kerosene for lighting (see table 31). However, as households' income increases, they are more likely to use kerosene for purposes other than lighting, such as cooking and boiling water (see tables 33 and 34). Second, at the two highest income levels, electrified households most likely use electricity for additional lighting and luxury items beyond what they used with kerosene.

Figure 9 All Households: Monthly Expenditures for Kerosene and Electricity by Monthly Household Income



Income

Table 40 summarizes the income distribution of the surveyed households. Household expenditure and consumption data are used as a proxy for income data in Indonesia. If we compare the Klaten expenditure and consumption data from this survey which indicates a mean per capita income of U.S. $9.85 per month, with the data derived by the Indonesian Central Bureau of Statistics (BPS) for rural Indonesia, which indicate a per capita income of U.S. $10.89 per month,[11] it appears that Klaten is most likely an "average income" community. However, the data from this survey was derived from only three interview questions and not the more extensive set of questions used by the BPS. Therefore, information about the amount of income earned cannot be compared with any validity. Information about income in relationship to other households in the Klaten survey may be studied since all these households will have answered the same questions. Likewise, if the same income questions are used in a future survey, the income data reported here could be compared with the new data.

Mean and median monthly household income was higher for electrified households. The mean $45.86 and median $37.79 income for the nonelectrified comparison village is higher than that of the nonelectrified households in the electrified demonstration area ($27.43 and $22.36 respectively), but not as high as the electrified households in the electrified villages ($54.19 and $45.20, respectively).

Table 40

All Households: Monthly Household Income by Electrification Status

Monthly Household Income in Dollars	Electrified Households		Nonelectrified Households	
	Percent*	Cumulative Percent	Percent*	Cumulative Percent
0 - 16	9	9	20	20
16 - 32	24	33	31	51
32 - 48	21	54	20	71
48 - 65	17	71	11	82
65 - 81	7	78	8	90
81 - 96	11	89	4	94
96 -113	4	93	4	98
More than $113	8	100	3	100

*Total may not equal 100 percent due to rounding.

[11]The Indonesian Central Bureau of Statistics (BPS) reported that per capita income for persons in rural areas of Indonesia was rupiah 3909 during 1976. Adjusting this figure for inflation based upon the Consumer Price Index from the International Monetary Fund, the adjusted per capita income for October 1980 is rupiah 6,806 (US $1 = Rp. 625).

VII. SUGGESTIONS FOR FURTHER ANALYSIS OF THE DATA

The data collected in these Klaten Area surveys provide an opportunity for investigation of a number of issues which have been beyond the scope of this report. Though these issues may be relevant for long range planning considerations, the time consuming nature of calculating variances, T-tests and regressions with the data have placed some analyses beyond the limited means of this report. Limited time and monetary resources placed many research topics beyond our means. They are outlined in this section.

First, Belang Wetan, the nondemonstration village, should be studied in greater depth so that we can evaluate the design of the study. For example, analysis of family size, household income and per capita income might provide evidence concerning the appropriateness of using a nonelectrified village to increase the number of nonelectrified households in the sample.

Second, the interrelationships between income and the cost and consumption of electricity should be further studied. It is clear that both the demand for electricity and actual consumption vary directly with income. Further analysis directed toward quantifying the nature of this relationship would be useful in several ways. The data could be used to construct a model that would predict the level of electrical consumption in villages targeted for future electrical service. The available survey data provide information on 1) how much households are willing to spend for electricity; 2) how much electricity is consumed at current prices; and 3) the distribution of household income in the sample villages. The relationship between consumption and income have been shown to be significant in a positive direction (i.e., more income, more consumption). These relationships could be used in conjunction with information on the expected cost of electricity (in terms of cost per KWH) and household income in other villages to estimate expected demand in these villages.

Similarly, the survey data may also be used to estimate the impact of changes in the cost of electricity on demand and consumption. The relationship between household income and electrical use at current costs could be built into a model that would allow planners to estimate how changes in the rates for electric service would affect consumption.

Another topic which could be explored more fully using the survey data is the nature of the substitution of energy sources (electricity and kerosene in particular). This analysis has addressed the issue in terms of the substitution of KWH of electricity for liters of kerosene. This could be more precisely refined to see how different income levels affect substitution. Or, it could be expanded to see how substitution of energy sources affects the actual amount of energy units consumed. This would necessitate determining how many units of heat or light one KWH of electricity emits in terms of one liter of kerosene. Further analysis along these lines could include investigating the cost of electricity relative to kerosene or a "unit of energy output" basis. This is especially critical in light of the large subsidies that the Government of Indonesia spends to reduce the cost of kerosene for consumers.

Further data collection may also be a valuable supplement to the data collected in the Klaten area surveys. These surveys took place at one point in time -- only 16 months after electrification. Additional data collection would allow the present data to be used as part of a "time series" study to monitor the study variables in greater depth. For example, further changes in ownership and use of appliances can be expected as more households and businesses pay off their connection fees and are able to take fuller advantage of the electricity.

GLOSSARY

Accumulators - large rechargeable batteries (automobile, motorcycle) used as a source of electricity.

Agricultural Business*- A business primarily involved with animals or crops and not service oriented. This includes such businesses as tobacco drying, goat milking, and cultivation or production of these plants or animals. It does not include ricemills or similar service providing businesses.

Agricultural Wastes*- wastes from gardens or fields such as rice stalks and corn cobs.

BPS - The Biro Pusat Statistik, or Central Bureau of Statistics which is the Indonesian Census Bureau.

Charcoal - a type of manufactured burning material bought through a commercial establishment.

Commercial/Sales Business*- a business which is primarily a commercial outlet for products that have been manufactured elsewhere. Some examples of businesses in this category are general stores, restaurants, gasoline stations, and shops that do not manufacture the items that they sell.

Comparison Area - Commonly refers to the control group in experimental design. However, in the Klaten study the "comparison area" is not a genuine comparison area. In this study the majority of the comparisons are between electrified and nonelectrified households. Since the electrified villages had very few nonelectrified houses, a nonelectrified village was added to the sample. This nonelectrified village is sometimes referred to as the "comparison area".

Demonstration Area - the villages were electrified in 1979 by the Rural Electrification Project, well in advance of the majority of the areas to be electrified. Three of these areas were located in Central Java and were surveyed in the Klaten area surveys; the other three areas are in the outer islands.

DGC - Directorate General of Cooperatives. In the outer islands the DGC desires to set up cooperative systems of electrical power production and distribution.

Firewood*- specially cut wood from trees; not randomly collected twigs, branches and bark.

Home Industry - any business including manufacturing, sales, service providing or agricultural that is operated in or near a building usually used as sleeping quarters and is owned and operated by a member of the households in which it is located.

*As defined in the Interviewer's Manual

Industrial/Manufacturing Business*- Businesses in which products are being made from raw materials even if products are also being sold at the same location are included here. This includes furniture factories, ice factories, calcium-carbonate processing, soy bean processing and earthenware manufacturing.

Kelurahan - The Indonesian word for an administrative district. In the Klaten area a Kelurahan refers to an entire village.

Kabupaten - a district smaller than a province (20 to 30 per province) which includes kecamatan which are further divided into kelurahan.

KW - kilowatt or a thousand watts

KWH - kilowatt hour, or a thousand watt hours

Lighting for Security - any form of illumination used at night for security, as defined by the respondent. Many times this consists of very low illumination believed to keep ghosts away from the home or business.

PDO - Project Development Office of the Directorate General of Cooperatives.

Per Capita Income - total household income divided by the number of household members.

PLN - Perusahaan Umum Listrik Negara, the National Electric Power Agency of Indonesia.

Rupiah - Indonesian currency; 625 rupiah equaled U.S. $1.00 in November 1980.

Service Providing Business*- a business that performs any of the functions auxilliary to production or distribution and does not primarily manufacture or sell products. Some examples of service providing businesses are welding shops, battery charging shops, tailors, sawmills and ricemills.

Social Activities*- includes meetings, gatherings, Koran reading, children playing and similar nighttime activities.

*As defined in the Interviewer's Manual

APPENDIX A: QUESTIONNAIRES

Note: An accompanying interviewer's manual, which contains definitions of all terms contained in the questionnaire, is available upon request.

FORM KES-1
August 1980

KLATEN ENERGY SURVEY - HOUSEHOLDS

IDENTIFICATION SECTION

Interviewer: _____

Observer (if any): _____

Village: _____

Name of Family: _____

Name of Respondent: _____

Address: _____

Description of Location: _____

[ ] [ ][ ][ ][ ]
Electrification Number Household Number

RECORD OF CALLS

A. Call Number	B. Date	C. Time	D. Outcome	E. Comments
1	_____	a.m. _____ p.m.	1 Complete (SKIP TO F) 2 No Interview (Complete E)	_____ _____ _____ (SKIP TO G IF INTERVIEW IMPOSSIBLE)
A. Call Number	B. Date	C. Time	D. Outcome	E. Comments
2	_____	a.m. _____ p.m.	1 Complete (SKIP TO F) 2 No Interview (Complete E)	_____ _____ _____ (SKIP TO G IF INTERVIEW IMPOSSIBLE)
A. Call Number	B. Date	C. Time	D. Outcome	E. Comments
3	_____	a.m. _____ p.m.	1 Complete (SKIP TO F) 2 No Interview (Complete E and G)	_____ _____ _____

F. Completed Interview Section

Time Began _____ a.m. _____ p.m.

Time Ended _____ a.m. _____ p.m.

Interviewer Number (2) _____

Village Number (3) _____

INTRODUCTION:
Good(morning/afternoon). I am _____ and I represent the Perusahaan Umum Listrik Negara from the Jakarta Office. We are conducting a survey in this area to see how people are using electricity and other fuels. I would like to speak to someone in the household who is knowledgeable about the household's use of energy.

G. Non-interview Reason

(1)
1. Vacant
2. Refused
3. Unavailable for duration of survey
4. Unable to locate
5. Other - Specify _____

1a. How many families live in this house?	(11) _____ If "1" - SKIP to 2a If more than "1" - ASK 1b
1b. During this interview, we will be asking questions about uses of energy such as electricity and kerosene. We want to ask the questions about your own family and any other family that lives here, if they share their living expenses with your family. Does any other family share their living expenses with your own family?	(12) 1 Yes - In that case, when I speak of the "household" during this interview, I am referring to the persons in all the families that live here and share their expenses. (NOW ASK 2b) 2 No - In that case, when I speak of the "household" during this interview, I am referring only to the persons in your own family. (Now ask 2a)
2a. How many persons in your family usually live here?	(13) _____ persons } SKIP to 3
2b. How many persons in your family and the other family(s) usually live here?	(14) _____ persons
3. I would like to ask about your household's usual sources of energy. First I want to know about your lighting. What source do you use <u>most of the time</u> for lighting - electricity, kerosene, or some other source?	(15) 1 Electricity 2 Kerosene 3 Other
4. Second, your cooking. Which of the following sources does your household use <u>most of the time</u> for cooking - electricity, kerosene, charcoal, firewood, agricultural wastes or some other source?	(16) 1 Electricity 2 Kerosene 3 Charcoal 4 Firewood 5 Agricultural Wastes 6 Other
5. Third, boiling and heating water. Which of the following energy sources does your household use <u>most of the time</u> for boiling or heating water - electricity, kerosene, firewood, agricultural wastes or some other source?	(17) 1 Electricity 2 Kerosene 3 Charcoal 4 Firewood 5 Agricultural Wastes 6 Other

6. Now I would like to ask some questions about the energy sources that your household uses. Did your household use any electricity in the past month?	(18) 1 Yes - Ask 7 2 No - Skip to 9
7. How many KWH of electricity did you use last month? (ASK TO SEE LAST MONTH's BILL IF POSSIBLE)	(19) _____KWH
8. How many rupiah did you spend on electricity last month? (ASK TO SEE LAST MONTH's BILL IF POSSIBLE)	(20) _____ rupiah
9. Did your household use any kerosene in the past week?	(21) 1 Yes - Ask 10 2 No - Skip to 12
10. How many liters of kerosene did you use last week?	(22) _____liters
11. How much did you spend for one liter of kerosene?	(23) _____rupiah per liter
12. Did your household use any acccumulators last week?	(24) 1 Yes - Ask 13 2 No - Skip to 15
13. How much do you usually spend to charge one accumulator?	(25) _____ rupiah per charge
14. How many times do you charge accumulators in one month? Please tell me separately for each accumulator that you use.	(26) _____times per month (ENTER TOTAL NUMBER. EXAMPLE: 2 ACCUMULATORS EACH CHARGED 2 TIMES PER MONTH = 4)
15. Did your household use any charcoal in the past week?	(27) 1 Yes - Ask 16 2 No - Skip to 17
16. How many rupiah did your household spend on charcoal in the past week?	(28) _____ rupiah

17. Did your household use any firewood in the past week?	(29) 1 Yes - Ask 18 2 No - Skip to 19
18. How many rupiah did your household spend on firewood the past week?	(30) _____ rupiah
19. Did your household use any agricultural wastes in the past week? By agricultural wastes, I mean things from your garden or fields such as rice stalks and corn cobs.	(31) 1 Yes - Ask 20 2 No - Skip to 21
20. How many rupiah did your household spend on agricultural wastes the past week?	(32) _____ rupiah
21. Did your household use any other source of energy such as benzine, sawdust, rice hulls, or candles?	(33) 1 Yes - Ask 22 2 No - Skip to 23
22. How much did your household spend on these sources in the past week?	(34) _____ rupiah
23. Does your household have a home industry? By home industry, I mean a business owned and operated by you or members of your household.	(35) 1 Yes - Ask 24 2 No - Skip to 27
24. Do you use PLN electricity in your home industry for lighting or anything else?	(36) 3 Yes - Ask 25 4 No - Skip to 26
25. Which of the following do you use PLN electricity for in your home industry? a. lighting for security?	(37) 5 Yes 6 No
b. lighting for doing more work than before you had electricity?	(38) 1 Yes 2 No
c. equipment or tools used for production?	(39) 3 Yes 4 No

d. refrigeration or cooking?	(40) 5 Yes 6 No
e. any other use?	(41) 1 Yes - Specify _____ 2 No SKIP TO 27
26. Could you use electricity productively in your home industry?	(42) 3 Yes 4 No
27. Now I would like to ask some questions about evening activities that require lighting. Do any household members <u>use lighting in the evening</u> for reading, writing or studying?	(43) 5 Yes - Ask 28 6 No - Skip to 29
28. Generally, how many hours per evening do household members usually use light for reading, writing, or studying?	(44) _____ hours per evening
29. Do any household members use lighting in the evening for sewing or household chores?	(45) 1 Yes - Ask 30 2 No - Skip to 31
30. Generally, how many hours per evening do household members usually use light for sewing or household chores?	(46) _____ hours per evening
31. Do any household members <u>use lighting in the evening</u> for handicrafts or in the home industry?	(47) 1 Yes - Ask 43 2 No - Skip to 33
32. Generally, how many hours per evening do household members usually use light for handicrafts or in the home industry?	(48) _____ hours per evening
33. Does your household use lighting in the evening or night for security?	(49) 1 Yes - Ask 34 2 No - Skip to 35

34. Generally, how many hours per night does your household use lighting for security?	(50) _____ hours per night
35. Does your household use lighting in the evening at your home for social activities such as meetings or Koran reading?	(51) 1 Yes - Ask 36 2 No - Skip to Check Item
36. About how many hours per month do you use lights in the evening for these social activities?	(52) _____ hours per night
Check Item 1. This household is electrified 2. This household is not electrified	(53) 1 Continue with item 37 2 SKIP to Item 45
37. What is the major reason your household decided to obtain electricity? (CODE ANSWER INTO ONE OF THE CATEGORIES, BUT DO NOT READ CATEGORIES TO RESPONDENT)	(54) 1 Status 2 More practical, efficient 3 For better lighting 4 Cheaper than kerosene 5 Other - specify _____
38. Of the following electric appliances, does your household use any? a. Electric iron	(55) 1 Yes 2 No
b. Electric radio	(56) 3 Yes 4 No
c. Television	(57) 5 Yes 6 No
d. Refrigerators	(58) 1 Yes 2 No
e. Fan	(59) 3 Yes 4 No
f. Electric sewing machine	(60) 5 Yes 6 No

g. Electric stove	(61) 1 Yes 2 No
h. Electric phonograph	(62) 3 Yes 4 No
i. Electric water pump	(63) 5 Yes 6 No
j. Power tools	(64) 1 Yes 2 No
k. Hair dryer	(65) 3 Yes 4 No
l. Other appliances that use electricity	(66) 5 Yes 6 No
39. Did your household use any of the following <u>battery</u> operated appliances before you got the electrical connection? a. battery radio?	(67) 1 Yes 2 No
b. battery phonograph or cassette?	(68) 3 Yes 4 No
c. battery operated tools?	(69) 5 Yes 6 No
d. battery television?	(70) 1 Yes 2 No
40. In your opinion, what is the greatest benefit of electricity to your household? (DO NOT READ ANSWER CATEGORIES)	(71) 1 Lighting 2 Household cooking and heating water 3 Irrigation or water pump 4 Home Industry 5 Household appliances such as fans, irons, sewing machines, refrigerators 6 Luxury items such as radio, television, stereo, hair dryer 7 Other

41. Now I would like to ask about the service you are provided. Are you warned of interruptions by the electric company before they occur - all the time, sometimes, hardly ever, or never.	(72) 1 all the time 2 sometimes 3 hardly ever 4 never
42. How many interruptions occurred in the last month?	(73) _____ interruptions } if "0" SKIP TO 44
43. Last month, how long did electric interruptions last, on the average - less than an hour, 1-2 hours, all night or more than 1 day?	(74) 1 less than one hour 2 1 - 2 hours 3 all night 4 more than one day
44. How would you rate your degree of satisfaction with the performance of the electric company serving you - high, fair or low?	(75) 1 High 2 Fair 3 Low } SKIPto 52
45. Does your household want an electric connection, or would you prefer to continue using your present energy sources?	(76) 1 Wants electric connection 2 Prefers present energy sources
46. For electricity,would your household be willing to pay more than Rp. 2500 each month or would it be less than that?	(77) 3 More than Rp. 2500 - SKIP to 48 4 Less than Rp. 2500 - ASK 47
47. Would your household be willing to pay a monthly bill of Rp. 2000 for electricity?	(78) 5 Yes 6 No } SKIP to 49
48. Would your household be willing to pay a monthly bill of Rp. 3000 for electricity?	(79) 1 Yes - SKIP to 50 2 No - ASK 49
49. Why would you not want to pay more for electricity?	(80) 3 Cannot afford 4 Other

50. Can your household afford a connection charge of Rp. 60,000, if you must pay this amount in cash?

(81)

5 Yes - SKIP to 52

6 No - ASK 51

51. Can your household afford a connection charge of Rp. 60,000 assuming that you are granted credit and pay in installments of about Rp. 1300 per month?

(82)

1 Yes

2 No

52. Which of the following categories represents the amount that your household spends for everything <u>each month?</u> By everything, I mean rent, food, clothes, electricity and other energy, water, school, social uses, taxes, vehicle for private use, and any other expenses each month. Do not inlcude business expenses.

(83)

1 Rp. 0 - 5,000

2 5,001 - 10,000

3 10,001 - 20,000

4 20,001 - 30,000

5 30,001 - 40,000

6 40,001 - 50,000

7 50,001 - 60,000

8 60,001 - 70,000

9 70,001 or over

53. Do you also consume products from your own farm or garden?

(84)

1 Yes - ASK 54

2 No - END INTERVIEW

54. First, the farm, How much would you have to spend in the market for the products that you consume from your farm each month?

(85)

_____ rupiah

(IF RESPONDENT ANSWERS IN TERMS OF)
(EACH DAY, MULTIPLY BY 30: EACH)
(WEEK, MULTIPLY BY 4)

55. Last, the garden. What products do you consume from the garden each month?

(FILL ONLY COLUMNS A AND B)

(a) Product	(b) Number Per Month	OFFICE USE ONLY (c) Unit Cost in Market	(d) Total Value

(86) - - - - - - - - - - -Total

Form KES-2
August 1980

KLATEN ENERGY SURVEY
COMMERCIAL ESTABLISHMENTS
QUESTIONNAIRE

Identification Section

Interviewer: _____

Observer (if any): _____

Village: _____

Name of Business: _____

Name of Respondent: _____

Address: _____

Description of Location: _____

Business Number

RECORD OF CALLS

A. Call Number	B. Date	C. Time	D. Outcome	E. Comments
1	_____	a.m. _____ p.m.	1. Complete (SKIP TO F) 2. No Interview (COMPLETE E)	_____ _____ _____ (SKIP TO G IF INTERVIEW IMPOSSIBLE)
2	_____	a.m. _____ p.m.	1. Complete (SKIP TO F) 2. No Interview (COMPLETE E)	_____ _____ _____ (SKIP TO G IF INTERVIEW IMPOSSIBLE)
3	_____	a.m. _____ p.m.	1. Complete (SKIP TO F) 2. No Interview (COMPLETE E AND G)	_____ _____ _____

F. Completed Interview Section

Time Began _____ a.m. _____ p.m.

Time Ended _____ a.m. _____ p.m.

(2) Interviewer Number _____

(3) Village Code _____

INTRODUCTION: Good (morning/afternoon). I am _____ and I represent the Perusahaan Unum Listrik Negara from Jakarta. We are conducting a survey in this area to see how businesses and industries are using electricity and other fuels. I would like to speak with someone who is knowledgeable about the business' use of energy.

G. Non-Interview Reason
(1)
1. Vacant
2. Refused
3. Unavailable for duration of survey.
4. Unable to locate
5. Other - specify _____

1. Could you please describe this business? That is, what do you produce, sell or raise, or what type of service do you provide?	_____ _____ _____
	OFFICE USE ONLY (8) 1. Industrial or manufacturing 2. Commercial or sales 3. Service providing 4. Agricultural
2. Does this business use PLN electricity for lighting or any other function?	(9) 1. Yes - Ask 3 2. No - Skip to T6
3. For which of the following does your business use PLN electricity? a. Lighting for security?	(10) 1. Yes 2. No
b. Lighting for doing more work than before you had electricity?	(11) 3. Yes 4. No
c. Equipment or tools used for production?	(12) 5. Yes 6. No
d. Refrigeration or cooking?	(13) 1. Yes 2. No
e. Any other use?	(14) 3. Yes - Specify _____ _____ 4. No
4. Has this business increased its hours of <u>operation</u> because of the PLN electricity?	(15) 1. Yes - Ask 5 2. No - Skip to 6

5. Because of this increase, do you now employ more people than you did before you had the PLN electricity?	(16) 3. Yes 4. No
6. Has use of the PLN electricity resulted in an increase in the level of your production, sales or service?	(17) 1. Yes - Ask 7 2. No - Skip to 8
7. Has use of the PLN electricity resulted in an increase in the profit that you receive from this business?	(18) 3. Yes 4. No
8. Could this business make effective use of an increase in the consumption of PLN electricity?	(19) 5. Yes - Ask 9 6. No - Skip to 10
9. What is the main reason that you do not make greater use of PLN electricity now? (DO NOT READ CATEGORIES)	(20) 1. Has other electricity already 2. PLN electricity is too expensive 3. Not yet determined if PLN is less expensive than private source 4. Equipment is too expensive 5. PLN electricity is unreliable 6. Other - Specify _____ _____
10. How much was your electric bill from PLN last month? (DETERMINE FROM BILL IF POSSIBLE)	(21) _____ rupiah
11. How many KWH of PLN electricity did the business consume last month? (DETERMINE FROM BILL IF POSSIBLE)	(22) _____ KWH
12. Now I'd like to ask about the service you are provided. Are you warned of interruptions by the electric company before they occur - all the time, sometimes, hardly ever, or never?	(23) 1. All the time 2. Sometimes 3. Hardly ever 4. Never

13. How many interruptions occurred in the last month?	(24) 24. _____ interruptions - - IF "0" SKIP TO 15
14. Last month, how long did electric interruptions last, on the average - less than an hour, 1-2 hours, 3-4 hours, or 5 or more hours?	(25) 1. Less than one hour 2. 1 - 2 hours 3. 3 - 4 hours 4. 5 or more hours
15. How would you rate your degree of satisfaction with the performance of the electric company serving you - high, fair or low?	(26) 1. High 2. Fair 3. Low } End interview
16. Could this business make effective use of PLN electricity?	(27) 1. Yes - Ask 17 2. No - End interview
17. What is the main reason that you do not use PLN electricity now? (DO NOT READ CATEGORIES)	(28) 1. No PLN electricity available 2. Has other electricity already 3. Not yet determined if PLN is less expensive than private source 4. PLN connection charge too expensive 5. PLN monthly bill too expensive 6. Equipment is too expensive 7. PLN electricity is too unreliable 8. Other - Specify _____
18. Would this business be willing to pay a connection charge of Rp. 160,000 for PLN electricity?	(29) 1. Yes 2. No - End interview
19. Would this business be willing to pay a connection charge more than Rp. 160,000 for a more powerful PLN connection? This amount could be around Rp. 200,000 or 300,000, but would depend on the type of connection you received.	(30) 1. Yes 2. No } End interview

KES-3

KLATEN ENERGY SURVEY -COMMUNITY

Ask 4 and 5 if electrified

1. How many of each of the following does this village have:	(Number)	2. How many of these _____ are electrified? (Number)	3. About what percent of the community do these _____ serve?	4. What do these _____ use electricity for? (READ CODES BELOW AND CIRCLE ALL THAT APPLY)	5. Determine total KWH consumption for all schools, hospitals, etc. from records and enter below.
a. schools				1 2 3 4 5 6 7 2	
b. hospitals or clinics				1 2 3 4 5 6 7 2	
c. religious institutions				1 2 3 4 5 6 7 2	
d. parks or recreational buildings				1 2 3 4 5 6 7 2	
e. movies				1 2 3 4 5 6 7 2	
f. art buildings				1 2 3 4 5 6 7 2	
g. libraries				1 2 3 4 5 6 7 2	
h. guard houses				1 2 3 4 5 6 7 2	
i. public water systems				1 2 3 4 5 6 7 2	
j. street lights				1	

1. lighting
2. appliances
3. heating/cooling
4. communications
5. refrigeration
6. pumping water
7. other

INTENTIONALLY

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INTENTIONALLY

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APPENDIX B:

Selected Tables with Standard Errors

The following six tables are presented with standard errors calculated for most cells. These tables are presented in the text of the report and are presented here to illustrate the level of standard error for some of the important data cells. Standard errors were not presented throughout the report, although they were calculated and used to determine if differences between cells were significant (see Section V.D. for the calculation method).

Additional selected tables with standard errors included are available on request.

Table A. Standard Errors for Estimated Average of Liters of Kerosene Consumed in Households by Electrification Status and Income Group

Income Group

	Lowest Group 1			Group 2			Group 3			Highest Group 4		
	Total	Elec.	Nonelec.	Total	Elec.	Nonelec.	Total	Elec.	Nonelec	Total	Elec.	Nonelec.
Average Liters of Kerosene Per Month by Electrification Status	10	5	14	13	10	18	22	14	40	37	31	62
Standard Error	.8	.8	1.1	1.8	2.8	1.7	2.1	2.0	5.2	4.1	3.1	13.5
	Total	w/ HB	w/o Hb	Total	w/ HB	w/o Hb	Total	w/ HB	w/o Hb	Total	w/ HB	w/o Hb
Average Liters of Kerosene Per Month, by Presence of Home Business	10	9	10	13	17	12	22	29	19	37	45	34
Standard Error	.8	1.1	.9	1.8	3.4	*	2.1	4.3	2.4	4.1	*	3.2

HB - Home Business
* not calculated

	All Households		
	Total	Elec.	Nonelec.
Average Liters of Kerosene Per Month, by Electrification Status	19	15	26
Standard Error	1.1	1.2	2.1
	Total	w/ HB	w/o Hb
Average Liters of Kerosene Per Month, by Presence of Home Business	19	25	17
Standard Error	1.1	2.9	1.1

Table B

Standard Errors for Estimated Average Monthly Expenditure for Energy in Households by Presence of Home Business, Electrification Status and Income Group

Income Group

	Total			Lowest Group 1			Group 2			Group 3			Highest Group 4		
	Total	Total w/ home b.	Total w/o home b.	Total	Total w/ home b.	Total w/o home b.	Total	Total w/ home b.	Total w/o home b.	Total	Total w/ home b.	Total w/o home b.	Total	Total w/ home b.	Total w/o home b.
Average Monthly Energy Expenditure by Home Business	Rp. 2750	3661	2434	1701	1706	1700	2184	2810	2006	3134	3988	2719	4674	6454	3950
Standard Error	*	327.	94.	98.	*	113.	180.	337.	*	220.	523.	199.	400.	*	257.

	Total	Elec.	Not Elec.	Total	Elec.	Not Elec.	Total	Elec.	Not Elec.	Total	Elec.	Not Elec.	Total	Elec.	Not Elec.
Average Monthly Energy Expenditure by Electrification Sta.	Rp. 2750	3074	2197	1701	2106	1302	2184	2854	1206	3134	3045	3343	4674	4342	5754
Standard Error	*	120.	207.	98.	138.	133.	180.	270.	130.	220.	256.	429.	400.	291.	150.

*Standard error not calculated

Table C

Standard Errors for Estimated Average Monthly Expenditure For Energy in Households by Monthly Household Income and Monthly Per Capita Income

Description	Monthly Household Income			
	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Average Monthly Expenditures for Energy	Rp. 1701	Rp. 2184	Rp. 3134	Rp. 4674
Standard Error	Rp. 98	Rp. 180	Rp. 220	Rp. 398

Description	Monthly Per Capita Income			
	Lowest Income Group 1	Group 2	Group 3	Highest Income Group 4
Average Monthly Expenditures for Energy	Rp. 1857	Rp. 2198	Rp. 2838	Rp. 3925
Standard Error	Rp. 162	Rp. 200	Rp. 173	Rp. 342

Table D

Standard Errors for Estimated Percentages of Households in Electrified Areas Using Electricity by Income Group

	Income Group			
	Lowest Group 1	Group 2	Group 3	Highest Group 4
Percent of Households Using Electricity	70	83	93	98
Standard Error	2.9	3.6	1.8	1.6

Table E

Standard Errors for Estimated Percentages of Households Using Each Energy Source by Electrification Status

Energy Source:	Percent of Electrified Households Using Source	Standard Error	Percent of Nonelectrified Households Using Source	Standard Error
Electricity	100	*	-	*
Kerosene	60	2.3	98	0.8
Accumulators	**	0.3	20	2.5
Charcoal	16	1.7	30	2.9
Firewood	38	1.9	45	2.8
Agricultural Wastes	55	*	56	*
Other Sources	21	*	24	*

* not calculated
** less than .5 of 1 percent

Table F

Standard Errors for Estimated Percentages of Households by Major Energy Source Used for Cooking and Income Group

	Income Group			
	Lowest Group 1	Group 2	Group 3	Highest Group 4
Percent of Households: Major Energy Source Used for Cooking				
Agricultural Wastes	47	38	39	20
Standard Error	3.2	3.9	3.4	3.5
Firewood	37	40	31	23
Standard Error	3.2	4.0	3.3	3.9
Kerosene	12	17	28	55
Standard Error	2.2	3.0	3.2	4.4
Charcoal	-	-	-	**
Standard Error	*	*	*	*
Other Sources	5	5	1	1
Standard Error	*	*	*	*

* not calculated
** less than 1 percent