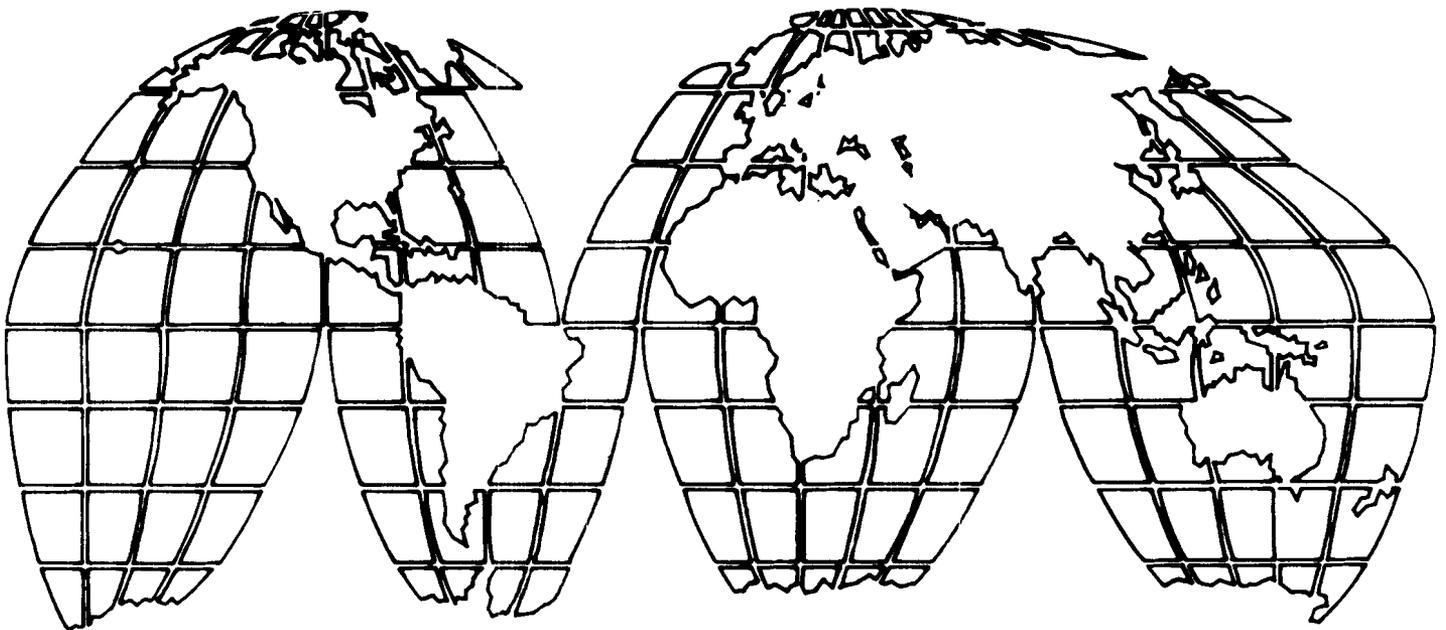


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Power to the People: Rural Electrification Sector Summary Report



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POWER TO THE PEOPLE
RURAL ELECTRIFICATION SECTOR SUMMARY REPORT

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PROJECT DATA--RURAL ELECTRIFICATION

Country	GNP per Capita ¹	AID Funding for RE	Project Purpose	Length of Time in Operation	Projects Studied by the Team
Bolivia	\$800	<ul style="list-style-type: none"> - 2 AID loans focusing on urban Santa Cruz (1962, 1966) - RE I (1973) \$11.8 million loan - RE II (1974) \$9.5 million loan <p>Total RE I, RE II: \$21.3 million</p>	To extend additional service to rural and peri-urban zones of the Santa Cruz region and to electrify areas adjacent to five other department capitals.	Most distribution networks were contracted and energized by 1979.	<ul style="list-style-type: none"> - Santa Cruz - Cochabamba - Sucre - La Paz
Costa Rica	\$1,850	\$3.3 million for three projects (between 1965 and 1969).	To help electrify, through member-owned cooperatives, three diverse areas of Costa Rica: Guanacaste, San Carlos, and San Marcos de Tarrazu.	Cooperatives were energized by 1969.	<ul style="list-style-type: none"> - Guanacaste - San Carlos - San Marcos de Tarrazu
Ecuador	\$1,100	<ul style="list-style-type: none"> - 1964 loan (Santo Domingo Coop) \$0.65 million - 1964 loan (Santa Elena Electric Co.) \$0.7 million - 1972 loan (for 11 planned subprojects which included Daule Coop) \$3.55 million - Total = \$4.9 million 	To assist in financing and implementing RE projects in selected parts of the country.	<ul style="list-style-type: none"> - Santo Domingo--funds loaned in 1964. - Santa Elena--funds loaned in 1964. - Daule--funds loaned in 1972. (Daule was a cooperative until taken over by national electric company in 1976.) 	Santo Domingo Coop, Santa Elena Electric Co., Daule (a cooperative until 1976), and Ambato Electric Co. (received no AID assistance, but active in RE)
Philippines	\$620	\$92.15 million between 1965 and 1978 (included funds for feasibility studies, two pilot projects, and five RE loans).	To finance equipment, engineering, consultant services, and extensive technical assistance provided by NRECA. (Led to establishment of Philippines National Electrification Administration, which plans total electrification by 1990.)	4-5 years for most cooperatives; some electrified for 10 years.	Batangas Electric Coop, Camarines Norte Rural Electric Coop, Victorias, Manapla/Cadiz Electric Coop, Central Negros Electric Coop, Don Orestes Romualdez Electric Coop, Camarines Sur Electric Coop II, and Leyte II Electric Coop

¹National Foreign Assessment Center, The World Factbook--1981, Washington, D.C., Central Intelligence Agency 1981. Figures are for 1979.

SUMMARY

In 1980, the Office of Evaluation, Bureau for Program and Policy Coordination, of the Agency for International Development (AID) undertook country studies to evaluate the impact of rural electrification programs in Bolivia, Costa Rica, Ecuador, and the Philippines. Based on findings from these studies, this summary report of the rural electrification sector draws the following major conclusions:

1. Rural Electrification and the Poor. Most people in electrified areas could afford to, and did, electrify their homes. This included a substantial percentage of the rural poor. Electrification of households was popular and highly valued by its users. The major use for household electricity was for lighting and appliances. The rural poor had limited ability to make productive use of electricity in their homes.

Previous Page Blank on Social Services. The most widespread public utility was for lighting (e.g., streets, public electricity on its own did not appear to be a vital impetus to the expansion of other social services. Development of further public usage required explicit linkage of rural electrification to strong, on-going social service programs.

3. Economic Development. Agriculture: Electricity had little direct impact on agricultural production. Only large and fairly sophisticated farming operations such as dairies appeared to enhance their production operations through use of electricity. However, electricity did have an important indirect impact on agriculture through its use in farm service industries (e.g., equipment repair) or crop processing (e.g., rice milling). Commerce and Industry: Although the four studies differed on the extent and importance of electricity use in business and industry, it appeared that electrification has had the greatest impact on commerce and industry in rural areas that are already experiencing economic growth, and in relatively developed locations such as market towns. General Conclusions: The more developed an area, the greater the impact of electricity on economic growth. Electricity does not elicit major spontaneous development in poor, less-developed areas. In these less-developed rural areas, other interventions (e.g., credit, roads) must be planned, funded, and coordinated to enable area residents to use the new energy source.

4. Rural Electric Organizations. The use and success of rural electric cooperative organizations was found to be dependent on the political traditions of the country and on the support (or lack of it) given by the central government. In each project area, a pragmatic choice should be made concerning what

type of organization (public, private, cooperative) can most effectively manage an electric system.

5. Financial Viability of Rural Electric Systems. The four evaluation studies reported that utilities used a number of methods to solve problems of financial viability (the most common of which was accepting heavy subsidization by the government). Because a wide range of responses may be appropriate in different locations at different times, the focus should be on creating a financially viable system, and then on making this system work to achieve development goals.

The following policy implications stem from the above findings and conclusions and were endorsed by the Rural Electrification Sector Meeting on September 18, 1981:

1. AID should view electricity as one of many possible ways of meeting the energy needs of a particular rural area. Rural electrification should be seen as part of the broader energy sector and not as an end in itself.

2. In order to fully assess the value of electricity in meeting the energy needs of a particular rural area, AID should conduct studies that will give a clear picture of the costs and benefits of the system. Serious attempts should be made to consider all the benefits and costs, including political and social ones which are relatively difficult to measure.

3. If rural electrification is determined to be an appropriate development activity in a particular area, then AID must find ways to make its shrinking budget more effective. In most countries where AID finds it desirable to assist in the development of rural electrification, AID's role should be a limited one--focusing on areas in which AID has special expertise (e.g., feasibility studies, training, and institution-building).

In areas where AID is involved in all levels of rural electrification, there are two possible courses of action:

1. If a certain threshold of modernity has been reached in the area, it may not be necessary for AID to link its rural electrification efforts to other development activity (for AID could expect the local inhabitants to make use of electricity relatively easily and quickly on their own).

2. If such threshold characteristics do not exist, AID should seek to integrate rural electrification projects with other development programs so that a host of complementary development activities are introduced along with electrification.

In addition to the policy issues discussed above, the Office of Evaluation more specifically recommends to AID that:

1. Caution be used in viewing rural electrification as an instrument of development in impoverished areas in the absence of other development dynamics. The poorer the area, the more skepticism one might have that rural electrification will enhance development.

2. The popular participation/cooperative model for managing rural electrification may not have relevance in a variety of cases and should be compared with other models of management in designing rural electrification projects.

I. INTRODUCTION

Development without electricity is difficult to imagine. The widespread use of electric power symbolizes a developed country; its absence is a sign of less-developed areas. Yet the question of how and when electricity fits into the process of development remains unanswered. At what stage of development should electricity be introduced? How should an electric system be organized and managed? What other resources are needed to maximize its benefits? Who should get it, and how should it be paid for?

The attraction in the United States for linking rural electrification (RE) to development has a solid basis in American history. The electrification of the U.S. countryside, beginning in the 1930s, had a significant impact on economic development. Electricity became important in agricultural production, such as dairy and poultry. Industry was able to move as because of the availability of electricity. ty came labor-saving appliances that freed the other activities. In short, the U.S. experience has been that rural electrification contributed substantially to an improved quality of life in the countryside and helped increase the efficiency of both industrial and agricultural production.

The U.S. experience has helped shape AID's vision of rural electrification in developing countries, incorporating several aims. The first has been to improve the quality of rural life by electrification of households, schools, clinics, and public areas. Second, electricity would aid the modernization of agriculture, the growth of small- and large-scale industry, and the expansion of commercial enterprises. Furthermore, rural electrification was expected to help stem rural migration into overcrowded cities by helping raise rural living standards and encouraging the economic development necessary to absorb an expanding rural labor force. Finally, the member-owned cooperatives, as an integral part of the AID-funded rural electrification model, were seen as a way to build democratic institutions in developing countries.

But many of these assumptions about the impacts of rural electrification programs have not been conclusively demonstrated. In part, this is because AID's goals for rural electrification have changed.

In the early 1960s, electrification projects focused more on the establishment of adequate power capacity than on distribution facilities and target beneficiaries. During this period, AID viewed rural electrification projects primarily as capital infrastructure projects. The primary concerns were engineering

design and the projected financial viability of borrowers. Evaluation of rural electrification considered completion of infrastructure, adherence to schedules, and appropriate distribution of funds. Hence, the evaluation was "more an audit than a socioeconomic assessment."¹

From 1966 to 1976, AID's purpose and goal statements did not mention construction. Rather, statements of this period stressed electricity use, improved standards of living and welfare, provision of 24-hour electricity at reasonable rates, and institution-building. Further definition of the intended target group appeared in the 1977 Philippine loan, which stressed service to the rural poor. This change of direction was stimulated by the 1973 congressional mandate that required AID programs to attempt to reach the "poor majority" as indicated by per capita income, health, and nutrition status.

With this concern for the rural poor ("New Directions") came criticism that infrastructure projects--such as electrification--did not have the impact of, say, rural health, nutrition, and agriculture projects. (Appendixes A and D provide more discussion of AID's past involvement in rural electrification; Appendixes B and C provide data on AID funding in this sector.)

On June 1, 1978, the United States House Appropriations Committee recommended that the Agency for International Development evaluate its rural electrification projects:

Through fiscal year 1978, AID has obligated over \$260 million for programs on rural electrification with \$78 million in loans and grants planned for fiscal year 1979. Given this sizable investment, it is recommended that AID's evaluation office undertake an assessment of rural electrification efforts to determine their effects on the poor.²

Subsequently, the AID Office of Evaluation commissioned Dr. Judith Tendler to prepare a discussion paper, "Rural Electrification: Linkages and Justifications." This 1979 exploratory study was intended to help formulate hypotheses for

¹Robert R. Nathan Associates, Inc., "Contribution of AID Documentation to the Evaluation of its Rural Electrification Projects," September 1979, Vol. I, p. 15.

²House Committee on Appropriations, "Foreign Assistance and Related Appropriations Bill, 1979," June 1, 1978, p. 17 (emphasis added).

testing and to assess what additional work needed to be done in the rural electrification sector.

Following the Tendler report, Robert R. Nathan Associates submitted a contracted study, "Contributions of AID Documentation to the Evaluation of its Rural Electrification Projects." This report was intended to help the Office of Evaluation determine what complementary and supplementary approaches (such as field trips) would be needed in order to determine project effectiveness. (Appendix D includes discussions of the Tendler and Nathan reports.)

Since existing documentation did not provide sufficient information to evaluate the rural electrification sector as a whole, the Office of Evaluation undertook four country studies in an attempt to supply needed information on that sector. The four countries chosen for evaluation studies (Bolivia, Costa Rica, Ecuador, and the Philippines) were located in Latin America and Asia, where the major part of AID-funded electrification activity had taken place. (See Appendix E, "Methodology," for the reasons behind this selection.)

Although teams varied in their approaches to the study and in the duration of their fieldwork, each team tried to acquire as much information as possible about the impact of rural electrification from onsite visits and interviews. The major questions asked by the teams included the following:

1. Are the poor reached by rural electrification projects? What impact has electrification had on rural households and social services? How can the varied impacts be explained?
2. What is the impact of rural electrification on economic development? What has been its impact on agricultural production, commerce, and industry? How can the varied impacts be explained?
3. How successful have rural electrification cooperatives been in meeting their organizational goals? What constraints have they faced in reaching their organizational objectives?
4. How financially viable are the AID-sponsored rural electric systems? How have factors such as equitable rate structures, electric system expansion, and the competing goals of organizational entities influenced the impact and viability of rural electric systems?

In 1981, when the four country studies were completed, the Office of Evaluation prepared a summary report based on the teams' findings. This draft was discussed by participants at

the Rural Electrification Sector Meeting held in Washington, D.C., on September 18, 1981. The meeting was attended by experts on rural electrification from various bureaus of AID, other international donor organizations (e.g., the Inter-American Development Bank), and the private sector. (See Appendix F for a report on this meeting.)

This rural electrification sector summary report draws on all this background and presents the views of the Office of Evaluation concerning future AID policy on this sector.

II. RURAL ELECTRIFICATION AND THE POOR

These reports attempted to answer three questions concerning the relationship between rural electrification and the poor: How many of the poor are reached by electricity? What is the impact of electrification on their lives? What explains these effects or lack of effects?

A. How Many are Reached?

Determining how many of the poor are reached by electricity is a difficult problem. Without choosing among the varied definitions of the poor, the teams looked only at the poor being reached through residential connections and not at those reached indirectly through social services and increased economic activity.

Connection rates were generally high. In Bolivia, approximately 60 percent of all those within reach of the lines connected to them, for a probable total of less than 20 percent of all households in electrified cantons. The Philippine report asserted that while most of the poor could not afford to make productive use of electricity, most could afford to have it in their homes (with an estimated 40 percent not being able to hook up). Ecuador and Costa Rica both enjoy higher per capita incomes than the Philippines, and the household surveys taken by the teams showed higher hook-up figures for these countries. The Costa Rica survey showed that over half the homes with electricity were below the poverty level (54 percent); about the same percentage of residences were without electricity. About 70 percent of potential customers in electrified areas had received electricity. In Ecuador, about 85 percent of the families surveyed who had electricity reported incomes below the poverty level. A reasonable conclusion is that, allowing for considerable variation, one can expect about two-thirds of rural families to hook up to reasonably priced, accessible

electricity and about half of the target beneficiaries to be able to afford a minimum connection and its monthly costs.³

The major obstacle to poor people electrifying their homes was the initial cost of installation,⁴ which ranged from \$30 to \$40 in the Philippines to \$5 to \$120 in Bolivia, depending on whether AID financing was available. Loan programs that spread out the initial payments helped increase the hook-up rate among the poor, but problems of repayment remained. The monthly costs of electricity were generally not a problem. In virtually all cases, monthly costs were substantially cheaper than kerosene/diesel fuel, although both forms of power generally included a government subsidy that did not reflect true costs. Generally, people wanted electricity, valued it highly, and were willing to sacrifice to get it. While water and education were often cited by beneficiaries as more vital to their lives,

³Other studies have resulted in somewhat lower figures for connection rates (e.g., 12 percent to 39 percent in Pakistan; 10 percent to 20 percent in some "electrified" Indian villages). (Bureau of the Census, "Philippine Rural Electric Evaluation: Preliminary Results of the 1980 House-hold Survey," Washington, D.C.: 1981, p. 22; H.S. Plunkett/USAID, Pakistan, "Social Effects of Rural Electrification: An Examination of Data From Pakistan," Islamabad, Pakistan: 1977 (?), p. 4; Elizabeth Cecelski, "The Role of Electrification in Development," Washington D.C.: 1979, p. 24; Agency for International Development, "Bangladesh Rural Electrification," 1980, p. 13; and see Appendix D, Evaluation Studies: Rural Electrification, Section III. A, Rural Electrification and the Poor.)

⁴A number of other studies--in Kenya, India, Bangladesh, Colombia, Indonesia, Nicaragua, and Pakistan--have supported this finding that the cost of hook-up is the greatest obstacle to household electrification. (Plunkett, p.6; Cecelski, p. 72; AID "Bangladesh" 1980, p. 16; AID "Bangladesh" 1981, p. 8; Anders Hjort, "Socio-Economic Effects of Rural Electrification in Kenya," Stockholm, 1974, pp. 10 and 50; Peter McCawley, "Rural Electrification in Indonesia--Is It Time?" Bulletin of Indonesia Economic Studies, January, 1979(?), p. 68; Robert R. Nathan Associates, "Contribution of AID Documentation to the Evaluation of Its Rural Electrification Programs," Washington D.C., 1979, Vol. II, p. 56; and see Appendix D, Evaluation Studies: Rural Electrification, Section III. A, RE and the Rural Poor.)

electricity was clearly psychologically important, if only as a symbol of modernity.⁵

One other point is that while it is difficult to target electricity directly to the poor, it is also difficult to exclude them from the service.⁶ Unlike cases of subsidized services such as agricultural credit and health clinics where the relatively well-off may be able to benefit disproportionately to their need, electricity afforded access to all those within reach of the lines who can also afford it. Given their fixed capital costs, utilities have a built-in incentive to expand use to as many customers as possible in electrified areas. This, together with the interspersed dwellings of rich and poor, means that the target population could, at least, not be excluded from access to the technology.

B. Impact on Households

Reaching the poor with residential electricity raised the question of its impact on their lives. Excluding the vital effects of increased economic productivity, the impacts on the target groups centered on the residential uses of electricity and its use in social services.

⁵Other studies have drawn mixed conclusions on the importance the rural poor place on electrification. In Indonesia, India, and Kenya studies, the poor did not cite electricity as a top priority. But in other studies--in Pakistan, Bangladesh, Bolivia, and Guatemala--the rural poor showed a strong desire for electricity. (Hjort, p. 84; Nathan, p. G-15; AID "Bangladesh" 1980, p. 10; and see Appendix D, Evaluation Studies: Rural Electrification, Section III. A, RE and the Poor; and Appendix F, Report of the Rural Electrification Sector Meeting, Section II. B, Household Use: Comments by Participants.)

⁶In a five-country survey, Moon comments, "Rural electrification, because of its tangible effects in service areas, rates extremely high as an instrument of propaganda. It is one development program which touches the rural poor." (Gilbert Moon/National Rural Electric Cooperative Association, "For the World Bank Group: A Report on Rural Electrification--the Costs, Benefits, Usages, Issues and Development in Five Countries," Washington D.C.: 1974, p. 137.)

The overwhelming use of electricity in the homes was for lighting.⁷ In general, and certainly among the poor, it was not used as an energy source other than for lighting. Very few used electricity in cooking, for example.⁸ Used for lighting, electricity extended the day, usually allowing more time for socializing. In some cases, students were able to do more homework in the evening. Greater safety was widely cited as a major benefit. This feeling came both from the removal of the threat of fire from kerosene lamps and the general sense of security from a well-lit home and environs. Comfort and convenience, however, were the most often mentioned benefits from home lighting. As one Filipino put it, "You don't wake up in the morning with soot in your nose."

The biggest economic impact of home electricity appeared to be on women's work. Many women said they could work more on handcrafts in the evening, and didn't get as tired as they had from kerosene lighting. Electric irons were frequently the first appliance purchased, and these also enhanced women's productivity.⁹ (The Philippine team noted relatively little sharing of appliances with nonadopters.) In some cases, home

⁷A host of other studies support the findings that use of electricity for lighting, followed by use for appliances, is the most common use in households that are connected. (Cecelski, p. 28; Nathan, p. 56; Census, p. 24; Inter-American Development Bank, "Evaluation Report on Rural Electrification and Energy," Washington, D.C.: 1979, p. 30; Development Alternatives, Inc., "An Evaluation of the Program Performance of the International Programs Division of the National Rural Electric Cooperative Association," Washington, D.C.: 1977, p. B-17; and see Appendix D, Evaluation Studies: Rural Electrification, Section III. A, Rural Electrification and the Poor.)

⁸Reports from Tendler, Hjort, and Inter-American Development Bank confirm these findings. (Judith Tendler, "Rural Electrification: Linkages and Justifications," Washington, D.C.: 1979, p. 40; Hjort, p. 42; and Inter-American Development Bank, "Summary of Ex-Post Evaluations and Rural Electrification Power Projects," Washington, D.C.: 1981, p. 3.)

⁹However, the Inter-American Development Bank noted that such use is limited by family income and ability to purchase appliances. The poorest women will therefore derive much less benefit from the easing of household chores than will women who are better off. (IDB 1981, p. 2.)

refrigerators enabled women to make extra money by selling iced candies and drinks to neighborhood children.¹⁰

There was clearly a ubiquitous positive psychological effect that electricity brought to its users. Isolated poor areas felt less isolated and less poor with the coming of this symbol of modernity. The increased availability of televisions and radios enhanced the leisure hours and probably increased peoples' awareness of the outside world. Many people saw electricity as a sign of their town coming of age or of the attention paid to them by the political leadership.¹¹ The opposite side of the coin was the sense of neglect felt by people in an area not reached by lines that extended to neighboring towns. Whether this psychological impact affected behavior is not as clear, although the resentment felt by people in nonelectrified areas was noted by the teams. While one might expect electrification to have a positive effect on migration--reducing out-migration or increasing immigration--the teams were unable to find a definite relationship.¹² The Bolivian team found some migration from cities to electrified market towns. The Costa Rican evaluation team speculated that electricity had indirectly accelerated migration from an electrified poor area. As another consequence of electrification, people were able to attend night schools and then move out of still impoverished areas for places offering greater opportunity.

¹⁰A 1977 study in Nicaragua showed that household refrigeration improved nutrition--especially as it facilitated storage of meat, and green and yellow vegetables. The study concluded that refrigeration results in an estimated significant increase of 9 to 10 percent of international standards for protein and vitamin A. (Barbara Wolfe and Jere Behrman, "Determinants of Nutrition Demand: the Limited Relevance of Income and the Importance of In-Kind Food, Refrigeration..." n.d.:n.p., p. 14.)

¹¹Looking at Latin American examples, American Technical Assistance Corporation (ATAC) found new "hope and encouragement" in newly electrified areas. ATAC attributed a developing social solidarity and reduction of violence to the coming of electricity. (American Technical Assistance Corporation, "A Final Report: AID Sectoral Evaluation," Washington, D.C.: 1972, p. 94.)

¹²Other studies, too, have found little evidence that rural electrification has influenced migration patterns. (Cecelski, p. 46; Nathan, p. 63; IDB 1979; Hjort, p. 98; World Bank, "Issues in Electrification," n.p.: 1974, p. 17.)

C. Impact on Social Services

The degree to which electricity enhanced social services varied considerably with the country and the type of services. The teams looked at services such as public lighting, schools, health facilities, and water systems. The level of development in an area appeared to be the most crucial factor in how widely electricity was used in public services. In the Philippines, Bolivia, and Ecuador, the teams voiced some disappointment in the low level of electricity usage for these services. In Costa Rica, widespread use in schools and health facilities was noted by the team. Generally, rural towns and market centers showed more evidence of increased services. Public squares were lighted at night, thus providing forums for community gatherings. Street lights offered safety and sociability.¹³ Lighted basketball courts provided teenagers with recreation in the evening. Services rendered in towns that were most easily and cheaply provided with light were generally found to be the services that were electrified.

Other service areas, such as schools and clinics, were a different matter. With the exception of Costa Rica, the use of electricity was disappointing. Schools, when they were lighted at all, were seldom used at night for adult education and made minimal use of electrical equipment. Health clinics were sometimes provided with electricity, but many had no electrical equipment--refrigerators for drugs or hot plates for sterilization. Nor did these services appear to extend their hours of operation into the evening.¹⁴ In Bolivia, the modest electrification of a potable water system was found to be the most significant social service benefiting from electricity. In Ecuador, the team found that minimal use was being made of power for improving services. Only in Costa Rica did social services show widespread improvement, notably in the use of electrification of schools for adult literacy classes. This reflected both the historical commitment in the country to high

¹³Many studies showed the public lighting function to be very important to rural residents who valued the security it provided. (Hjort, p. 58; Plunkett, p. 5; AID "Bangladesh" 1981, Attachment 2, p. 4.)

¹⁴A study in Kenya found limited use of electricity for educational purposes, but did find electricity used to enhance hospital service. There was even some indication that improvements in the newly electrified health care facilities might have helped attract doctors to the area. (Hjort, pp. 13 and 89.)

standards of education and health, and the expansion of strong on-going programs in these areas.

Several reasons were found to explain the failed linkage between electrification and improved social services that had been anticipated in the project papers. The most apparent was the failure to assign responsibility to anyone to facilitate this linkage process. Little local planning was evidenced in the public uses of electricity, and no administrative or financial mechanism was apparent to implement the tasks.¹⁵ The central government social service agencies could not themselves provide the necessary resources. Whereas the government's electric power agencies, which had access to resources, were typically among the strongest bureaucracies, public agencies concerned with health, education, and water were among the weakest. Consequently, the reach of an electric distribution system often exceeded its grasp on social services. Another factor was that electricity was not as essential to social service usage as had been anticipated in the project papers. While often necessary for expansion of these services, electrification was far from sufficient in itself. Clinics needed refrigerators along with spare parts and provision for their repair when they broke down. Night schools needed a separate adult education program and teachers willing to teach at night. Usually the costs of these complementary inputs were far higher and more difficult to attain than was the electricity itself.

D. Conclusions

As reflected in its popularity, electricity for rural households filled important roles. The social consequences of lighting were central.¹⁶ Extending the day, adding comfort to the home, and giving added security and modernity to the house were often-cited benefits. Radios, televisions, and refrigerators were fairly widespread and presumably enhanced the quality of life of their users. People's eagerness for electricity was reflected by the high percentage of hook-ups in electrified areas. Initial costs of installation were the most serious

¹⁵The Inter-American Development Bank also recognizes the need to include plans for social service use in rural electric project design. (IDB 1979, p. 18.)

¹⁶The Inter-American Development Bank concurs with this, finding that although original project justification has often been based on the economic benefits to be expected, the national social benefits from rural electrification tend to be more important. (IDB 1979, p. 30.)

barrier to gaining electricity, but this did not prevent most people from gaining the service.

The poor benefited the least from household electricity.¹⁷ Clearly, more electricity was used by higher income families who were able to purchase appliances more easily. Because they could not afford the costs of either hook-ups or of appliances to fully use the electricity, the poor gained less from electrification.¹⁸ Interestingly, the two countries showing the most positive impact from these household connections, Ecuador and Costa Rica, also had the highest per capita incomes, \$1,100 and \$1,850 per year respectively. The Philippines and Bolivia, with lower per capita incomes, \$620 and \$800 respectively, showed less impact. Similarly, while all the studies cited a positive effect on women's household work, the countries with higher incomes reflected a greater impact. In general, however, the social effects of providing households with electricity were much more evident in the reports than were increases in productivity in the home.¹⁹

The teams found little use of electricity for improving social services. Other than its use in public lighting of streets, few social services were enhanced by the coming of electricity. Health and education facilities appeared to make minimal use of the power, seldom extending their hours of service or improving the quality of their equipment after electrification. The availability of power was not the crucial

¹⁷Nathan Associates concluded that rural electrification appeared to "reach the poor but not the poorest." Other studies support this conclusion. (Nathan, p. 50; Hjort, p. 41; Tendler, p. 15; IDB 1979, p. 38.)

¹⁸There may be additional reasons for the failure of electricity to reach the poorest households. For example, in Brazil, Argentina, and Colombia, electric lines follow roadways, and electrified households may not include the poorest which are often located away from the roadways. (Appendix F, Report on the Rural Electrification Sector Meeting, Section II. B, Household Use: Comments by Participants.)

¹⁹It has been suggested that "productive use" may have been too narrowly defined in some studies; that is, the availability of household lighting itself had an effect on productivity by lengthening the day. For example, the Census Bureau found that a significant number of households in Indonesia and the Philippines used light for production in home business. (See further discussion in Appendix D, Evaluation Studies: Rural Electrification, Section III. A, Rural Electrification and the Poor.)

obstacle to expanding these services. Without a linkage to programs aimed at improving these social services, electricity was unlikely to show much effect on them. Costa Rica was the exception that underlined the point (with some examples occurring in Bolivia as well). Here electricity helped improve health and educational services when it was joined to ongoing programs and a strong public commitment to these areas.

III. RURAL ELECTRIFICATION AND ECONOMIC DEVELOPMENT

The impact of rural electrification on economic development was found to vary. The most positive finding was in the Ecuador evaluation, which concluded that rural electrification "contributed to the development of market towns and service centers." Nearby Bolivia inspired the most negative findings in that team's conclusion that "providing electricity was neither a catalyst for economic development of rural areas nor a precondition to it." Underlying these findings are two common themes.

The first is that electricity alone does not lead to spontaneous development activities. The provision of power did not in general release untapped demand for its productive use. Linkages to productive activities had to be planned, and programs involving, say, credit or irrigation systems needed more support than electricity alone provided. Rural electrification can aid development activities, not on its own, but as part of a wider program to develop the productive resources of the area receiving the power.²⁰

The second theme emerging clearly from the reports was that the development impact of electricity was a reflection of the existing level of development in the area. The more developed the area, the greater the impact. Where population was more concentrated, where there was greater access to markets, where technical skills and capital were present, there were more opportunities to use power productively. Development was enhanced in areas where development was on-going. In poorer areas with less potential, important social objectives may have

²⁰Looking at the Indian example, Cecelski stresses the interrelation between key productive inputs such as credit, land, technology, and electricity. A change in the availability of any one, she feels, will affect the area's overall productivity. (Cecelski, p. 16.)

been attained, but increases in production and productivity were less evident.²¹

All the teams saw a wide array of productive uses of electricity in the areas visited. Tailors used sewing machines for complex stitching; cafes used television to attract customers; rice, sugar, and timber mills employed power; and small industry converted from diesel to electricity, which was cheaper. However, most rural-based industrial users had installed their own motors prior to the arrival of central-system electricity. Both the Bolivia and Philippines teams were struck by the slowness with which several industries made the transition from diesel engines to utility supply hook-up.²² The cost savings resulting from the use of electricity did not appear to some of these businessmen to be sufficient reason to sell their diesel engines for new electric motors. Credit schemes to ease the burden of the conversion were either not known to them or not available.

A. Rural Electrification and Agriculture

Three of the teams found that electricity had little impact on agricultural production. The Philippines team reported "no substantial impact on cultivation" in the areas visited. They, along with the Bolivia team, saw little use being made of electricity for irrigation. The Ecuador team, with its generally favorable findings, saw electricity's direct impact on agricultural production as neutral. The survey taken by the Costa Rica team found that only 5 out of 96 respondents used electricity in agricultural activities. In general, the costs of both equipment using electricity and compatible farming techniques were beyond the means of most farmers.

This point was underlined by the teams' discovery of very few irrigation pumps that used electricity. The Bolivia project anticipated that 15 percent to 30 percent of the benefit flows in its cost-benefit analysis would come from irrigation. Yet no parallel plans for irrigation were implemented, nor were

²¹This is supported by World Bank findings that rural electrification most influences economic development in areas where some development is already taking place as a result of public or private investment in agriculture, agro-industries, and infrastructure. (World Bank 1974, p. 54.)

²²Looking at Indonesia, McCawley has the same observation. At two electrified sites, he found that industries frequently used autogenerated rather than grid power. (McCawley, p. 60.)

funds included in the project for financing the cost of connection. The Costa Rica team observed electricity in irrigation only in a few large farms.

Although the team was told that electrified pumping was widespread, they saw little evidence of it. In those areas of Ecuador where irrigated rice was a major crop, the team saw only small diesel-powered pumps. The team saw no electric pumps. Similarly, Philippines government figures indicated the existence of 216 pumps irrigating more than 20,000 hectares. The evaluation team, however, observed only one electricity-based irrigation system, and that was a failure due to faulty design.

The reasons for the lack of use of electricity for irrigation illustrate broader problems for its direct use in agricultural production. A major reason has to do with the inappropriateness of electricity to the crops and the farming systems in use. Some crops, such as sugar and coffee in Costa Rica and small vegetable plots and coconut trees, do not lend themselves to the use of electricity in cultivation or irrigation. In the Altiplano region in Bolivia, where irrigation was projected to be 20 percent of benefit flows, the area's harsh winters and salinity problems may have made irrigation neither desirable nor feasible. Small farmers in the Philippines and Costa Rica who face large up-front costs for material input seem to have made the calculation that the use of electricity was beyond their means.

This leads to a second set of reasons related to the appropriateness of the electric system. The Philippines team noted that the fields of small paddy farmers tended to be far from distribution lines, making the connection costs substantial if not prohibitive. The Bolivia team pointed out that small residential users were charged more than larger users and that the seasonal nature of many rural activities made electrification unprofitable for the utilities and uneconomical for the users, given the existence of a minimum monthly rate regardless of use.

Complementary inputs which might overcome some of these constraints were generally not found by the teams and provide a third level of reasons for the lack of on-farm uses of electricity. Both in Bolivia and the Philippines the lack of financing available to small farmers for connections and electrical equipment was noted. The banks did not promote such loans, and government assistance to farmers did not have an important electric component. Technical assistance to these small producers was not evident in these two countries nor in Costa Rica, where managers of cooperatives cited lack of staff and funds as the constraint. In the Alto and Yacuiba Valleys of Bolivia, the government agencies responsible for studies and

experimental drilling to facilitate irrigation projects never initiated these activities. The utilities were not prepared to coordinate these efforts or offer technical assistance, nor was any effort made to aid Bolivian farmers in organizing themselves into water-using associations. The Bolivia report further pointed to the lack of promotion of electricity and the resulting confusion by small producers concerning appropriate motors and costs of hook-ups.

The Costa Rica study, which found the greatest use of electricity for on-farm production, reinforced and modified the points made by the other studies. Examining the fairly sophisticated farming operations in Costa Rica, the team concluded that "the impact on agriculture and agro-industry can be partially predicted according to the production activities which are taking place in the area." Generally, the group using electricity comprised large landholders, cultivators of permanent crops, and livestock producers. The nonelectrified groups were the smaller landholders and cultivators of less lucrative basic grains. The team found that livestock producers (dairy, pig, and poultry) relied on cooperative electricity in the production stages, while on-farm use for coffee, rice, and sugar production was minimal. Nowhere was electricity more important than in dairying. According to the Costa Rica study, "in this industry, electricity is important at all stages from cultivation to marketing and its absence at any point would significantly reduce the volume of production." For example, electrified fences were relatively cheap to install, electric milking machines increased a cow's output, and refrigeration allowed farmers to increase their income by selling to dairy cooperatives.

A more widespread impact on agriculture came indirectly from the use of electricity in processing and for industries servicing the farmers. In Costa Rica, benefits to farmers not using electricity directly in production came from the increase in equipment repair shops which, according to their owners, owed their existence to cooperative power. Similarly, in small sugar processors and large rice millers, electricity had increased the plants' capacities and may have stimulated farm production. (Small rice millers retained more expensive diesel generators because of the cost of conversion, while large sugar processors used a sugar byproduct for fuel.) In Ecuador, agro-industries had increased in the areas electrified, with local husking and drying facilities for coffee and rice substantially increasing the value of the crop to the farmer. Unreliable service and high processing in the Daule area of Ecuador.

In the Philippines, the team found widespread conversion to electricity by rice mills as well as the establishment of new mills. The Bolivia team found relatively little use of electricity in local agro-industries and attributed this to a number of factors such as lack of markets for expanded production, high costs of connecting, and lack of financing.

B. Commercial and Industrial Uses

All the teams found that commercial and industrial businesses were using electricity in the areas visited. They differed, however, on the degree of impact they believed rural electrification to have on these economic activities. In Ecuador, the team saw electric power as having contributed significantly to the growth of market towns and the expansion of industry and commerce. On the other hand, the Bolivia team found little use of electricity by small, rural producers and, except for the boom area of Santa Cruz, little growth of production. In general, the studies agreed on three points: (1) that larger businesses converted to electricity more quickly and made relatively greater use of it than smaller ones; (2) the more developed the area the greater the impact of electricity on commerce; and (3) the availability of electricity was of much greater economic significance for market towns than it was for outlying rural areas.

The disagreement among the teams on the impact of rural electrification on commerce and industry was largely one of degree. Differing emphases on how important electricity was to the development of these economic activities and how widely it was used elicited varied observations. The Ecuador team, which centered its attention on large market towns, and the Costa Rica team, which looked at the relatively prosperous economy of that country, emphasized the positive aspects. In Ecuador, the growth of small industry and of artisanry shops was attributed to electrification. The team stressed the high impact of electricity on industry in Santo Domingo (population 50,000), which allowed the town to become a transportation center with a population dependent on jobs that would not exist without power. The Costa Rica team found a wide variety of industrial and commercial users, ranging from cement factories and saw mills, to tourist hotels and restaurants. The team concluded that electricity had accelerated the socioeconomic growth of all three project areas to varying degrees.

The Bolivia and the Philippines teams were less positive about the impact on commerce and industry. The Philippines report stressed electricity's lack of productive uses except in the relatively prosperous market town of Batangas. High costs, reliability of service, lack of start-up capital, and dearth of

industrial or commercial skills were pointed out as reasons behind this nonuse. Where electricity was used, it tended to be by wealthy families who did not usually generate much employment beyond the family.²³ The Bolivia report also emphasized the constraints: high costs for small users, lack of information on using and converting to electricity, machine-based technologies not being competitive with existing labor-based ones, and the questionable economic advantages of conversion. Even in Santa Cruz, where electricity was used in small industry, much of this use was transferred from previous autogeneration supplies.

Given these differing emphases, the teams did nevertheless converge on several crucial points. All saw larger entrepreneurs as more fully capable of using the power than smaller ones. In Santa Elena, the Ecuador team viewed this as a viable exercise in trickle-down economics, with employment being generated among the poor from repair shops, brick plants, and tourist hotels. Costa Rica similarly emphasized the employment generated in cement factories, saw mills, and tourist hotels. In Bolivia, large entrepreneurs had an advantage over smaller ones for sources of finance and discounted much of the increase in employment. The Philippines team, while seeing the poor excluded from direct productive uses of the power, saw a number of upwardly mobile families using electricity to assist their rise into the middle classes.

There was also general agreement that commerce and industry in the market towns and more-developed areas showed the most impact from electricity. Batangas in the Philippines, Santa Domingo in Ecuador, Santa Cruz in Bolivia, and San Carlos in Costa Rica, all showed significantly increased economic activity, greater in varying degrees than in less-developed electrified areas. The teams generally believed that electricity was an important development input, but in most cases not the crucial factor in a town's development. In less developed areas, less impact was found. Negros in the Philippines, Guanacaste in Costa Rica, and Cochabamba in Bolivia, all showed less economic reaction to the coming of electric power. An exception to this was found in the poor area of Santa Elena, Ecuador. Here the team found that electricity was crucial to the development of a tourist industry. Although this directly benefited the upper-income classes using the resort, it also provided jobs in an area with few other options for development. Outside of tourism, electricity had little impact on industry and agriculture in this area.

²³Other studies support this more pessimistic view about the potential of rural electrification for increasing employment. (Hjort, p. 11; Nathan, p. 55; IDB 1979, p. 35.)

C. Conclusions

The most important impact of rural electrification on agricultural production was an indirect one. In processing plants and in equipment shops, electricity appeared to stimulate production indirectly. On-farm uses were less in evidence.²⁴ Except for fairly sophisticated livestock operations and among large landholders, electricity was not usually a direct benefit to on-farm production.²⁵ Whether complementary inputs such as credit for irrigation pumps would result in greater utilization or prove cost-effective remains unclear.²⁶

Rural electrification had the greatest productive effect on economic activities for those with the resources to use it. Whether it was due to the size of the business, its location in a town, or the ongoing development in an area, those entrepreneurs who could combine electric power with other inputs made greater productive use of electricity. The teams differed on whether the increase in productivity was substantial enough to justify the investment and to what degree the benefits trickled down to the target beneficiaries. What does seem clear is that the major productive impact of electricity on the lives of the poor was indirect, lying in its assistance to the overall process of development. This, in turn, was dependent on the provision of other inputs and on the existing level of economic activity rather than on the delivery of electricity alone.

²⁴Partly as a result of these evaluation findings, AID's Bangladesh rural electrification project has made efforts to increase the proportion of agricultural and agro-industrial sign-ups. (AID "Bangladesh" 1980, p. 13.)

²⁵The Inter-American Development Bank came to similar conclusions. The IDB found that rural electrification helped larger farms (which often had irrigated fields) and dairy and poultry farms, rather than helping small family farms. (IDB 1981, p. 41.)

²⁶It should be noted that India, which has encouraged the use of electricity for irrigation pumpsets, is taking a hard look at its electric grid extensions because of rising costs. (See Appendix F, Report on the Rural Electrification Sector Meeting, Section IV. B, Agricultural Productive Use: Comments by Participants.)

IV. RURAL ELECTRIFICATION AND ORGANIZATION

AID funding for rural electrification was not aimed only at creating and supporting rural electrification organizations which would effectively generate and deliver their service. The organizations, it was said, were also designed to reach the beneficiaries in the poor majority more efficiently than existing institutions and to involve the local population in the administration of rural electrification. Thus, the aim of the rural electric cooperatives was to effectively construct and maintain a rural electric system, deliver its power to rural poor, and gain the participation of the population as owners of their local cooperatives. These lofty goals were, of course, dependent on local conditions far more than on outside initiatives for their success. Not surprisingly, a mixed picture of organizational accomplishments emerged from the evaluations.

Two sets of organizational questions emerged. One concerned the relationships between the central government's electric agency and the local cooperatives. How supportive they were of the cooperatives and how much control they sought over them were recurring questions. The other organizational question concerned the relationship between the cooperatives and their members. How involved and aware of the cooperatives were the people who in theory owned them? To what degree did they participate in the cooperatives and thus influence their operations?

A. Central Government and the Cooperatives

The attitude of the central government and its power agency was crucial to the functioning of the local electric cooperatives. In most cases they were legally and functionally creations of the central government. They were dependent on the government for the bulk of their financing (including AID funds), technical assistance, equipment, and often for the electricity they used. In Costa Rica and the Philippines, the support given the cooperatives was critical to their success. In Ecuador, the dislike and indifference of the central power agency toward cooperatives largely explain their lack of success.²⁷

²⁷Other studies have come to similar conclusions. (See Nathan, p. 35 and Appendix D, Evaluation Studies: Rural Electrification, Section III. D, Rural Electric Organizations.)

The Philippine Government's National Electrification Administration (NEA) was a strong, well-managed institution maintaining tight control over some 117 cooperatives. Through loan agreements to cooperatives, training for their staff members, approval of local managers, and technical assistance, NEA closely supervised the cooperatives. This has resulted in generally well-run cooperatives and the rapid expansion of the electric system. At times, NEA has pushed the cooperatives to expand services (in line with the government's political priorities) faster than the local cooperatives wished. In Costa Rica, the combination of a tradition of cooperatives, the government desire to expand electricity in rural areas, and the availability of AID funds led to the initiation of cooperative electric service. These cooperatives apparently functioned well without the intense government oversight found in the Philippines.

In Ecuador, AID funding was designed to benefit six private companies and five cooperatives. The cooperatives met with only limited success; two were formed but only one is still functioning. (Two of the five were constituted as companies.) There was a variety of economic and political reasons for their difficulties, but central to the problem was that the government agency overseeing electrification never favored cooperatives. The government had an implicit policy of not promoting cooperatives and when U.S.-Ecuador relations cooled in the early 1970s, the NRECA-AID-sponsored cooperatives became suspect. With little government backing and no strategy for building grass-roots support, it's not surprising that cooperatives did not take hold. Technical and financial considerations with central control were maximized. The fox was in charge of the hen house with predictable results for the cooperatives.

B. Cooperatives and Local Involvement

A major purpose of using cooperatives to manage the rural electric system was to involve the local population in its activities. This was seen to be an important social objective beyond the delivery of electricity. The Capital Assistance Papers in Ecuador and the Philippines make this clear. In Ecuador, providing power through a cooperative "has the best chance to contribute to the formation of an increasingly responsive and responsible democratic society." In the Philippines, the rural people would "gain useful social and political experience by organizing themselves into electric cooperatives...." Once established, the cooperative, "since it laces together all the social and economic levels of the community," would act as a "watering place" leading toward further community efforts. The cooperatives' function was thus to

support grass-roots decision-making and community participation in their activities.

In the studies that touched on these concerns (all except that in Bolivia), a mixed picture emerged. The expectations for cooperatives' participation went unfulfilled in Ecuador and the Philippines, while the Costa Rica study showed more positive results. Generally, it appears that the Costa Rica team's conclusion that the success of cooperatives depends on "the existence of supportive and mutually reinforcing attitudes and policies" in the general society is borne out by the other studies.

The teams generally found little evidence of broad and active member participation in the cooperatives.²⁸ In Ecuador, only a small percentage of the members attended the annual general membership meeting. In the Philippines, the team found no users who had attended the general meeting, attendance at which appeared to vary with the presence or absence of raffles, free food, and transportation. In Costa Rica, however, half of the survey sample reported that they had attended cooperative meetings in the last year.

Awareness of the cooperatives and their activities was generally low. In the Ecuador survey, only 3 percent of cooperative members were aware that they were members. In the Philippines, none of the respondents knew the name of the cooperative board members elected to represent them, and thus did not go to them with complaints. Few knew they were cooperative members. Costa Rica again provided an exception, with only 13 percent of cooperative members failing to identify themselves as such.

The Philippines report provides the closest view of how the cooperatives run and a partial answer to the lack of the desired popular participation and awareness. The boards of

²⁸Similarly, Nathan Associates found that, in most projects, community participation in rural electric cooperatives was "weakly developed." However, the U.S. National Rural Electric Cooperative Association points out that there is still much room for discussion as to the definition of a "good" rate of participation. Other criteria might be the way members are involved in the management of the cooperatives, or the commitment of the cooperatives in getting rural electrification to the poor. NRECA also noted that participation figures compare favorably with attendance figures at U.S. rural electric cooperative meetings. (Nathan, p. 38; and Appendix F, Report on the Rural Electrification Sector Meeting, Section IV. B, Rural Electric Organizations: Comments by Participants.)

directors of the several cooperatives visited were dominated by a local elite of government officials, businesspeople, professionals, and planters, with no workers or small farmers on the boards. The general meetings were usually pro forma affairs designed to get members' agreements on continuing policies and personnel. In one cooperative, membership itself was limited to about 10 percent of consumers, apparently in order to maintain the present board in power.

The coming of electricity did have some impact on community organizations. In order to get transmission lines into new areas, local community groups had to organize labor and bring pressure on the authorities to serve them. These activities ranged from sabotage of other areas' electric lines in Bolivia, to organizing local contributions in Ecuador. The cooperative form of organization may have been less important in motivating these activities than the prospect of electric service itself. The replication of cooperatives for other activities was not evident to the teams. Neither the government of Ecuador nor Bolivia appeared keen on repeating its experience in cooperatives. In the Philippines, the success of rural cooperatives was cited as an exception to a lengthy record of unsuccessful farmers' cooperatives in the country. And in Costa Rica, no other electric cooperatives have been created following the AID-funded ones.

C. Conclusions

The constraints placed on rural electrification organizations were twofold. One was political, deriving from the central government's wish not to lose control of the electrification program. In Ecuador, where cooperatives were seen as a threat, this eventually led to only two of five cooperatives being formed and to the restriction on additional financing. In the Philippines, the central government could keep control through funding and personnel, and strongly expanded the cooperatives as a vital part of its strategy of rural development. The second constraint was technical and financial. Here the need for technical expertise to make the system effective, and financial responsibility to make it viable, tended to centralize decision-making. In the Philippines, control over pricing and distribution remained in Manila. In Bolivia, technical decisions over the type and cost of the system were made by foreign advisors and government experts. Only in Costa Rica did these constraints apparently not limit the operations of the rural cooperative. Here a long tradition of central government support for cooperatives and an active, educated populace resulted in the smooth functioning of the rural electrification cooperatives.

The major consequence of the rural cooperative form appeared to be in keeping the system from being totally centralized. While producing lines of conflict between the center and regions, it kept the system accessible to local influences and conditions. Whether this required a cooperative organization or whether a private/public company would have functioned as well is not clear. The participatory goals of the cooperatives were not generally achieved. This, of course, was a secondary objective of the cooperatives. What the cooperatives did accomplish was the effective delivery of electric service. And generating power rather than generating participation is clearly the most important output to be sought from any electric organizations.

The conclusion to be drawn from this is straightforward. Decisions on organization by planners should center on the need for effective management. Priority should not be placed on participatory goals that are more dependent on the traditions of the country and the political attitudes of the government than on the services being delivered by a rural electrification system. A pragmatic choice should be made on what type of organization (public, private, or cooperative) can most effectively manage an electrification system in a particular country. Social objectives of participation should be a secondary consideration.²⁹

V. Rural Electrification and Financial Viability

Several common problems affected the financial viability of the rural electric utilities visited by the teams. First was the high cost of installation, the major constraint in reaching the poor and increasing the level of usage. Second was the difficulty in balancing electricity supply and demand--especially in the critical years following disbursement of AID funds. This was linked with the third issue of system expansion and the tension between the central government, which

²⁹Colombia, for example, has no cooperatives, but has a national rural electrification approach that produces the same end results as the cooperatives in terms of delivering electricity. The World Bank has found little evidence that one institutional arrangement is preferable to another. Appropriate institutional arrangements depend on the country, on the culture, the size and population of the rural areas, and the available skills (World Bank 1974, pp. ix and 52; DAI, p. 59; and Appendix F, Report on the Rural Electrification Sector Meeting, Section IV. B, Rural Electric Organizations: Comments by Participants.)

supported wider rural electrification, and local utilities, which viewed expansion as a threat to their resources. The final problem was the difficult question of fixing a rate schedule that balanced social and financial considerations.

It should be noted that all these issues are closely tied to the fact that the rural electric systems visited by the teams emphasized household connections. Therefore, solutions by the utilities to these financial viability problems promised a continued emphasis on household electrification. Rural electric systems emphasizing social service or productive uses would be expected to present different kinds of financial challenges. Such systems would need, for example, investment in complementary development efforts such as irrigation programs or health clinic construction to gain maximum impact from the electricity.

A. Cost of Installation

In general, the cost of installation, rather than monthly rates, was the major constraint in reaching poor households. The Ecuador team, for example, found an average hook-up cost of about 2,500 sucres (U.S.\$100). Even when this cost was spread over 18 months, it still represented a very substantial investment for most people in rural areas. Incomes of less than 6,000 sucres per month were reported by 84.6 percent of the families surveyed by the team.

The Costa Rica and Bolivia teams found that project plans had included loan funds to help poor households absorb the hook-up costs. But the loan money had run out and the teams found that the poor were bearing much more of the burden of installation than envisioned by planners. In Bolivia, would-be consumers had to make a downpayment of nearly U.S.\$120-- compared to the \$4 to \$8 downpayment required of those who had been able to take advantage of the available financing earlier. However difficult the initial financing, the Costa Rica, Ecuador, and Bolivia teams commented upon the willingness of the poor to save and sacrifice to meet the substantial capital costs of installation.

The Philippine team, like the others, found installation costs a burden for poor households. The team determined that with installation costs ranging from P150 to P250 (U.S.\$30 to U.S.\$40), together with additional charges for connecting houses further than 35 to 40 meters from the main line, many poor households were not able to afford the costs of hook-up. In terms of occupation and income, the team felt that few Philippine fishermen, small tenant farmers, or landless laborers, for example, would be able to electrify their homes.

Unlike the other teams, however, the Philippines team found a reluctance on the part of poor households to borrow for housewiring. The reason for this is not clear. The difference may be attributable to more precarious incomes, to a lower standard of living among Philippine poor, or to the difficult loan terms available for housewiring and the unwillingness of households to go into debt to gain access to electricity. (Many loans allowed only a 90-day grace period and required repayment in three monthly installments.)

B. Balancing Electricity Supply and Demand

Many of the financial problems faced by the rural electric companies and cooperatives were due to a mismatch of electricity supply and demand--especially in the early years of operation immediately following disbursement of AID funds. Rural electrification projects in general are characterized by high initial costs and underused capacity in the system in the years immediately following the completion of construction. Therefore, it is essential to load up the system as quickly as possible. Adding new customers is necessary to realize economic benefits and ensure adequate revenues for the utility.³⁰

The Costa Rica team reported that during the first 5 to 6 years of operation, Costa Rican cooperatives were faced with unpredicted low growth rates in the number of users and low consumption of electricity per user. The cooperatives had not consolidated their financial position and administrators lacked experience; the result was an uneasy financial position for a number of years. The cooperatives' financial position did improve, however. By the time of the team's visit, the cooperatives had been operating at a profit for 4 to 5 years and had a very good credit rating.

In Bolivia, the utilities also had trouble during the early years of operation. In this case, rural electrification plans had overestimated the average consumption per individual consumer and had underestimated the number of people desiring electricity. At the same time, because of financial and personnel constraints, Bolivian utilities were not able to fill requests for hook-up. The result was unused generation,

³⁰Success in loading up the system frequently depends on the tariff structure. If tariffs are too high, there may be disappointing levels of demand and an underused system. But if tariffs are too low, there may be a rationing of scarce electricity and implicit subsidies to consumers. (McCawley, p. 74.)

transmission, and distribution capacity in the system and insufficient revenues.

The difficulties of projecting supply and demand were further illustrated in Ecuador, where the team found that lack of generating capacity, not the willingness of the people to pay hook-up costs and membership fees, was the constraining factor in building up usage at the Santo Domingo cooperative.

C. Expanding the Rural Electric System

How far and fast electric systems expanded their grids were often a result of political pressures from government officials opposing financial restraints voiced by utility managers. The central governments generally supported rural electrification and frequently pressured the local utilities to expand their service area. The central governments' motivations ranged from a concern for improving the lives of the rural poor, to a realization that rural constituents wanted electricity in their homes. The local utilities, charged with the responsibility for carrying out electrification, were staffed with managers and technicians who were regularly faced with balance sheets and were closely concerned with the utilities' financial viability. The result was an area of tension where the national government urged expanded service while the local manager often viewed the expenses of expansion with alarm.

In Ecuador, for example, the team found one local electric company that saw rural electrification as a social service at best and, at worst, as a potential long-term drain on its resources. The Government of the Philippines, with a commitment to electrify the whole country by 1987, urged maximization of connections to rural households. The team felt that this weakened the financial viability of many cooperatives, for the rapid expansion of services had caused the cooperatives to postpone establishment of adequate sinking funds in favor of increased construction expenditures. In Bolivia, there was some indication that central government support for rural electrification was confronting utilities that were unenthusiastic about expanding service into the countryside. Some local managers preferred to concentrate on serving more profitable urban consumers.³¹

³¹The Inter-American Development Bank found similar instances where electric utilities' precarious financial situation made them reluctant to extend service into rural areas. (IDB, 1981, p. 14.)

More positive comments on this issue came from Costa Rica, where the policy of cooperatives was to keep an adequate balance between social and financial health. A supportive attitude on the part of the national government made it possible for the cooperatives to consider their own financial viability when deciding to expand service. Thus, when profits were high, a cooperative was more willing to expand service to low-income communities.

Clearly it is possible for expansion and financial viability to co-exist. Logically, expansion of service will be most successful when utilities are making a profit. What has not always been clear is that more expansion of electrification is not the sine qua non of a rural electrification project. This returns to the issue of objectives: Is the electricity meant to satisfy social uses in households, to increase agricultural production, to expand commercial or industrial operations, to improve social services, or to politically strengthen the government? Financial viability is a necessary requirement only for system expansion. Development objectives and adequate resources combined with electricity ought to remain the ends and means of the process.

D. Rate Schedules

A final problem that affects the financial viability of the rural electric utilities is the difficulty of balancing social and financial considerations in fixing rate schedules. The Costa Rica team had the most favorable comments on this issue, saying that the perceived fairness of the costs charged was an important reason for the cooperatives' positive relationship and subsequent good reputation with the consumers. Other teams reported more mixed findings.³²

³²The World Bank's somewhat pessimistic findings were that in most rural electric systems, pricing policies contradict the social and economic development aims of the investments. Nathan Associates suggested that a tendency exists to favor tariff structures in which residential users pay higher than average costs per kWh. This, they felt, may limit access to electricity by the rural poor. Cecelski found that cross-subsidies from domestic to industrial users were the most common. The Inter-American Development Bank findings have been mixed, although project goals call for an adjusted rate schedule so that the poor can afford at least minimum monthly service. (World Bank 1974, p. 34; Nathan, p. 20; Cecelski, p. 66; IDB 1979, p. 32; IDB 1981, p. 14.)

Several common themes, however, ran through the reports of all the evaluation teams on the subject of rate structures. First, teams found that because of pressure to keep rates down and a perceived obligation on the part of the government to subsidize power, the full costs of electricity were seldom passed on to the consumer. (This is a common characteristic of rural electric systems worldwide, because the cost of delivering service in rural areas is high.) In Costa Rica, government policies provided for subsidized rates for block purchasers of power supplied to cooperatives by the national power company. In Ecuador, the government subsidized petroleum prices, which lowered generation costs for electricity. In Bolivia and the Philippines, utility delinquency in paying for power purchased or in repaying loans in effect forced the national power company to provide interest-free operating capital and reduced the pressure on utilities to raise consumer prices.

Another characteristic found to some extent by all the studies was the utilities' effort to have their more affluent consumers subsidize electricity used by the poor: higher income or urban households subsidized low-income and rural electricity users; industrial consumers helped subsidize household use.³³

In Costa Rica, the poor paid low rates for basic service. In addition, the team found that households in the highest income strata paid very high installation costs and monthly charges based on commercial rates. The team suggested that these more affluent households were in effect subsidizing those at the lowest income strata. The Ecuador team found that urban areas subsidized rural areas, because hook-up charges in rural areas did not cover full costs. Commercial and industrial users (mainly urban) paid a 10-percent surcharge on electric bills, which support a national program to expand rural electrification. The team also reported that the Government of Ecuador was in the process of establishing a progressive rate structure that would benefit the smallest residential and commercial users.

Bolivian utilities had begun to set equal rate policies for urban users. Since delivery costs were higher in rural

³³This is not supported by Cecelski, who looked at developing countries in Asia, Africa, and South America and found that most tariffs used a declining block structure in which larger users such as industry paid lower rates. The World Bank, too, found existing tariff structures that gave greater subsidies to larger consumers--a practice that the Bank felt undermined the performance of the system. (Cecelski, p. 63; World Bank 1974, p. 34.)

areas, urban users could be said to subsidize rural use. However, the team also found that AID-funded rural systems had set higher minimum consumption levels than their urban counterparts, even though average rural household consumption is lower. In the Philippines, utilities typically collected the same amount per kWh from industrial users as they collected from residential users. Costs of servicing industry were lower, so industry subsidized household usage. Future Philippines Government plans call for an increase in the industrial sector's contribution to financing the rural electric cooperatives.

E. Conclusions

Evaluation teams received different responses by electric systems to the problems of financial viability. In some areas, loan programs had made it possible to spread out high installation costs, and thus eased the burden on poor households wishing to connect to the system. The Costa Rica and Bolivia reports suggest that insufficient attention may have been paid to the importance of such loan programs in project planning. In both cases, loan money ran out, leaving the poor with a heavier financial burden than originally envisioned.

Teams found instances--also in Costa Rica and Bolivia--where consumers were willing to make capital investments in order to expand service or to help their utility out of a tight financial spot. Such opportunities for mobilizing private savings were not always used, however, and may be missed chances to involve local capital in an infrastructure project.

The Costa Rica cooperatives' success in balancing expanded electric service with collecting adequate revenue demonstrates that financial health can co-exist with further electrification efforts.

The Bolivia team observed that most AID-funded rural electrification projects were, in fact, household electrification projects. Given this fact, the team pointed out that expensive U.S. technical design standards might not be necessary for the relatively low power loads required by rural household consumers. The Bolivia report suggests that less expensive technical designs be considered in planning rural electrification projects.

The household focus of rural electrification projects has posed certain problems to financial viability and also helped define the solutions to these problems. If rapid electrification of rural households is the desired goal, certain costs (such as hook-up and maintenance) must be absorbed. On the

other hand, if the aim of rural electrification projects is to encourage productive or social service usage, then certain other costs must be incurred. In the least developed areas, increasing productive usage seems to require complementary development inputs such as irrigation or rural credit programs. Encouraging social service use in such areas will require similar inputs in such forms as personnel and equipment for clinics and schools. The alternative would be to limit rural electrification projects to areas where a certain amount of development has already been achieved, where fewer complementary inputs would be needed.

In the end, the issue of the financial viability of rural electric utilities comes back to the question of desired goals. Financial viability, in itself, is not a primary goal of rural electrification. Rather, it should be the bottom line in keeping the system functioning. The question should be how to create a financially viable system and then make it work toward development goals that do not impinge on the system's viability.

VI. CONCLUSIONS

The following general conclusions emerge from this review of the impact evaluations on rural electrification.

A. Economic Development

1. The more developed an area, the greater the impact of electricity on economic growth. Greater development impact was found in electrified towns than in less populated areas. Priority for electricity to enhance economic development should not be given to the poorest areas but rather to regions that are fairly well-developed and where economic potential is stymied by the lack of cheap, reliable power.

2. Electricity does not elicit major spontaneous development activities in poor, less-developed rural areas. Other interventions--credit, roads, irrigation pumps--must be planned, funded, and coordinated to enhance the potential benefits of this new energy source.

B. Rural Households

3. Electrification of households was popular and highly valued by its users. It added comfort, convenience, and safety to rural homes. It also appeared to be an important psychological symbol of modernity.

4. Most people in electrified areas could afford to, and did, electrify their homes. This included a substantial percentage of the rural poor.

- Initial costs of installation rather than monthly charges were the major financial inhibition to electrification of their homes by poor people.
- Lighting was the major use for household electricity. Use of appliances varied greatly, with irons and radios being among the first appliances purchased. Further use of electricity was dependent on improved income from other sources.
- The rural poor's ability to make productive use of the electrification of their homes was limited. The most important productive impact was on women's work, by giving women access to labor-saving devices and extending the hours they could work.

C. Social Services

5. Electricity did not appear to be a vital impetus to the expansion of social services.

- Little explicit linkage was evident between electric utilities and social service agencies in planning the use of electricity in social service activities.
- Where strong social service programs already existed, electricity was more likely to lead to their improvement and expansion.

6. Lighting of streets and public squares in towns generally followed electrification. The increased feeling of security was highly valued by area residents.

D. Agriculture

7. Electricity had little direct impact on agricultural production.

- Little use was made of electricity for irrigation or on-farm activities.

- Only in large and fairly sophisticated farming operations (e.g., dairy) did electricity appear to directly enhance productivity.

8. Electricity had an important indirect role in agriculture through its use in industries servicing farmers (e.g., equipment repair) or processing farm crops (e.g., rice milling).

E. Commerce and Industry

9. The teams differed in their judgments on how widely electricity was used in commerce and industry, and how important it was to both.

- Larger industries were likely to more fully use electricity than were smaller ones.
- Some job creation opportunities and opportunities for small businesses were created by rural electrification.
- No evidence of electricity-caused unemployment was found by the teams.
- The availability of electricity had a greater positive impact on business in market towns than on those in outlying areas.
- Electricity was more likely to enhance business productivity in areas of economic expansion than in economically depressed areas.

F. Organization

10. Most rural electrification organizations were well-managed institutions effectively delivering their services.

11. AID-sponsored electric organizations generally delivered electricity to rural areas that would not have been served without the AID intervention.

12. Central governments favored rapid expansion of rural electrification for political reasons.

13. The use and success of rural electric cooperatives was dependent on the political traditions of the country and on the support (or lack of it) given by the central government.

14. Cooperative organizations in rural electrification did little to enhance participation by the rural poor.

15. Locally based cooperatives kept the system responsive to local conditions and influence.

16. In each area, a pragmatic choice should be made on what type of organization (public, private, cooperative) can most effectively manage an electric system.

G. Financial Viability

17. The teams found rate schedules generally progressive, with larger or commercial users paying higher rates than smaller, rural users. Rates seldom reflected the true costs of electric service to rural areas.

18. Few instances were found of local capital being mobilized to expand electric service, even when the local residents were willing to invest in the system.

19. The rapid expansion of a rural electric system may endanger its financial viability.

20. Estimates of future supply and demand were often inaccurate, which frequently led to initial underuse of the systems and lost revenues.

21. Design of electric systems to U.S. technical standards may be inappropriate for the average low consumption of Third World rural users and may be too costly to maintain.

VII. RURAL ELECTRIFICATION POLICY IMPLICATIONS

Rural electrification is one part of an AID energy strategy that includes activities in a number of other areas, such as energy analysis and planning; energy training and institution development; site testing, demonstration, and evaluation of new energy technologies; and increasing energy supplies (especially fuelwood production).³⁴ AID's Energy Assistance Policy Paper (January 1981) gives two basic policy goals for the energy area:

³⁴Agency for International Development, Energy Assistance Policy Paper, January 1981.

1. To ease the immediate energy constraints to development in developing countries
2. To help those countries make the difficult transition to a mix of energy sources that will sustain their economies in the future³⁵

More specific prescriptions in this paper for carrying out this policy include recommendations to support a range of energy activities, tailored to specific needs in developing countries, and to promote least-cost energy alternatives based on life-cycle cost (the total cost of the technology over its useful life).

The evaluation work series did not point to the need to change these policy goals. Therefore, keeping these goals in mind, a number of policy implications stem from the findings/conclusions of the studies. These policy implications were endorsed by the Rural Electrification Sector Meeting on September 18, 1981.

1. AID should view electricity as one of many possible ways of meeting the energy needs of a particular rural area. In other words, electrification should be seen as a means and not as an end in development.³⁶ The major question should be how specific energy needs can be met in a cost-effective, reliable, and socially acceptable manner. Rural electrification should be seen as a sophisticated kind of energy that may or may not best meet an area's energy needs.³⁷

Ultimately, AID's activities in rural electrification, as in other energy areas, "must depend on the particular country's situation, on AID's overall program goals in that country and on the degree of creativity that AID staff can bring to

³⁵Agency for International Development, Energy Assistance Policy Paper, January 1981, p. 10.

³⁶Previous AID documents have also urged that rural electrification be considered part of an integrated development approach (e.g., AID, "AID Assistance to Cooperative Development in Latin America: A Task Force Report," December 1, 1971).

³⁷See "Where and How Should Rural Electrification be Introduced?" and "The Role of Rural Electrification in Development." (Policy Questions, Appendix F, Report on the Rural Electrification Sector Meeting, Section VII, Policy Questions.)

bear."³⁸ This recommendation arose from evidence that energy options were not well considered in most AID-financed rural electrification projects.

2. In order to fully assess the value of rural electrification in meeting the energy needs of a particular area, AID should conduct studies that will give a clear picture of the costs and benefits of the system.³⁹ This is particularly important at a time when energy costs are rising while available development funds are decreasing.

Serious attempts should be made to consider all benefits and costs, including political and social ones which are, admittedly, relatively difficult to measure.⁴⁰ Past analyses have often sidestepped consideration of such issues, but future studies should recognize that most rural electrification projects incorporate a range of objectives--economic, political, and social.

These recommendations arise from concern that rural electrification projects do not necessarily directly help the poor unless carefully designed for the given context. In assessing the costs and benefits of rural electrification in a particular area, the 1981 Energy Assistance Policy Paper suggests some important questions to be considered:

A. What are the implications of national rural electrification plans for energy supplies in a country (particularly as they relate to oil imports)?

B. What is the evidence of the benefits from previous rural electrification projects (e.g., degree of encouragement of industry, increased irrigation)?

³⁸AID, Energy Assistance Paper, p. 12.

³⁹Nathan Associates' 1979 review of AID rural electrification project documents found cost-benefit analysis had been conducted in only a few cases. Participants at the Rural Electrification Sector meeting (September 1981) stressed that much work needed to be done in this area. (Nathan, p. 29; and see "Costs and Benefits of Rural Electrification," in Appendix F, Report on the Rural Electrification Sector Meeting, Section VII, Policy Questions.)

⁴⁰See "The Objectives of Rural Electrification/Is Rural Electrification a Social Service or a Consumer Good?" (Appendix F, Report on the Rural Electrification Sector Meeting, Section VII, Policy Questions.)

C. What is the cost of electricity from a central grid when compared with decentralized systems, both conventional and nonconventional, over the life of the investment, given realistic estimates of future fossil fuel prices?

D. What are the relative benefits of rural electrification compared to foregone planning assistance, site testing, fuelwood activities, and other rural development programs?⁴¹

3. If rural electrification is determined to be an appropriate development activity in a particular area, then AID must find ways to make its shrinking budget more effective. Because of future funding considerations, AID may have to limit its involvement in infrastructure projects such as rural electrification. However, there will still be a number of ways for AID to be effectively involved in rural electrification.

A. In most countries where AID finds it desirable to assist in the development of rural electrification, AID's role should be limited. One suggestion has been to emphasize AID's involvement at all levels of rural electrification projects only in Security Assistance countries where sufficient funds are available. A limited role for AID could emphasize areas in which AID has special competence and experience:

- Analysis and planning assistance, including project preparation and feasibility studies
- Training and institution-building
- Site testing, demonstration, and evaluation of technologies
- Credit programs for small electrified business and industry, or loans for electrical connections.⁴²

B. AID should emphasize coordination with other international lenders, international assistance agencies, U.S. government agencies, and with the private sector. This will be crucial to effective involvement if AID's future role in rural

⁴¹AID, Energy Policy Paper, p. 23.

⁴²See "What Should Be AID's Future Role in Rural Electrification?" (Appendix F, Report on the Rural Electrification Sector Meeting, Section VII, Policy Questions).

electrification is a limited one with capital financing of rural electrification systems depending on other entities.⁴³

C. In areas where AID is involved in all levels of rural electrification, there are two possible courses:

-- If a certain threshold of modernity has been reached (e.g., if the area has roads, available credit), it may not be necessary for AID to link its rural electrification efforts to other development activity (for AID could expect the local inhabitants to make use of electricity relatively easily and quickly on their own).

-- If such threshold characteristics do not exist, AID should seek to integrate rural electrification projects with other development programs so that a host of complementary development activities are introduced along with electrification (e.g., linkages with social service programs, irrigation projects, or small business loan programs).

In both of these cases, AID should include a project mechanism for developing the capability to maintain and expand the rural electric system, unless the organizational entity responsible for operating the project has already demonstrated such a capability.⁴⁴

In addition to the policy issues discussed above, the Office of Evaluation recommends to the Agency more specifically that:

1. Caution be used in viewing rural electrification as an instrument of development in impoverished areas in the absence of other development dynamics. The poorer the area, the more skepticism one might have that rural electrification will enhance development;

2. The popular-participation cooperative model for managing rural electrification may not have relevance in a variety of cases and should be compared with other models of management in designing rural electrification projects.

⁴³Rural electrification projects have shown themselves able to attract funding from a wide variety of sources. For example, multilateral development banks, the United Kingdom, Finland, Canada, and OPEC have shown interest in funding such projects. (Interview with Mr. J. Fish, World Bank, September 1981.)

⁴⁴See "Where and How Should Rural Electrification be Introduced?" (Appendix F, Report on the Rural Electrification Sector Meeting, Section VII, Policy Questions).

APPENDIX A

AID INVOLVEMENT IN THE RURAL ELECTRIFICATION SECTOR

by

Alice Davenport

I. SUMMARY

Funding electrification programs in rural areas of developing countries is a relatively recent activity. In 1964, the U.S. Agency for International Development (AID) became the first international donor of development funds for this purpose.

In the early 1960s, infrastructure was a major focus of economic development within AID and within the general international development community. During this period, AID viewed rural electrification projects primarily as capital projects. The goal was "to electrify," with less emphasis on the social and economic effects of electrification.

Throughout the 1960s and 1970s, the concept and scope of rural electrification projects evolved. One of the strongest factors in this change was the 1973 "New Directions" congress-
 Previous Page Blank that required AID programs to reach the "poor developing countries.

With changing development priorities, AID's expectations for rural electrification projects also changed. New concern appeared for the impact of rural electrification on the rural poor (i.e., did rural electrification contribute to social or economic development in rural areas?).

Through the years, however, the rural electrification model used in most AID-funded projects did not change appreciably. Originally developed by the U.S. Rural Electrification Administration (REA) for use in rural areas of the United States, this model was used by the U.S. National Rural Electric Cooperative Association (NRECA)--AID's most important rural electrification contractor.

The REA model consists of several key elements, including "area coverage," member-owned cooperatives, central station power, low-cost electricity, and promotional and educational activities. Studies have raised certain questions about a too-faithful compliance with this model in developing countries.

Therefore, it seems appropriate at this time for AID to determine which components of the REA model are vital to successful rural electrification projects in developing countries, and which elements (although suited to the United States) are not appropriate for AID-funded rural electrification projects. To do this, AID may have to define more clearly what it means by a "successful" rural electrification project. That is, AID should clarify what it expects from its rural electrification projects before it can reasonably evaluate the usefulness of the REA model in its overseas programs.

II. THE BEGINNINGS

Funding electrification projects in rural areas of developing countries is a relatively recent activity. In 1964, the U.S. Agency for International Development (AID) was the first donor of development funds for this purpose.¹ At that time few significant rural electrification projects had been undertaken in Latin America (the exceptions were in Chile, Brazil, and Argentina), or in East Asia (except for Taiwan and Japan). Some village electrification programs had been started in the Middle East, Asia, and Africa. But none of these programs had stressed coverage of the broader rural area.²

In 1962, President John F. Kennedy witnessed the signing of a contract between AID and the NRECA.³ The initial funding mechanism was Task Order 1 of the Basic Ordering Agreement between AID and NRECA. Task Order 1 enabled NRECA to establish and maintain a central office and staff in Washington, D.C. to advise and assist in overseas rural electrification programs.⁴ In 1964, AID approved the first international loan for cooperative rural electrification in the history of the U.S. foreign aid program. That year, funding was approved for five pilot projects in Latin America.

These projects were scheduled to provide electricity for approximately 16,000 farms, rural homes, businesses, and industries in Central and South America. Operation of the projects was expected to assist in determining the feasibility of using cooperatives to

¹University of Florida Center for Latin American Studies, "Rural Electrification: an Evaluation of Effects on Economic and Social Changes in Costa Rica and Colombia," 1973, p. iii.

²James E. Ross (NRECA), "Cooperative Rural Electrification: Its Implications for International Development," 1966, p. 1; and Samuel Bunker (Administration 1 PD/NRECA), Memorandum dated September 30, 1981.

³"Rural Electrification in the Third World," Rural Electrification, (NRECA), February 1981, p. 10.

⁴Development Alternatives Inc. (DAI), "An Evaluation of the Program Performance of the International Program Division of the National Rural Electric Cooperative Association (NRECA)," 1977, p. iv.

carry out rural electrification programs in the newly developing countries.⁵

Since the early 1960s, rural electrification projects in developing countries have found a number of donors in addition to AID/NRECA. For example, the World Bank Group has provided financing for projects in Ecuador, the Philippines, Egypt, and North Yemen.⁶ Saudi Arabia has financed a North Yemen generating plant and may offer additional financing. The People's Republic of China has loaned \$30 million to the Philippines for developing small hydroelectric plants.⁷ And Canada and Kuwait are assisting Indonesia and Bangladesh, respectively.⁸

Initial AID enthusiasm for rural electrification projects was influenced by the success of rural electrification in the United States in the 1930s. In a 1965 study, AID drew several lessons from the U.S. rural electrification experience:

In the United States...rural electrification cooperative programs...demonstrated that reasonably-priced power substantially increases the number of small rural industries, especially the processing of agricultural, forestry, and mineral products. Such sound developments are the key to greater rural prosperity. This increases the efficiency of agriculture.... The electrification projects provide employment for surplus labor which otherwise might migrate to city slums. They also provide part-time, farm, and industrial employment to help stabilize income, maintain a high living standard, and promote rural security.⁹

⁵Ross, p.1. The World Bank Group became the second donor to make an international loan for rural electrification. In 1972 the Group granted credit (including \$450,000 for rural village electrification) to the Government of Ecuador. (University of Florida, p. iii.)

⁶It should be noted that extensive involvement by the World Bank in rural electrification has been quite recent. Earlier World Bank rural electrification activities in the 1960s tended to be modest. (Samuel Bunker, NRECA, Memorandum dated September 30, 1981.)

⁷Rural Electrification, p. 15.

⁸Samuel Bunker, NRECA, Memorandum dated September 30, 1981.

⁹AID, "Rural Electric Cooperatives in International Development," 1965, p. 2.

This positive attitude toward rural electrification was shared by other international development organizations in the early 1960s. For example, a 1963 United Nations report concluded:

It is clear...that the introduction of electricity to rural areas brings with it an appreciable improvement in the level of agricultural life and contributes considerably to farm production. By using electric power it is also possible to improve the quality of farm, vegetable, and animal products; and the better regulated output thus achieved enables better prices to be obtained. Moreover the social significance of rural electrification is stressed by several countries as a means of improving the living and working conditions of rural populations, and also of slowing down the drift from the countryside to towns.¹⁰

III. AID AND RURAL ELECTRIFICATION IN THE 1960s

In the early 1960s, infrastructure was a major focus of economic development within AID and within the general international development community. Electrification projects focused more on the establishment of adequate power capacity than on building transmission and distribution facilities. During this period, AID viewed rural electrification projects primarily as capital projects. Design and feasibility were determined principally by engineers. In project approval, primary concerns were engineering design and the projected financial viability of borrowers.¹¹

Statutory criteria of the Foreign Assistance Act of 1961 did require AID to account for the way a loan would promote a country's development and contribute to the welfare of its

¹⁰AID, "Rural Electrification," 1965, p.2, quoting from U.N. Economic Commission for Africa, "Activity of the United Nations in the Field of Rural Electrification," September 10, 1963.

¹¹Robert R. Nathan Associates, Inc. "Contribution of AID Documentation to the Evaluation of its Rural Electrification Projects," Vol. I, 1979, p.15. Through 1966, AID purpose and goal statements for rural electrification projects stressed construction functions, and the agricultural, residential, commercial, and industrial uses for electricity (Nathan, I, pp. 17-18).

people.¹² Some attention was paid to these issues. For example, a 1965 AID discussion of rural electrification recommended "package" or "productive" rural electrification systems that would emphasize electrification's effects on health, sanitation, agriculture, municipal lighting, etc.¹³ But many times, social and economic benefits of projects were not clearly laid out. Nathan Associates' review of AID project documents found that Capital Assistance Papers of the early 1960s did not substantiate claims regarding likely consumers or how rural electrification would promote their welfare.¹⁴

IV. NEW DIRECTIONS

When AID and NRECA began their joint efforts in the 1960s, the overall development focus was primarily on strengthening a community's infrastructure and institution building. We still have the same objectives, but we have become more concerned with the welfare of the individual. Today, we follow the congressional mandate which directs us to focus on the needs of small farmers and rural poor.¹⁵

The congressional mandate referred to above was the Foreign Assistance Act of 1973, Public Law 93-189 (S. 1443), in which Congress took a major new direction in the U.S. bilateral development assistance programs. This constituted a markedly new approach to U.S. foreign aid. Previously, development assistance had stressed increasing a country's overall economic development. With the "New Directions" mandate of 1973, the target of development programs was defined as the poor of developing countries.¹⁶

¹²Section 251a, Foreign Assistance Act 1961. Quoted in Nathan, I, p. 15.

¹³AID "Rural Electrification" 1965, pp. 3-4.

¹⁴Nathan, I, p. 15. No specific examples of these documents were given.

¹⁵AID Administrator Douglas Bennett, Jr. writing in Rural Electrification, February 1981, p. 21.

¹⁶U.S. House of Representatives, Committee on International Relations, "New Directions in Development Aid..." 1977, p. III.

Key elements of the 1973 Foreign Assistance Act included the following:

- Concentration on three sectors--food and nutrition, population and health, and education and human resource development--in order to help developing countries meet the basic needs of their people
- Projects and programs directed towards the poor majority¹⁷ in developing countries, so that program benefits do not accrue only to a select few
- Encouraging private and voluntary organizations to participate with AID in assistance programs (in planning, implementing, and evaluating programs)
- Stress on integrating women into development efforts
- Emphasis on involvement of the poor themselves in the development process to avoid the suggestion of handouts¹⁸

To meet this mandate, AID began a reexamination of all its programs, including rural electrification. Since 1973, AID has supported NRECA and other nongovernmental organizations in reviewing the impact of rural electrification on the poor.¹⁹

With changing development priorities, AID's expectations for rural electrification projects changed. In early projects, preproject impact assessments assumed a direct transfer of experience from the U.S. model and focused primarily on farm output, rural incomes, household uses, and democratic participation. "As time progressed, expectations regarding rural-urban migration, family planning and the preservation of forestry resources were added."²⁰ And subsequent to the "New Directions" mandate (and several evaluative studies), expectations were further revised. Nathan Associates gives the example of the second Guatemala loan that stresses that the

¹⁷The "poor majority" was defined by certain benchmark criteria: per capita income, nutrition, health, etc.

¹⁸AID, "Implementation of 'New Directions' in Development Assistance....," 1975, p. 3.

¹⁹Rural Electrification, p. 21.

²⁰Nathan, II, p. 14.

impact of rural electrification depends in part on a broader, multiprogram development strategy.²¹

V. NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION (NRECA)

From the beginning, AID efforts in rural electrification have been linked with those of AID's primary contractor, NRECA. A 1962 Basic Ordering Agreement between AID and NRECA provided a long-term mechanism through which AID could recruit NRECA specialists without going through a lengthy open-bidding process. This ease of recruitment (in addition to NRECA's substantial experience) has made NRECA the contractor of choice in almost all AID-funded rural electrification projects.

NRECA's expertise lies in rural electrification management; engineering firms are hired separately to design the physical system. In a typical case, NRECA specialists would be brought in during the first stages of a project for development and planning work. NRECA promotional activities may, in fact, have initiated the interest in rural electrification in a particular country.

In the next stage, project implementation, NRECA still plays a prominent role. It should be noted that it is the host country government, not AID, which signs the contract in rural electrification implementation. And in most cases, host countries have chosen NRECA over other management consulting firms. (Two of the few exceptions to this were in Bolivia and India.)²² Here, NRECA has several advantages over its competitors. One, it has often been involved in preproject activities and thus is already familiar with project outlines. Two, and this cannot be overemphasized, in comparison with its competitors, NRECA has accumulated far more experience in the specialized field of rural electrification and has easier

²¹Nathan, II, p. 14.

²²In Bolivia, the Cochabamba cooperative insisted on hiring another firm. In India, Indian (not U.S.) contractors have recently been sought. (July 20, 1981 telephone conversation with Mr. Hasan A. Hasan, Chief, Engineering Division, Asia/Program Development, AID; and July 23, 1981 telephone conversation with Mr. Wilson Hodgkin (Ret.) Chief, Engineering Division, Asia/Program Development, AID.)

access to rural electrification specialists (through its U.S. cooperative system).²³

Because of NRECA's prominence in AID-funded rural electrification project development and implementation, it is important to understand the role played by NRECA and by its companion organization, the U.S. Rural Electrification Administration (REA).

The REA was created on May 11, 1935, by an Executive Order from President Franklin D. Roosevelt. The REA made low-interest loans to groups that would agree to provide rural areas with electric service. NRECA was founded to provide services to rural electric cooperatives, which were organized across the United States in response to the REA program.²⁴

By the time of the AID/NRECA agreement in 1962, NRECA's member cooperatives had over 25 years of experience in rural electrification. During those years, electricity had spread from 10 percent of all U.S. farms in 1932 to 98 percent of all farms in 1962.²⁵ These successful rural electrification efforts in the United States were based on a program that stressed:

- Member-owned cooperatives to provide nonprofit service in thinly populated areas

²³NRECA was actually used in India for the first AID financing where cooperative development (five projects) was involved. In later loans, cooperatives were not involved and external consultants were not required. (Samuel Bunker, NRECA, Memorandum dated September 20, 1981.)

²⁴NRECA International Consulting Services, "Social and Economic Benefits of Rural Cooperatives," (pamphlet, n.d.). It should be noted that the REA and NRECA are now and always have been two separate entities. REA is a U.S. Government organization; NRECA is a private organization. (Samuel Bunker, NRECA, Memorandum dated September 30, 1981.)

²⁵AID, "Rural Electrification," 1965, p.24. This increase was due in large part to the cooperatives that NRECA served and to the competition which these cooperatives stimulated among private power companies.

- The concept of "area coverage," which stressed household hookups²⁶
- Reduced costs for construction of rural lines
- Availability of technical and other assistance
- Availability of government financing²⁷
- Intensive educational and promotional efforts on electricity use²⁸

As NRECA gained experience, the organization became enthusiastic about an international program through which NRECA could share its experience in rural electrification with developing countries.²⁹ Clyde Ellis (NRECA general manager 1943 to 1967) first approached then President-elect Kennedy on the issue in 1959. In early 1960, Ellis wrote Secretary of State

²⁶J. B. McCurley and D. H. Cooper of the REA commented on "area coverage": "In developing full area coverage, REA borrowers build a 'backbone' distribution system adequate for provision of service to everyone in the area who might eventually want service" (emphasis added). In AID, "Rural Electrification," 1965, p. 15.

²⁷REA was empowered "to make self-liquidating loans to companies, cooperatives, municipalities, and public power districts to finance the construction and operation of generation plants, transmission and distribution lines and related facilities...to furnish electric service to unserved persons in rural areas." REA loans are generally secured by first mortgages on the electric systems and are made for a maximum period of 35 years at 2 percent interest. (From Interview with J. B. McCurley and D. H. Cooper of NRECA in AID, "Rural Electrification," 1965, p. 15.)

²⁸AID "Rural Electrification," 1965, p. 15.

²⁹DAI comments that it would not be greatly exaggerated to describe NRECA's International Program Division as a "true believer" in rural electrification: "In conversation and in document one message came through clearly: all rural areas are candidates for electrification and, furthermore, serious development cannot take place without central station electricity." DAI, p.9, fn. 2.

Dean Rusk. By 1961 Ellis had persuaded NRECA's board of directors to support the idea of an international program.³⁰

AID responded that NRECA could give valuable assistance in AID-funded rural electrification projects. A 1965 discussion paper stated that NRECA would offer comprehensive organizational, "managerial and technical help in the establishment and early operation of rural electrification systems."³¹ This included training programs such as formal courses overseas and in the United States, on-the-job training, and orientation for AID personnel who would be involved in rural electrification. NRECA also offered consultation services for technical, organizational, and management problems encountered in rural electrification. Finally, AID believed NRECA might be able to supply some of their excess equipment that is needed for demonstration rural electrification projects.³²

Since the early 1960s, NRECA's International Program Division (IPD) has engaged in three major forms of activity overseas:

- Active promotion of rural electrification throughout the world
- Offering technical and consultative services for rural electrification in developing countries
- Training and other support for rural electrification programs³³

³⁰Rural Electrification, p. 10.

³¹In the early 1960s there were approximately 1,000 rural electric cooperatives in the United States from which administrative, managerial, and technical talent could be drawn. AID, "Rural Electrification," 1965, p. 8.

³²A 1965 AID study comments, "Today, rural electric cooperatives supply an average of about 400 kWh per consumer per month as against 60 to 90 kWh some years ago when lines were built. As a result, power distributors are "heavying up" their lines and substations. Materials and equipment such as conductor wire, transformers, meters, etc., have been--and are being--outgrown by the U.S. rural electric cooperatives. Many of the systems have established a stockpile of good, serviceable equipment which might help meet some of the current needs of participating countries." (AID, "Rural Electrification," 1965, p.9.)

³³DAI, pp. v-vi.

A. Promotional Activities

NRECA/IPD devotes a great deal of time and energy to promoting rural electrification throughout the world. Its efforts take the form of direct and indirect contact with developing country officials, multinational conferences, and discussions with potential lending institutions.³⁴ NRECA/IPD actively seeks out opportunities to encourage an interest in rural electrification in developing countries. DAI reported that NRECA/IPD had "carried out promotional activities in a total of 55 countries since 1962. As of February 1976, 32 of these countries had received formal assistance from NRECA."³⁵

As part of its promotion efforts, NRECA/IPD helps countries identify possible funding sources for rural electrification projects. AID, the World Bank, the Inter-American Development Bank, and the Asian Development Bank have all been identified as possible funding sources.³⁶

DAI's report called NRECA/IPD:

aggressive and competent, perhaps even peerless...in promoting rural electrification and in initiating programs of rural electrification around the world: just the number of countries visited and assisted is ample evidence of the conviction, the zeal and the effectiveness with which IPD carries out its responsibilities.³⁷

B. Technical and Consultative Services

DAI's evaluation of NRECA/IPD's program performance concluded that the organization had been "highly qualified and effective" in technical and consultative services--such as identifying optimal areas and resources available for establishing and strengthening rural electric systems.³⁸

³⁴DAI, p. 21.

³⁵DAI, pp. 22-23.

³⁶DAI, p. 32.

³⁷DAI, p. 33.

³⁸DAI, p. 33.

NRECA/IPD also takes on ad hoc program and project planning. For example, it assisted in preparing an AID project proposal in Nicaragua. In Thailand, NRECA/IPD collaborated with an engineering firm to draft a proposal for a study.³⁹

C. Training

One of the most valued services performed by NRECA/IPD is its training program on rural electrification, "for in countries assisted by NRECA there is often a greater scarcity of trained human resources than financial or natural resources."⁴⁰

Once or twice a year there have been formal training programs jointly sponsored by NRECA, U.S. Department of Agriculture (USDA), AID, and other institutions. NRECA/IPD has prepared most of the materials for the courses.⁴¹ NRECA/IPD also conducts informal observational tours to NRECA-member cooperatives in the United States. Finally, there is consultative training, which consists of on-the-job training and seminars "often conducted in the context of an NRECA troubleshooting mission to a cooperating country."⁴²

In 1977, after 15 years of experience, NRECA/IPD's efforts in rural electrification in developing countries earned the following praise:

NRECA/IPD is highly qualified and perhaps without equal in the fields of encouraging governments to undertake rural electrification and in offering technical planning and technical consulting services and training to developing countries.⁴³

³⁹DAI, p. 31. In Nicaragua, NRECA/IPD staff assisted the AID Mission in preparing a "Rural Electric Cooperative Management Grant" (which was not, in fact, accepted as written by AID). In Thailand, NRECA prepared a joint proposal with R. W. Beck Engineering Co. to conduct a prefeasibility study of a rural electrification program.

⁴⁰DAI, p. 60.

⁴¹The course is administered by USDA Division of Economic Research (DAI, p.61).

⁴²DAI, p. 62-63.

⁴³DAI, Executive Summary, (no page).

VI. THE NRECA/REA MODEL

NRECA (and the U.S. REA model that NRECA supported) has strongly influenced AID-funded rural electrification projects throughout the years. When Nathan Associates reviewed AID project documents in 1979, it found these documents considered "almost exclusively the United States experience under the Rural Electrification Administration (REA) as the model for the need and design of rural electrification projects."⁴⁴

Key elements of the REA rural electrification model are the concept of "area coverage," the support of member-owned cooperatives, and the stress on central grid (as opposed to autogenerated) power. All of these elements are considered important for establishing the 24-hour, low cost, reliable electricity that NRECA wants to provide in rural areas.

A. Area Coverage

NRECA has a strong commitment to the idea of "area coverage," which stresses household connection. Clyde Ellis, former NRECA General Manager, expressed this when he wrote, "Rural electrification will never be complete until the last person in the most remote corner of the world who wants electricity has it."⁴⁵

Influenced by a view of rural electrification as a universally and immediately desirable goal, AID has supported NRECA's idea of area coverage--connection for every rural household which desires electricity.⁴⁶ On a project level, this thinking has frequently made farm (not rural village) electrification the object of AID-funded rural electrification projects.⁴⁷

⁴⁴Nathan, II, p. 12.

⁴⁵Quoted in DAI, p. 9, fn. 2, from Clyde Ellis, The Giant Step, Random House, N.Y., 1966, p. 221.

⁴⁶In real life, it should be noted that feasibility studies (and not "connection for every household which desires electricity") determine how and where a system should be introduced. But NRECA projects are regional in concept, and electric service is eventually anticipated for all within the area. (Samuel Bunker, NRECA, Memorandum dated September 30, 1981.)

⁴⁷DAI, p. 35.

There has been some recognition within AID that the REA model could only be taken so far--that U.S. target populations were different from those in developing countries. When REA began its rural electrification projects in the United States, most U.S. villages and small towns had already been electrified. REA efforts were aimed at electrifying individual farms, which averaged three to a mile.⁴⁸

But the situation is very different in most developing countries. Villages do not already have electric systems or, if an electric system exists, it tends to be highly inadequate:

Initially, rural electrification in these countries is directed primarily towards the villages. From there, service is extended as feasible to small, scattered settlements and individual farms, outside the villages.... [At the first stages] rural electrification systems in developing countries do not serve the large number of individual, scattered farmers as do U.S. systems.⁴⁹

Most rural electrification projects in developing countries are, in fact, extensions of urban electrification services to concentrations of rural populations rather than to scattered farms.⁵⁰ Rural electrification programs include urban centers in order to have the concentrations of population necessary to pay for the generation and distribution of power. "Rural electrification, in other words, generally means that urban centers provide the bulk of the demand for the electric service in rural areas."⁵¹

⁴⁸In practice, the first REA loans served areas near main roads. Later loans extended the lines to more isolated farms. (AID, "Rural Electrification," 1965, p. 13; and Samuel Bunker, NRECA, Memorandum dated September 30, 1981.)

⁴⁹In practice, the first REA loans served areas near main roads. Later loans extended the lines to more isolated farms. (AID, "Rural Electrification," 1965, p. 3; and Samuel Bunker, NRECE, Memorandum dated September 30, 1981.)

⁵⁰See Inter-American Development Bank, "Evaluation Report on Rural Electrification and Energy," 1979, p. 11.

⁵¹DAI, p. 40. DAI found that a common argument in favor of rural electrification would not hold (e.g., that rural electrification programs would channel development benefits to subsistence farmers and away from towns). DAI found some NRECA-supported cooperatives in developing countries that included urban centers with populations over 25,000. (See DAI, Annexes, for details.)

In spite of such reports, AID has historically perceived rural electrification in terms of connecting up individual, scattered rural farms and rural households. This has undoubtedly been partially due to the strong focus on household connections in NRECA's view of area coverage. But in addition, the Philippine project--AID's most extensive and most widely known rural electrification project--contributed to this perception through its strong focus on household connections. (In the Philippine case, President Marcos had made a strong political commitment to electrifying remote villages and rural households.)

Project documents have reflected the confusion between the vision of area coverage (and its stress on farm and rural household connections) and the reality of most rural electrification projects, which focus on population centers. Nathan Associates' study found that rural/urban distinction had not generally been made in project designs.⁵² No guidance was given as to what proportion of the target population should be rural. "The cases which provide such information generally conclude that rural outreach is substantially less than urban by their own definition of urban and rural."⁵³

Because of the equation, in theory, of "rural electrification" with "farm and rural household electrification," AID has tended to defend these programs by emphasizing the benefits resulting from household use, rather than emphasizing productive or municipal use.⁵⁴ It has been suggested that AID direct more attention to nonhousehold uses for electricity--that AID should attempt to design rural electrification projects so that productive and municipal uses of electricity could be better realized.⁵⁵ This implies a new concept of area coverage in rural electrification, a concept that is closer to the thinking of some other international donors.

⁵²Except for Bolivia and Colombia loans.

⁵³Nathan, II, p. 48. The reports gave examples from Bolivia, Ecuador, Colombia, and the Philippines.

⁵⁴In 1979, Judith Tendler wrote that this argument was used particularly to defend rural electrification against "New Directions" critics, who charged that infrastructure projects like rural electrification did not have the direct impact on the rural poor of, say, rural health, nutrition, and agriculture projects. Judith Tendler, "Rural Electrification: Linkages and Justifications," April 1979, pp. v and vii.

⁵⁵Tendler, pp. v and vii.

One proposal has been made that in identifying target populations for rural development, an international donor should consider the nature of work that rural people do, not whether they live on the land in isolated households. That is, rural development efforts should be aimed at geographical areas where the population is engaged in primary production activities, such as agriculture. The people in these areas might be scattered throughout the countryside, or they might live in villages or towns.

Rural electrification projects would thus provide electricity to individual farms, farm households, agrobusinesses, and to market towns (for household use, municipal services, commerce, and light industry).⁵⁶

B. Cooperatives

A second key element in the REA U.S. rural electrification experience is the stress on member-owned cooperatives. In the early 1960s when AID began its involvement in rural electrification, the Cuban situation spurred Congress to seek ways to halt the Communist influence of Fidel Castro's government. Cooperatives, it was thought, would be one answer. The Humphrey Amendment of the Foreign Assistance Act of 1961 made it the official policy of the U.S. foreign aid programs to encourage the development and use of cooperatives.⁵⁷ In 1966, a further amendment specified cooperatives as one way to encourage democratic institutions in developing countries.⁵⁸

NRECA has strongly favored the cooperative model--especially in its early overseas rural electrification projects--but has not always insisted on it. Some host countries have shown a reluctance to adopt the cooperative model at all. And most countries wish to control all rural electrification activities from the top. Faced with this, NRECA has shown itself willing to work with whatever distribution structure a host-country government wants to establish--public or private

⁵⁶IADB, pp. 1-2.

⁵⁷The same passage also called for development and use of credit unions and savings and loan associations. (DAI, pp. 5-6.)

⁵⁸DAI, pp. 5-6.

power companies--rather than not have rural electrification at all.⁵⁹

In its review of NRECA's International Program Division (IPD), Development Alternatives Inc. (DAI) concluded that rural electric cooperatives were not necessarily "the poor banded together to help themselves" (as envisioned by the 1966 Amendment to the Foreign Assistance Act). Rather, they should be seen "as what they more often are--legal entities which control (within the often narrow boundaries set by a national authority) procedures and management, and which are able to receive funds and pay back loans at reasonable interest rates over the life of purchased equipment."⁶⁰

The procedures commonly followed by NRECA/IPD program planners help mold this kind of rural electric cooperative. Program planners work primarily with government and national electrification authorities to electrify rural areas and then to help them plan how to do it. In practice, a national-level rural electrification authority becomes the recipient of rural electrification loan funds. This national-level organization then has the authority to disburse or re-lend the money to local-level cooperatives or private power companies.⁶¹ The result frequently is strong central government control of the cooperatives and an emphasis on cooperatives as legal entities that can receive and pay back rural electrification loan funds. "From the point of view of the host country government...most of the benefits to be derived from using cooperatives to electrify the countryside have to do largely with legal questions and with relative debt burdens."⁶²

There are several other ways in which AID/NRECA rural electric cooperatives differ from the image of a cooperative as a group of "rural poor meeting together in face-to-face discussions and helping to generate a sense of accomplishment and self-determination at the local level."⁶³ For one thing, NRECA recommends relatively large numbers of members in its overseas cooperatives. DAI found that one in the Philippines had over

⁵⁹DAI, pp. 10, 14, and 52. DAI found that as long ago as 1964, NRECA showed itself willing to work through a private power company in El Salvador. (DAI, p. 14, fn. 1.)

⁶⁰DAI, p. 54.

⁶¹DAI, p. 30-31.

⁶²DAI, p. 55.

⁶³DAI, p. 53.

25,000 members and one in Bolivia had over 27,000 members.⁶⁴ Also, in developing countries, the rural population may well lack the literacy skills and management and business experience required to run a modern business enterprise. The result has often been cooperative managers and employees who are also employees of the national electric authority.⁶⁵

For such reasons, rural electric cooperatives may be too unique to fit the common image of cooperatives. DAI found that rural electric cooperatives did not resemble other cooperatives in developing countries and warned against extrapolating benefits issuing from other types of cooperative organizations to rural electric cooperatives.⁶⁶

NRECA's development, over the years, of a flexible position on rural electric cooperatives might have been a signal to AID to rethink its views on the subject. Instead, AID has in large part retained its enthusiasm for the cooperative rural electrification model.

Some questions have been raised within AID concerning the usefulness of the cooperative. An early AID report in 1965 warned against following the U.S. REA cooperative model too closely.⁶⁷ Later, a 1975 AID paper concluded that the cooperative mechanism for rural electrification was not demonstrably superior to institutional alternatives (credit unions, commercial banks, etc.), although cooperatives did help address one major institutional problem in rural electrification--the high cost of individual loans. The report criticized some of AID's early electrification efforts which assumed that the creation of a cooperative would itself solve credit, marketing, and distribution problems, as well as problems of social organization.⁶⁸

Despite such questioning, the language of the first two AID/NRECA rural electrification funding mechanisms stressed the

⁶⁴DAI, p. 53.

⁶⁵DAI, p. 54. DAI gives examples from Nicaragua and the Philippines.

⁶⁶DAI, p. 53.

⁶⁷AID, "Rural Electrification," 1965, p. 6. This paper continued to support the value of the general cooperative model, however.

⁶⁸DAI, pp. 14-15. Quotes from "Non-Capital Project Paper for 1975," Development Program Grant, May 15, 1975, pp. 4-5.

cooperative model.⁶⁹ The third funding mechanism does not absolutely rule out other organizational structures, but gives weight to the cooperative alternative when it specifies that NRECA shall conduct studies to determine the social, economic, and political financing for such cooperatives.⁷⁰

Although some very recent loans (to Guatemala, Honduras, and Indonesia) did not stress cooperatives, AID has for the most part continued its enthusiasm for rural electric cooperatives up to the present.⁷¹ For example, a recent project paper (Bangladesh, 1981) showed strong support for the cooperative model. It stated that local control and autonomy for project area Rural Electric Societies (the cooperatives) was "central in the rural electrification strategy for providing efficient, reliable rural electric service." The project paper noted that these cooperatives must be carefully nurtured, and remarked, "Here the experience of NRECA consultants, most of whom have managed or been working members of independent rural cooperatives in the U.S., is invaluable."⁷²

But AID support for rural electric cooperatives may have to be reexamined. At the heart of the matter is AID's past expectation that the cooperative form would serve two purposes: that it would be an effective way of administering rural electric systems, and that it would be a means of building democratic institutions in developing countries. As AID looks at its rural electrification programs in the light of today's development priorities, the separate nature of these two purposes should be kept clear. It may be discovered that rural electric cooperatives are well suited to one purpose and are of less value in pursuing the other.⁷³

⁶⁹DAI, p. 15. The first two AID/NRECA funding mechanisms were Task Order 1 of Basic Ordering Agreement (November 1962), and a Development Program Grant (July 1975).

⁷⁰Special Support Grant (AID-SOD-PDC-G-0076), paragraphs 3a and b.

⁷¹Samuel Bunker, NRECA, Memorandum dated September 30, 1981.

⁷²AID, "Bangladesh: Rural Electrification II," FY 1981 Project Paper, p. 11.

⁷³"Once the rural electrification program gets off the ground, whether there is any fundamental difference in the benefits to be derived from a cooperative serving 20,000 members or a branch of the national electric authority serving 20,000 clients is open to question." DAI, p. 55.

C. Central Station Power From a Central Grid

A third element in the REA rural electrification model is the emphasis on central station power (as opposed to local, autogeneration). In its study of NRECA's International Program Division, DAI found, running through conversations and through documents, a strong belief within NRECA that "serious development cannot take place without central station electricity."⁷⁴

In practice, central station electricity can be provided by larger autogeneration plants, which could serve a relatively broad local area.⁷⁵ More often, however, discussions of AID/NRECA central station electricity projects assume that power is supplied by a central grid system. A central grid system is a regional or national system of transmission or distribution lines cross-connected, in order to allow multiple supply to any point on the system.⁷⁶ It has been widely held that such a central grid system is in most cases the most economical way to reach more and more rural people. Because of the technical nature of rural electric systems, electrification projects are incremental--they reach out from the ends of previously installed urban transmission lines and/or distribution networks to new rural users.⁷⁷

In the past, AID has generally accepted this position, assuming that the alternative (usually independent diesel-powered autogeneration which reaches fewer people) is much less efficient and reliable than central grid power.⁷⁸ Even when accepting the idea that a developing country might need to use smaller diesel generators in the short run to meet its electricity needs, AID has felt that the "ultimate objective should be a connection to a central transmission grid."⁷⁹

Nathan Associates found that in most AID/NRECA project documents, the superior reliability of central grid systems is

⁷⁴DAI, p. 9 fn. 2.

⁷⁵An example of this is in Palawan, the Philippines, which has two 500 kW diesel generators for the area's electrification. (Samuel Bunker, NRECA, Memorandum dated September 30, 1981.)

⁷⁶Samuel Bunker, NRECA, Memorandum dated September 30, 1981.

⁷⁷IADB, p. 11.

⁷⁸Tendler, p. 38.

⁷⁹AID, "Rural Electrification," 1965, p. 5.

asserted as an advantage over existing autogenerated systems. But "no further analysis of this issue was generally undertaken prior to project initiation."⁸⁰ The same study found that in most rural electrification project documents there was no discussion of alternative technological or organizational approaches. Nathan Associates found a few exceptions--for example, early Philippine cooperatives where autogeneration was provided. But generally there has been an emphasis on distribution from a central grid as opposed to an autogeneration system.⁸¹

Recently, however, a number of questions have been asked about the central grid model. Judith Tendler's 1979 paper presented several of her findings for discussion. Tendler suggested:

- Central station grids tend to magnify the losses from system downtime by transmitting losses to all connected localities. A failed autogenerator, by contrast, affects only the immediate area.⁸²
- Because autogeneration requires little transmission and coordination of various systems (compared with a central grid system), autogeneration "minimizes the demand for organizational and management skills that are scarce in recipient countries."⁸³
- "Piecemeal" investments in autogeneration--one small system at a time--may be a better use of scarce capital in developing countries than one large investment in a central grid system.⁸⁴

It is important to note that Tendler feels autogeneration and central station systems are not mutually exclusive alternatives. She believes each approach corresponds to a stage in electric power development. For example, she suggests that the NRECA cooperative approach might work well in an autogeneration system, as a first step in electrification growth.

⁸⁰Nathan, II, p. 19.

⁸¹Nathan, II, p. 27.

⁸²Tendler, p. 45.

⁸³Tendler, p. 51.

⁸⁴Tendler, p. 51.

This cooperative "phase" would be followed by a series of steps leading ultimately to the central grid pattern. As the sequence of events progressed, the cooperatives would gradually wither away.⁸⁵

Elizabeth Cecelski (Resources for the Future) took a similar approach in her 1979 study of rural electrification. She also saw autogeneration as a preliminary step to providing central grid power.⁸⁶ Cecelski questions Tendler's idea that central power systems magnify the losses from downtime compared with autogeneration:

It is difficult to see why this should necessarily be so: indeed, maintaining autogeneration capacities demands scarce technical and managerial skills as well.⁸⁷

She agrees with Tendler that one advantage of autogeneration is that it spreads out the capital costs of electrification. By making small capital investments as demand develops, the uncertainties of projecting rural electric loads are minimized.⁸⁸

However, Cecelski adds that other factors should also be considered. Whether central grid power or autogeneration is preferable in an individual case will depend upon the following factors: the relative costs of power generation for each, the distance of consumers from the central grid and the density of consumer populations, and the load factor of an area.⁸⁹

A recent article by AID Administrator Douglas J. Bennett, Jr. suggested that AID's thinking on the central grid model may be undergoing a change. Writing in REA's magazine, Rural

⁸⁵Tendler, pp. 60-61. Tendler suggests an organized local-level group could better pressure for eventual hookups to a central system and could provide a record of local electricity needs for central power authorities.

⁸⁶Elizabeth Cecelski, "The Role of Rural Electrification in Development," Resources for the Future, Washington, D.C., July 1979, p. 54.

⁸⁷Cecelski, p. 57.

⁸⁸Cecelski, p. 54.

⁸⁹Cecelski, p. 52. (The load factor is the ratio of average to peak consumption of a system. For example, a high load factor means high fuel and operating costs for autogeneration, which cannot compete with the economies of scale of a central grid.)

Electrification, he says, "Whether achieved through a national grid, through many unconnected mini-hydroelectric plants or a combination of the two, rural electrification is an efficient development tool."⁹⁰

The article notes that small hydroelectric projects "hold promise" and remarks favorably on wind and solar power generation. "Initial installation costs for all the renewable energy resources are relatively expensive, [but] ongoing operation and maintenance costs are minimal."⁹¹ This might make autogeneration from renewable energy sources preferable to central grid power in some localities.

In some cases, central grid power will never be preferable to autogeneration. Many low-demand areas will always remain remote from the main grid, and because of this it may never be worth electrifying them from the central grid. Even in Europe and North America where rural electrification programs were substantially completed 20 years ago, local autogenerators continue to serve some areas.⁹²

D. Low Cost of Electricity

In addition to the three key elements discussed above--area coverage, member-owned cooperatives, and central grid power--NRECA's program is also characterized by an emphasis on the low cost of the electricity provided. Cost issues are complex and few have been adequately considered up until now. For example, the question of appropriate rate policy has been influenced by the rural household emphasis of NRECA's model. Are metered rates, which reflect actual use, more appropriate in developing countries than flat rates, which save on installation and meter-reading costs? Should urban consumers, whose electric costs are

⁹⁰Rural Electrification, p. 38. Essentially, this point of is not inconsistent with NRECA's position that autogenerated power (from large units) may sometimes be more appropriate than central grid electricity. NRECA points out that it helped install autogenerated electricity in early projects in the Philippines, Ecuador, Costa Rica, and Bolivia. (One project, at Santo Domingo de Los Colorados in Ecuador, is an autogeneration project to this day.) (Samuel Bunker, NRECA, Memorandum dated September 30, 1981.)

⁹¹Rural Electrification, p. 38.

⁹²See International Bank for Reconstruction and Development (IBRD), World Bank Group, "Issues in Rural Electrification," July 24, 1974, p. 9.

lower, subsidize rural consumers by absorbing part of the costs of system expansion?⁹³

Nathan Associates identified a number of important cost issues that had not been sufficiently discussed in rural electrification project documents:

- Comparative construction costs of local autogeneration and distribution and large central grid distribution systems
- Comparative power-production costs of these two systems, including fuel, maintenance, and depreciation
- Relative administrative and personnel costs (considering scarce management skills)
- Metering and billing costs
- Costs of obtaining financing, for example, costs of stock-issued cooperative or noncooperative systems, state systems, private and municipal systems⁹⁴

E. Promotional and Educational Activities

One of the most important elements of the REA model in the United States was the educational and promotional campaign for electricity use that accompanied the introduction of electricity to an area.⁹⁵ This type of promotional activity is also very important in developing countries. Because of the design and the initial large investment required by most rural electrification projects, the financial viability of the new electric cooperative frequently depends upon how many consumers it can reach.⁹⁶

However, in marked contrast with rural electrification efforts in the United States, such campaigns have been lacking in AID/NRECA projects in developing countries. Nathan Associates found no evidence of any promotional activities in the project documents reviewed. Nathan Associates concluded that it was therefore impossible to fully determine whether greater outreach would increase consumption of electricity, or whether other

⁹³See Tendler, p. 7 ff. for a discussion of this question.

⁹⁴Nathan, II, p. 27.

⁹⁵AID, "Rural Electrification," 1965, p. 15.

⁹⁶Nathan, II, p. 44.

factors--low income, low area growth potential, etc.,--were the impediments to greater outreach.⁹⁷

VII. CONCLUSIONS

NRECA has been AID's primary rural electrification contractor since the 1960s. The NRECA/REA model, taken from experience with rural electrification in the United States, has profoundly influenced AID-funded rural electrification projects. "New Directions" development priorities--and changing expectations for the benefits rural electrification should bring--have also affected AID's thinking on rural electrification.

It seems important, at this point in the relatively short history of rural electrification, to determine which components of the NRECA/REA model are vital to successful rural electrification in developing countries, and which elements (although suited to the United States) are not appropriate for AID-funded rural electrification projects. To do this, AID may have to look at its expectations for rural electrification, and to define more clearly what it means by a "successful" rural electrification project.

As a final note, the following should be remembered:

The major expansion of rural electrification occurred in the United States in the 1940's and beyond in a highly favorable economic and social environment.... At a national level...the expenditure for rural electrification [was not] of such magnitude as to require the serious curtailment of other projects in a nation that was already highly developed and which had relatively few pressing needs for investments in the social and economic infrastructure.⁹⁸

⁹⁷Nathan, II, p. 44.

⁹⁸University of Florida, p. 1.

APPENDIX B

RURAL ELECTRIFICATION FUNDING MECHANISMS

by

Alice Davenport

I. INTRODUCTION

Three funding mechanisms have established the relationship between the National Rural Electric Cooperatives Association (NRECA) and the U.S. Agency for International Development (AID):

- Task Order 1 (T.O.1) of a Basic Ordering Agreement between AID and NRECA, November 1962.¹
- Development Program Grant (two-year grant) issued July 1975.²
- Specific Support Grant: June 1, 1978 to February 23, 1981. (This was extended to run until February 28, 1982.)³

A brief look at the provisions of these funding mechanisms will help shed some light on changing development priorities in ID-funded rural electrification efforts and w NRECA (AID's primary rural electrification c interpreted its responsibilities under the funding agreements.

II. TASK ORDER 1

The 1962 Task Order 1 (T.O.1) has been the basic instrument which established and maintained the home office staff of NRECA's International Program Division (IPD). T.O.1 is project-oriented. It does not, in itself, provide funding for technical assistance to rural electrification, but it does provide the mechanism to recruit specialists for these projects. NRECA/IPD generally recruits these specialists from member cooperatives in the United States. (Their services are paid for through separate task orders.) T.O.1 requires NRECA/IPD to supervise, coordinate, and evaluate the performance of these specialists.⁴

T.O.1 also requires NRECA/IPD to conduct studies "to determine the social, economic and political desirability for

¹AID/pha/BOA-1090 Project No. 921-13-960-009.

²Project No. 932-13-950-058.

³Specific Support Grant No. AID/SOD/PDC-G-0076.

⁴DAI, p. 5.

establishing rural electric cooperatives and the advantages, possibilities, and limitations of such cooperatives."⁵ Finally, T.O.1 calls for NRECA/IPD to organize formal and informal training programs for cooperating country rural electrification participants.⁶

III. DEVELOPMENT PROGRAM GRANT

The second funding mechanism was the two-year Development Program Grant (DPG) issued in July 1975. Its purpose was to enable NRECA "to expand its capabilities in the areas of management, program and project design analysis and evaluation in order to increase its effectiveness in program planning in developing countries."⁷

The DPG was intended to be less project-oriented than the first funding mechanism (T.O.1). The shift from contract to grant format was meant to allow NRECA to work outside the narrow project framework emphasized by T.O.1. The DPG also gave an emphasis to evaluation not found in T.O.1.⁸

IV. NRECA/IPD

In its 1977 study, Development Alternatives Inc. (DAI) found that NRECA/IPD felt it had several major areas of responsibility under T.O.1 and DPG:

1. To promote and export rural electrification to as many countries as possible
2. Once the idea of rural electrification has been favorably received by a donor agency or a developing country, to plan a countrywide rural electrification

⁵T.O.1, quoted in DAI, p. 5.

⁶T.O.1, in DAI, p. 6.

⁷T.O.1 quoted in DAI, p. iv.

⁸T.O.1, in DAI, pp. 6-7. DAI found that the NRECA/IPD staff felt that the main effect of the DPG was to increase their capacity to do more of what they had been doing for 14 years under T.O.1--except that DPG required designing and carrying out impact assessments of rural electrification projects. (DAI, p.9.)

project, including necessary training for rural electrification officials

3. "Troubleshooting"--providing management and technical assistance to existing cooperatives, other rural power companies, or national rural electric agencies for special problems
4. To conduct impact assessments⁹

V. SPECIFIC SUPPORT GRANT

The third funding mechanism, the Specific Support Grant, has been in effect from June 1978 to the present. (This grant has been extended to run through February 28, 1982.)

The purpose, as stated in the grant, is to:

permit NRECA to assist in the planning, development and establishment of self-sustaining, financially viable, properly managed and maintained rural electric systems, supported by institutions within LDC [Less-Developed Countries] government frameworks, providing power at reasonable rates to LDC rural residents, including the rural poor; and to augment the response and institutional capability of the International Program Division of NRECA to assist [AID] Missions and LDCs in the planning, design, implementation and evaluation of rural electric systems in the context of rural development.¹⁰

NRECA was specifically required to "prepare evaluations of the impact of rural electric systems on the lives of rural people and the improved production and employment that occur when central station rural electric service is provided in developing countries."¹¹

⁹DAI, pp. 9-10. The DAI study called T.O.1 and DPG "very difficult to interpret" and stated: "DAI is in basic sympathy, therefore, with the difficulties encountered by a practical, task-oriented organization like NRECA in interpreting the requirements of the two funding mechanisms and in transferring these requirements to their actual operations." (DAI, p. 16.)

¹⁰Specific Support Grant, Attachment A, Paragraph A, "Purpose."

¹¹Specific Support Grant, Attachment A, Paragraph B-11.

In addition, NRECA was also asked to engage in a number of related activities--establishing development models, for example. To do this, NRECA would perform studies to identify the preconditions for rural electric development and the conditions which have contributed to the success or failure of rural electrification programs in developing countries.¹²

In response to such requirements in the Development Support Grant, NRECA/IPD has conducted an evaluation study in Costa Rica, and has proposed a second study in the Philippines.¹³

¹²Specific Support Grant, Attachment A, Paragraph 2.

¹³NRECA/IPD, "Rural Electrification in Costa Rica: Viability Concepts and Evaluation," November 1980 (Draft); and Proposal letter from S. Bunker (NRECA/IPD) to J. Shaffer (AID), dated June 1, 1981.

APPENDIX C

BREAKDOWN OF DONOR INVOLVEMENT IN THE RURAL
ELECTRIFICATION SECTOR

by

Alice Davenport

I. BREAKDOWN OF AID INVOLVEMENT IN RURAL ELECTRIFICATION¹

The following tables detailing AID's involvement in rural electrification by country are based on information held in the AID database under the topic "Rural Electrification." This list, however, may include projects in which rural electrification played only a small part.

Another list of projects has been provided by the National Electric Cooperative Association, International Program Division, which gives AID loans and grants more specifically for rural electrification. This list is also included in this section.

These tables are not necessarily a comprehensive list of all such projects.

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¹The sources for tables based on the AID database are the following: Practical Concepts, Inc., "Patterns in Electrification Projects: An Analysis of AID Automated Data," IQC No. AID/otr-C-1377, Work Order 20, Report to AID December 12, 1978; and Development Information System (DIS), AID database, search conducted by AID library on June 18, 1981.

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Table C-1. Breakdown of AID Involvement in Rural Electrification

Country/ Regime/ Bureau	Project Number	Project Title	Dates ¹	Estimated Costs (U.S.\$000) ²	Comments
Regional	4980133	Mekong River Basin: Develop- ment Natural Resources	1961-1975	13,854	-----
	4980236	Mekong River Basin: Develop- ment Natural Resources	1974-1977		-----
	4980260	Mekong River Basin: Develop- ment Natural Resources	1978-1979	250	-----
Afghanistan	3060101	Kajakai Hydroelectric Plant	1967-1968 (1968-1978: PCI)	17,000	Loan
	3060141	No project title given	1966-1974	11,819	Status = "completed" ³
Bangladesh	3880021	Rural Electrification	FY 1978-1980 (1977-1983: PCI)	35,300 (grant) 34,000 (loan)	PCI: estimated costs=\$50,000,000
Bolivia	5110000	Contx--Technical Support	FY 1956-1979	11,018: 5 grants (PCI: costs=9,688)	Includes technical support for RE study.
	5110205	Infrastructure Monitoring	FY 1968-1976	10,729	Project Evaluation Summary RE Phases I & II Bolivia
	5110049	No project title given	FY 1974-1979	19,035	-----
	5110491	No project title given	FY 1979	5,000	-----
	5110493	No project title given	FY 1979	15,500	-----

Table C-1. Breakdown of AID Involvement in Rural Electrification (cont.)

Country/ Regime/ Bureau	Project Number	Project Title	Dates ¹	Estimated Costs (U.S.\$000) ²	Comments
Bolivia (cont.)	5110534	Rural Electrification Management	FY 1979-1980	200	Grant
Costa Rica	514999999	Special Evaluation Report	1973	No budget given	U. of Florida study
Colombia	515999999				"RE: Evaluation... Costa Rica & Colombia"
Ecuador	5180072	Financing Sub-Loans	No dates given	No budget given	One reported output: "RE Coop organized"
	5180099	Rural Electrification Assistance	FY 1971 (PCI: 1971-1976)	3,413 (PCI: costs=3550)	Loan
	2630013	Technical and Feasibility Studies II	FY 1976	15,000	Grant. Included plans for RE sector assessment
El Salvador	5190251	Marginal Community Improvement	FY 1980-1981	15,550 (total 2 loans and 2 grants)	Includes development of electrical systems
Guatemala	5200214	Rural Electrification	FY 1972	6,992	Loan
	5200217	Rural Electrification I	1977	No budget given	Project Appraisal Report
	5200248	Rural Electrification II	FY 1979	8,600	Loan

Table C-1. Breakdown of AID Involvement in Rural Electrification (cont.)

Country/ Regime/ Bureau	Project Number	Project Title	Dates ¹	Estimated Costs (U.S.\$000) ²	Comments
Honduras	5220109	Municipal Development Bank	FY 1975	4,100	Loan. Includes initiation of 3 RE project
	5220138	Rural Electrification	FY 1977 (PCI: 1978-1982)	10,000	Loan
India	3860233	Beas Dam Project	FY 1966 (PCI: 1966-1974)	14,438	Loan
	3860342	India: Rural Electric Coop Development	None given	None given	-----
	3860462	Rural Electrification	FY 1979	58,000	Loan
	4970267	Rural Electrification I	FY 1978-1981 (PCI: 1978-1983)	11,000 grant 30,000 loan	PCI: est, cost= \$36,000,000
	4970283	None given	FY 1980	36,700	-----
	4970295	None given	FY 1979	1,650	-----
Costa Rica	5320046	Integrated Regional Rural Development	FY 1977-1979 (PCI: 1977-1981)	2,000 grant 13,000 loan	Includes financing rural electrification
Morocco	6080159	Morocco: Renewable Energy Development	FY 1980-1982	5,000 grant	Includes small decentralized rural hydro projects

Table C-1. Breakdown of AID Involvement in Rural Electrification (cont.)

Country/ Regime/ Bureau	Project Number	Project Title	Dates ¹	Estimated Costs (U.S.\$000) ²	Comments
Nicaragua	5240078	Rural Electric Cooperatives (II)	FY 1968 (PCI: 1968-1973)	10,200	Loan
	5240096	Nicaragua--RE III	FY 1971 (PCI: 1971-1975)	4,299	Loan
	3910408	None given	None given	55,000	Status = "planned"
	5270119	None given	1967-1973	None given	Status = "completed"
	5270226	Small Hydro Projects	FY 1981-1985	9,000 (loan) 1,000 (grant)	Project beneficiaries = <u>campesino</u> rural communities
Philippines	4920189	RE Services Coop--TW	FY 1968	None given	Evaluation MISAMIS/ ORIENTAL
	4920236	Philippine Development	FY 1969-1976 (PCI: 1968-1977)	3,776 (PCI: costs=3783)	Includes RE component (grant)
	4920248	Rural Electrification	FY 1972-1977 (PCI: 1971-1980)	2,537 (PCI: costs=2487)	Includes "Philippines ...RE" Sector Evalua- tion (Grant)
	4920306	Rural Electrification IV	FY 1976	20,000	Loan
	4920314	None given	1974-1980	18,595	-----
	4920315	None given	1971-1977	39,399	-----
	4920321	Philippine RE V	FY 1978	8,400	-----

Table C-1. Breakdown of AID Involvement in Rural Electrification (cont.)

Country/ Regime/ Bureau	Project Number	Project Title	Dates ¹	Estimated Costs (U.S.\$000) ²	Comments
Philippines	4920888	Rural Electrification III	FY 1977	20,000	Loan
Philippines Asia Reg. Bureau	4980260	Rural Electrification Training	FY 1978-1979	250 grant 4,000 grant	-----
	2760025	None given	FY 1979	30,000	Status = "planned"
Thailand	4930248	Hill Tribe Research Food	FY 1973 (PCI: 1973-1975)	42	Grant. Includes electric generation project
Engineering Bureau	9250203	Eval. Lend. Prog. Rural Electrification	FY 1971-1974	97	Grant
	9320058	National Rural Electric (Coop. Assoc. (NRECA)	FY 1975-1977	None given	Progress reports Interim report
	9320087	Evaluation Assistance RE: NRECA	FY 1976	17	Grant
	9320117	None given	1978-1981	388	Status = "active"
	9365715	Small Decentralized Hydro- power	FY 1980-1983	3,200	Grant

¹Where AID Library dates and PCI dates differ, PCI dates are given in parentheses.

²Where AID Library estimated costs and PCI estimated costs differ PCI estimated costs are given in parentheses.

Table C-2. Major AID Loans and Grants for Rural Electrification Since 1963¹

Cooperatives	Country	AID Loan (U.S.\$)	Local Contribution	Potential Meters
1	Nicaragua	\$ 400,000	\$ 63,000	1,800
3	Colombia	1,300,000	396,000	11,300
1	Ecuador	650,000	491,000	3,300
15	Chile	3,100,000	3,600,000	12,000 (farms)
3	Costa Rica	3,300,000	818,000	14,000
1	Bolivia	4,750,000	1,150,000	23,000
1	Peru	1,600,000	2,925,000	13,000
5	India	National Currency	17,000,000 (PL 480)	85,000
3	Nicaragua II	10,200,000	6,000,000	37,600
2	Philippines	3,460,000	1,650,000	20,200
66	Philippines II, III, IV	78,000,000	86,000,000	1,400,000
1	Nicaragua III	4,300,000	2,400,000	19,000
3	Ecuador II	3,500,000	1,600,000	4,000
3	Vietnam	5,000,000	2,200,000	42,250
0	Bolivia (ER)	10,800,000	1,200,000	61,700
1	Bolivia III	<u>6,500,000</u>	<u>1,300,000</u>	<u>36,000</u>
Total, May 1977		\$136,860,000	\$128,793,000	1,898,000

¹Table compiled by NRECA's International Program Division September 1981. Does not include grant for 12 small cooperatives in Brazil in early 1960s.

Table C-2A. Major AID Loans and Grants for Rural Electrification Since May 1977

Country	AID Loan (U.S.\$)
Philippines V 492-0321	8,400,000
Honduras 522-0138	10,000,000
Guatemala 520-0248	10,250,000
Indonesia 497-0283	30,000,000
Bangladesh 388-0021	37,000,000
<hr/>	
Subtotal (Since May 1977)	95,650,000
Subtotal (May 1977)	<u>136,860,000</u>
	\$232,510,000
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If all AID loans since 1963 total \$30,000,000,000, then RE loans are

$$\frac{\$ 232,510,000}{\$30,000,000,000} = .0077\%$$

II. BREAKDOWN OF THE INVOLVEMENT OF OTHER INTERNATIONAL ORGANIZATIONS IN THE RURAL ELECTRIFICATION SECTOR²

A. Inter-American Development Bank

The Inter-American Development Bank (IDB) signed one loan for rural electrification in 1962 and two more in 1969. In the years 1970 through 1980, the IDB signed 17 more rural electrification loans. (The IDB definition of "rural electrification projects," however, includes construction of generation structures as well as energy transmission and distribution facilities.) Seven of the 19 rural electrification sector loans signed since 1969 have been completely disbursed. The remainder represent ongoing commitments of the IDB. Total IDB involvement in the rural electrification sector from 1969 through September 1980 was more than U.S.\$400 million for projects with an estimated aggregate cost of over U.S.\$1 billion. For the future, IDB does not indicate that it plans to greatly alter its pattern of involvement in rural electrification, although criteria for project preparation, execution, and evaluation may be tightened.³

B. The World Bank

The World Bank began formal lending for rural electrification in 1976. Previously, Bank funding for rural electrification had been included as part of other projects, primarily because the Bank did not have a policy for evaluating and approving rural electrification as a separate project activity. Total lending for rural electrification from fiscal year 1976 through fiscal year 1981 was \$676 million (8 percent of World Bank lending for the power sector).

At present, the World Bank does not consider rural electrification projects among its top priorities. For one thing, rural electrification is not viewed as a useful vehicle for the Bank's usual institution-building functions (e.g., assistance

²This is not necessarily a comprehensive list of all such projects.

³See Inter-American Development Bank, "Summary of Ex-Post Evaluations of Rural Electrification Projects," (Washington, D.C.: IDB, July 1981).

in planning and pricing). Moreover, the Bank believes rural electrification projects are capable of attracting financing from other donors (ranging from Canada to OPEC) that see in rural electrification the attractions of an easily implementable, replicable development activity. Therefore, the World Bank's participation in such projects does not necessarily result in the resource transfers the Bank considers important.

Historically, the World Bank has provided some 10 percent of the funds loaned to borrowing countries by international lenders. In the future, however, this may drop to approximately 5 percent of the total. In this future scenario, the Bank anticipates a continued involvement in the rural electrification sector, but the form and the extent of the involvement may change. As it has in the past, the Bank will continue to apply lenient standards to the financial earnings and rates of return on rural electrification projects. However, as available funding diminishes, the Bank will be more and more careful where it places its rural electrification projects. For example, the Bank will look for areas with threshold characteristics which would enable a rural economy to effectively use electricity (e.g., an area with a cash economy).

Future Bank involvement in rural electrification will also be influenced by the fact that country governments are themselves backing off from rural electrification projects. Brazil, for example, has virtually halted rural electrification, and India is taking a hard look at the value of a rural electrification program that stresses electrification for irrigation pump sets.

Because maintenance and loss-avoidance in many existing rural electrification systems leaves much to be desired, most future World Bank involvement in rural electrification may take the form of programs to rehabilitate existing rural electrification systems, rather than programs to build new systems. The World Bank could also play a useful role by coordinating other aid sources, by applying rigorous economic analysis to project justification and subproject priorities, and by optimizing design standards.⁴

⁴Conversation with Mr. James Fish, World Bank Energy Department, Washington, D.C., on October 5, 1981; and "Summary of FY 76-81 Power Lending," World Bank memorandum from Edwin A. Moore dated August 11, 1981.

Table C-3. IDB's Involvement in the Electrification Sector, 1980

Country	Project	Amount (million U.S.\$)
Argentina	Piedra Aguila-Limay Medio hydroelectric power project. Engineering study.	\$33.0
Brazil	Expansion of transmission facilities, State of San Maranhao.	13.5
Brazil	Distribution system. State of Bahia. Will provide low-income users with electricity.	80.0
Colombia	Electrification project.	50.0
Colombia	Playas hydroelectric power project.	85.0
Cost Rica	Rural electrification.	26.5
Costa Rica	Ventanas-Garita hydroelectric power project.	82.5
Dominican Republic	Lopez-Angustora hydroelectric power project.	44.5
Dominican Republic	Pilot project for solar-powered electric plant in rural area. Technical cooperation project.	NA
Guyana	Technical cooperation for a wood-fired steam and power plant.	NA
Haiti	Technical cooperation for Artibonite River hydroelectric power plant.	NA
Nicaragua	Rural electrification project in Departments of Matagalpa and Zelaya. Project near completion.	16.5
Panama	In 1980 concluded a 5-year master plan for rural electrification in Panama. Partially funded by IADB.	0.147
Uruguay	Assist Uruguay to build transmission lines.	25.0

Source: Inter-American Development Bank, "Annual Report 1980," Washington, D.C., 1980, pp. 38, 39, and 84.

Table C-4. Summary of World Bank Rural Electrification Lending,
Fiscal Year 1976-1981

Fiscal Year/ Country	Project	Amount (million U.S.\$)
<u>1976</u>		
Malaysia	Seventh power project. Includes rural electrification component.	2 (total project 35)
India	Rural electrification I. 140 rural electrification schemes.	57
<u>1977</u>		
Egypt	Regional electrification. Had rural electrification component.	24 (total project 48)
<u>1978</u>		
Syria	Regional electrification. Extending service to 150,000 rural households involving 5000 km to 20 kV and low tension lines and 70 MVA of distributor transformer capacity.	40
Yemen, PDR	Wadi Hadramout Power. Four 4-MW heavy fuel oil-fueled diesels at Qaraw and rural distribution system.	5
Philippines	Rural electrification. Extension of 69 kV system lines to supply consumers of the rural cooperatives.	60
Thailand	Rural electrification I. Electrification of 4,567 villages with a total population of about 5 million.	25
Brazil	South-southeast distribution. Includes some rural electrification.	10 (total project 130)
<u>1979</u>		
Jordan	Third power project. Includes rural electrification component (electrification for 33 villages)	3 (total project 15)
Morocco	Village electrification. Electrification of 220 rural centers.	42

Table C-4. Summary of World Bank Rural Electrification Lending,
Fiscal Year 1976-1981 (cont.)

Fiscal Year/ Country	Project	Amount (million U.S.\$)
<u>1979 (cont.)</u>		
India	Rural electrification II. Providing electricity to 2 1/2 million people in 15,000 villages included in about 1,800 subprojects.	175
Brazil	COPEL second power distribution. Sub-transmission and distribution facilities to extend service to about 415,000 households including 45,000 low-income households and 50,000 rural consumers.	14 (total project 109)
<u>1980</u>		
Egypt	Third power project. Includes rural electrification component.	9 (total project 127)
Thailand	Second rural electrification project. Electrification of 7,876 villages in 27 provinces.	75
Brazil	CEEE distribution. Included expansion of service to 12,000 rural consumers.	4 (total project 114)
<u>1981</u>		
Ivory Coast	Power I. Provide electricity supply to the rural area.	33
Jordan	Power IV. Includes extension of distribution network to 50 villages.	9 (total project 25)
Tunisia	Power III. Implementation of part of a 5-year rural electrification program.	41
Yemen AR	Power II. Expansion and connection of the distribution networks in 17 villages.	12
Colombia	Village electrification. Rehabilitation of distribution networks plus provision of electricity for 120 villages.	36

Source: "Summary of FY 76-81 Power Lending," World Bank Memorandum from Edwin A. Moore dated August 11, 1981.

Table C-5. World Bank Lending Program in Electric Power
(million current U.S. dollars)

Item	Amount
Current Lending Program	\$7,590
Current Total Project Cost	37,950
Desirable Lending Program	11,000
Desirable Total Project Cost	47,450

Source: Table 30, "Current and Desirable World Bank Energy Programs, FY 1981-85" in "Energy in Developing Countries." (Washington, D.C.: World Bank, August 1980), p. 72.

Table C-6. U.S. Bureau of the Census
Rural Electrification Data

Project	No. of Professional Personmonths	Status
Bangladesh RE Evaluation	5	Completed
Indonesia RE Evaluation	11	Ongoing
Philippines RE Evaluation	15	Preliminary results drafted for 1980 survey

Source: U.S. Bureau of the Census, Surveys and Evaluation Unit, International Statistical Program Center, "Annual Report for FY 1980." (No cost figures were given for these projects.)

APPENDIX D

EVALUATION STUDIES: RURAL ELECTRIFICATION

by

Alice Davenport

I. BRIEF HISTORY OF EVALUATION IN AID-FUNDED RURAL ELECTRIFICATION PROJECTS

Evaluation studies were not conducted when rural communities in the United States or other developed countries were electrified. Therefore, when AID and other international donors began their rural electrification projects in the 1960s and 1970s, there were no studies available that defined the relationship between electrification and economic and social change--nothing to help provide criteria for judging the priority of electrification among other capital projects.¹

In the early 1960s, when AID first began its involvement with rural electrification, the concept of "evaluation" itself was very nebulous. There was little consensus within AID (or within most Federal Government programs) regarding its increasingly frequent use. During this period, AID viewed development projects primarily as capital projects. Evaluation of rural projects considered completion of infrastructure to schedules, and appropriate distribution of funds. Hence, the evaluation was "more an audit than a socioeconomic assessment."²

In a review of AID rural electrification project documents, Nathan Associates found that before 1970 there were few, if any, project evaluations that included assessment of social and economic impacts. A few special studies were undertaken by AID contractors--including university sociologists who produced profiles of project recipients (age, income, level of education, etc.). But more data for these studies were collected before project initiation than during or after project implementation.

When baseline data were collected no follow-up studies were undertaken to assess the extent to which the project had changed the lives of the intended recipients or the extent to which intended goals and purposes had been achieved.³

¹University of Florida Center for Latin American Studies, "Rural Electrification: an Evaluation of Effects of Economics and Social Changes in Costa Rica and Colombia," 1973, p. iii.

²Robert R. Nathan Associates, Inc. "Contribution of AID Documentation to the Evaluation of its Rural Electrification Projects," Vol. I and II, 1979, p. 16.

³Nathan, I, pp. 16-17.

The first AID/NRECA funding mechanism (the Task Order 1 in the Basic Agreement of 1962) did not stress evaluative activities. But with the second funding mechanism (the 1975 Development Program Grant), NRECA's International Program Division was asked to concern itself with overall development and impact questions.⁴

One result of AID's evolving interest in evaluation was to put rural electrification programs into a larger perspective of national development objectives. AID began to require certain justifications in its funding procedure: social soundness, economic, environmental, and technical analyses, along with statements of how the project would fit in with other development activities.⁵ In the third AID/NRECA funding mechanism (the Specific Support Grant of 1978), NRECA was specifically required to "prepare evaluations on the impact of rural electrification systems," and to engage in a number of related studies. (For example, NRECA was asked to identify the preconditions necessary for successful rural electrification projects.)⁶

II. A REVIEW OF SELECTED RURAL ELECTRIFICATION STUDIES

A number of studies have been undertaken on rural electrification in developing countries. These studies and the resulting conclusions and recommendations are understandably oriented towards the primary purposes and interests of the sponsoring organization. This section offers a review of some of the most helpful of these studies.

One of AID's first attempts to analyze the impacts of rural electrification projects was "Rural Electrification Cooperatives in Country Development" (1965, no author given). Since the first AID/NRECA rural electric cooperative had only been set up in the previous year, this 1965 report was more

⁴Development Alternatives, Inc. (DAI), "An Evaluation of the Program Performance of the International Program Division of the National Rural Electric Cooperative Association (NRECA), p. 34. But DAI commented that NRECA's International Program Division had not been given "the resources (financial or human) to properly address these issues or carry out these activities."

⁵DAI, p. 47. The World Bank has similar requirements.

⁶Specific Support Grant, Attachment A, Paragraphs B-2 and B-11.

like a discussion paper (raising points for consideration) than an evaluation of a rural electrification program.

Another early study was "Cooperative Rural Electrification: Its Implications for International Development." James E. Ross of NRECA submitted this study to AID in April 1966. This was a look at the first five pilot rural electric cooperatives to be assisted jointly by AID and NRECA--located in Colombia, Nicaragua, and Ecuador. Ross found positive links between cooperative rural electrification and increased income levels, and between rural electrification and economic and social change. Ross stressed, however, that cooperative rural electrification in itself would not trigger development in the area. He felt its role was that of a catalyst:

Implications of the study are that the institutional arrangements of a cooperative can provide the framework for carrying out development needs which will become evident to the community as it is exposed to the conveniences of electricity and a better way of life. The greatest contribution of cooperative rural electrification in less developed countries may be as a prime mover in development--as a catalyst to the desire to develop.⁸

In 1973, the University of Florida produced a study for AID, "Rural Electrification: An Evaluation of Effects on Economic and Social Changes in Costa Rica and Colombia." Up to that time, the report found, rural electrification feasibility studies had been based largely on financial projections. But financial costs and benefits are not necessarily an adequate indication of the socioeconomic impacts of rural electrification. The study's objective was to examine the social and economic impact on selected areas in Costa Rica and Colombia, looking at such issues as rural electrification and infrastructure development, the comparative effectiveness of various lending patterns, and the development of research instruments to measure the impact of rural electrification.⁹

⁷International Cooperative Development Service, Office of Material Resources, AID, "Rural Electric Cooperatives in Country Development," April 1965 (no author given).

⁸James E. Ross (NRECA), "Cooperative Rural Electrification: Its Implications for International Development," April 1966, p. 321.

⁹University of Florida, p. xvii.

In 1974, Gilbert Moon (NRECA) published a study for the World Bank Group, "A Report on Rural Electrification: The Costs, Benefits, Usages, Issues and Developments in Five Countries." This report evaluated AID/NRECA rural electrification projects in five countries,¹⁰ focusing mainly on cost and financial viability issues, but with some discussion of usage patterns. The Moon/ NRECA report concluded that in capital-short countries with many infrastructure needs, rural electrification is a marginal program if measured only in direct monetary returns:

Since it is a program which requires grass-roots support and often experiences a time lag between established goals and accomplishments, rural electrification is better handled as a basic ingredient or essential part of a total development program.¹¹

The report makes a number of specific recommendations that the author believes are necessary for a successful (e.g., technically and financially viable) rural electrification project.

In 1974, the International Bank for Reconstruction and Development (IBRD) of the World Bank Group published "Issues in Rural Electrification." This report was based on an El Salvador research study, on field trips to four countries, and on correspondence with over 20 countries in Africa, Asia, and Latin America. IBRD was concerned with several main issues: the prospects for successful investment in rural electrification, the best approach to this investment, and the implications for Bank policies and procedures.¹² The report is not, nor was it meant to be, primarily an evaluation of the socioeconomic impacts of rural electrification.

In June 1979 the Inter-American Development Bank (IDB) released its "Evaluation Report on Rural Electrification and Energy." This is a general review encompassing most IDB field

¹⁰The five countries were Nicaragua, Ecuador, Costa Rica, India, and the Philippines.

¹¹Gilbert Moon/NRECA, "For the World Bank Group: A Report on Rural Electrification--The Costs, Benefits, Usages, Issues and Developments in Five Countries," July 1974, p. 137. Historical information for the report was obtained from NRECA files; forecast statistics were prepared on project sites by NRECA specialists as a local cooperative management tool.

¹²International Bank for Reconstruction and Development (World Bank Group), "Issues in Rural Electrification," July 24, 1974, p. i.

operations (31 in all), most IDB field technical consulting operations, and field trips to 48 project sites in 9 countries. The report discusses the economic and social impacts of rural electrification but finds that existing evaluation data are not sufficient for definite conclusions along these lines. IDB found data limited on the socioeconomic background of users and the socioeconomic benefits of rural electrification.¹³

In 1977, Development Alternatives Inc. (DAI) submitted a report to AID: "An Evaluation of the Program Performance of the International Program Division of the National Rural Electric Cooperative Association." The study was not primarily an evaluation of rural electrification as a project activity. However, DAI looked closely at available studies and found that often preliminary or tentative impact studies had been presented as convincing demonstrations of support for rural electrification as a development tool.¹⁴ DAI reported that it could not find documented evidence in academically sound, theoretically solid impact assessments for the hypothesis that rural electrification is universally applicable and beneficial to AID's target population, the poor majority of developing countries.¹⁵

Another study, funded by AID at about this time, was "Patterns in Electrification Projects: An Analysis of AID's Automated Data" (December 1978) prepared by Practical Concepts Inc. (PCI). This study was an overview of AID-funded projects that in some manner involved rural electrification. Thirty-two projects were identified--including completed, active, and planned projects.

PCI reported that most projects were in the Asia and Latin America Bureaus. And although the number of projects financed by each of these Bureaus was similar, the average size of a Latin America Bureau project was half that of an Asia Bureau project. PCI found that the Near East Bureau had displayed little activity in the rural electrification sector, and that the Africa Bureau had not pursued rural electrification as a project activity. Total AID allocation for rural electrification 1961 to 1977 was found to be \$209.6 million.¹⁶

¹³Inter-American Development Bank, the Group of Controllers of the Review and Evaluation System, "Evaluation Report on Rural Electrification and Energy," June 1979, pp. 26, 29, and 31.

¹⁴DAI, 1977, p. 88.

¹⁵DAI, 1977, p. 88.

¹⁶Practical Concepts, Inc., "Patterns in Electrification Projects: An Analysis of AID's Automated Data," December 12, 1978.

In September 1979, Robert R. Nathan Associates submitted a report to AID, "Contribution of AID Documentation to the Evaluation of its Rural Electrification Sector Projects." AID had requested this study to determine the extent that existing documentation could contribute to an evaluation of AID-funded rural electrification projects. Nathan Associates reviewed project documents for seven countries--Bolivia, Colombia, Costa Rica, Ecuador, Guatemala, Nicaragua, and the Philippines. The major conclusion of the study was that existing AID project documents did not provide adequate information for a full evaluation of the effects of rural electrification projects.¹⁷

In response to concern for the impacts of AID programs, AID produced a series of discussion papers meant to stimulate thought and dialogue on development problems and to encourage experimentation. The papers were intended to be a "mix of what is known (from experience and evaluation evidence) and what needs to be known from future evaluative studies."¹⁸

As part of this series, Judith Tendler produced "Rural Electrification Linkages and Justifications" in April 1979. Tendler discussed a number of rural electrification issues including household consumers and the rural poor, flat versus metered charges, and autogeneration versus central-station systems. Tendler's paper was based on 40 interviews conducted in Washington, D.C. in the spring of 1978, with additional information from discussion with AID staff and from literature sources.

In 1979, Elizabeth Cecelski (Resources for the Future) released "Draft: The Role of Rural Electrification in Development." This working paper presented some limited conclusions based on scattered data and anecdotal evidence. Cecelski found that although large sums of money had been spent on rural electrification, information was lacking on its impact on economic development. She recommended further research analysis in several areas: alternatives to electrification, alternatives to the central grid model, subsidies and the true cost of rural electrification, direct and indirect benefits to recipients, and necessary preconditions for successful rural electrification projects.¹⁹

¹⁷Nathan, I and II, p. ___.

¹⁸Judith Tendler, "Rural Electrification: Linkages and Justifications," April 1979, "Preface," p. ii.

¹⁹Elizabeth Cecelski, "The Role of Rural Electrification in Development," Resources for the Future, Washington, D.C., July 1979, p. 91 ff.

The U.S. Bureau of the Census (BUCEN) provided training and technical support to the Philippines National Electrification Administration to conduct a project-level evaluation that would provide insights into the household impact of the rural electrification programs in the Philippines.²⁰ To provide data for this evaluation, two large-scale household surveys have been conducted. Findings from a 1977 survey were released in 1978. On March 19, 1981, BUCEN released some initial findings from its 1980 survey, "Philippine Rural Electrification Evaluation: Preliminary Results of the 1980 Household Survey."

This survey project had the following major components and purposes:

- The development of comprehensive data on the socio-economic characteristics of households that connected to the system versus those that did not connect
- The identification of the uses made of electricity and the changing pattern of use over time
- The identification of the extent to which rural electrification reached the poor majority as opposed to upper- and middle-income groups
- The magnitude of the demand for electricity²¹

In response to the requirements of the third AID/NRECA funding mechanism (the 1981 Specific Support Grant), NRECA has developed a preliminary analytic rationale and framework for developing and implementing impact analysis. NRECA has produced a preliminary draft of findings from a study of rural electrification in Costa Rica. In addition, NRECA hopes to conduct an evaluation study during 1981 in the Philippines.²²

²⁰U.S. Bureau of the Census, "Philippine Rural Electrification Evaluation: Preliminary Results of the 1980 Household Survey, U.S. Bureau of the Census, Washington, D.C., March 1981.

²¹U.S. Bureau of the Census, p. 31.

²²NRECA/IPD, "Rural Electrification in Costa Rica: Viability Concepts and Evaluations", November 1980 (Draft). A letter from S. Bunker (NRECA/IPD) to J. Shaffer (AID, Coordinator of Cooperative Development) dated June 1, 1981 proposed this Philippine study. In a June 23, 1981 telephone conversation, Bill Costis (NRECA/IPD) indicated that NRECA would go ahead with the project after certain funding questions had been solved, and after the Philippine Government had given its approval for the project.

In reviewing existing evaluations of rural electrification projects, it is important to remember that the term "evaluation" itself is open to widespread interpretation. Nathan Associates reached the following conclusion:

To date, there is an overabundance of definitions and far too little consensus on what actually constitutes an evaluation. Some persons use the term in reference to pre-project cost-benefit analysis. During a project, or after it is implemented, the term may refer to a range of project reviews--from short-run studies (several weeks) gauging overall project progress or only as one aspect of a project (i.e., an audit) but without resort to sophisticated research methods, to long-run impact measurement studies, or program effectiveness studies utilizing econometric or survey and statistical techniques.²³

It is hoped that this paper, a sector evaluation of AID's rural electrification efforts, will help clarify some of these problems of interpretation.

III. RELEVANT FINDINGS FROM OTHER RURAL ELECTRIFICATION EVALUATIONS

A. Rural Electrification and the Poor

1. How Many Are Reached?

Other studies have produced mixed findings for connection rates in rural electrification project areas, which suggests that wide variation must be allowed in estimating rates of electrical hook-ups in order to allow for great differences in geography and population on areas to be electrified.

U.S. Bureau of the Census (BUCEN). A BUCEN Philippine study found that slightly over half of all the Philippine rural poor are in the National Electric Cooperative areas, and that 23 percent of these people had been connected to the system.

Within NEA service areas, electrified households represent 36 percent of all rural households in the area. Rural area coverage of NEA cooperatives was somewhat higher than rural area coverage by private and municipal electric systems. This

²³Nathan, I, p. 16.

was especially true in remote villages, where NEA cooperatives connected 12 percent of households, and private and municipal systems connected only 2 percent.²⁴

Denton/Asian Development Bank. Denton's 1975 study in the Philippines estimated that all but the very poorest of the population (possibly the lowest 15 percent) were able to hook up to the system.²⁵

AID Bangladesh Project Papers. The overall sign-up rate for electricity in Bangladesh project areas was higher than expected. Nearly 40 percent of all households deposited fees for future connection. And since the sources for household figures come from a census of the entire area, it is likely that the proportion of those signing up is much higher along the distribution network.²⁶

Plunkett/AID Pakistan. In 25 sample villages in Pakistan, households with electricity varied from 12 to 39 percent of total households, with a national average of only 24 percent.²⁷

Cecelski/Resources for the Future. In India, electrification has been introduced on a regional basis emphasizing irrigation use, with a limited concern for household hook-ups to the system or for the socioeconomic levels of those who do hook up. Cecelski found that the average number of connections in some electrified Indian villages was as low as 10 or 20 percent.

Cecelski speculates that household connections may be higher in Latin America (where income levels are relatively high) than in Asia (except for the Philippines, where rural electrification was promoted by the government and household connections were stressed).²⁸

²⁴U.S. Bureau of the Census, pp. 17, 21, and 23.

²⁵Frank Denton/Asian Development Bank, "Philippine Rural Electrification: A Social Analysis," n.p. ADB, 1975, pp. 24-25.

²⁶AID, "Bangladesh Rural Electrification Fiscal 1980 Project Paper Amendment," Washington D.C., 1980, p. 13.

²⁷H. S. Plunkett/AID Pakistan, "Social Effects of Rural Electrification: An Examination of Data from Pakistan," Islamabad, n.d., p. 4.

²⁸Cecelski, pp. 24 and 27.

2. Socioeconomic Characteristics of Users

A number of studies have concluded that users of electricity tend to be more affluent than nonusers.

Nathan Associates. Nathan Associates reviewed a number of studies and concluded that rural electric cooperatives appear to reach the poor but not the poorest. Nathan Associates looked at studies including DAI's evaluation in Nicaragua,²⁹ Ross' survey in Costa Rica, and the NEA Philippine survey.²⁹

Tendler. Tendler also concluded that households with electricity were the better off among the rural poor. She looked at the University of Florida study of Costa Rica and Colombia, a 1975 World Bank survey in El Salvador, and an AID Philippines study.³⁰

Inter-American Development Bank. The IDB found that the largest group of users of electricity (in numbers, not in the amount of electricity consumed) were the medium- to low-income categories.³¹

McCawley. McCawley concluded that electricity was a luxury in Indonesia and felt that rural electrification programs often had the unintended effect of channeling subsidies to wealthier rural residents.³²

AID Bangladesh Project Papers. A quick study in Bangladesh revealed that economically, households with electricity appeared to be better off than average, with higher literacy and educational levels than the national average.³³

²⁹Nathan II, p. 50.

³⁰Tendler, p. __.

³¹Inter-American Development Bank, p. 38.

³²Peter McCawley, "Rural Electrification in Indonesia--Is It Time?" Bulletin of Indonesian Economic Studies, 1979 (?), p. 68.

³³AID/Bangladesh, "Annual Evaluation of the Rural Electrification Project," 1981, Attachment 2, p. 3.

Hjort. Hjort's Kenya study found that consumers of electricity were generally richer than nonconsumers; Hjort felt that a regular, substantial cash income was needed before households would become electricity consumers.³⁴

Plunkett/AID Pakistan. In Pakistan, the average income of nonelectrified households was only half that of electrified households. The study concludes that penetration of electrification to rural areas of Pakistan is not very effective.³⁵

Bureau of the Census. In the Philippines, the Bureau found that nonelectrified areas were somewhat poorer, though not greatly different from electrified areas. This was attributed to the fact that more central areas (inhabited by the relatively better off among the rural poor) were electrified first.³⁶

3. Obstacles to Household Connection

A number of other studies support the conclusions of the four AID evaluation teams that the cost of hook-ups to the system is the greatest obstacle to household electrification.

Hjort. In Kenya, Hjort found that high installation costs, not monthly bills, were the major obstacles to hook-up.³⁷

Cecelski. Cecelski comments that since electricity costs are themselves only 30 to 60 percent of the total cost of using electricity, "subsidies to electric rates alone are unlikely to have a substantial effect on consumption unless subsidies or liberal credit [is] also provided for connections and appliance purchases."³⁸

AID Bangladesh Project Papers. Findings from Bangladesh have been mixed. For example, the 1980 AID Bangladesh paper concluded that low-income households were likely to lack funds

³⁴Anders Hjort, "Socio-Economic Effects of Rural Electrification in Kenya," Stockholm, 1974, p. 41.

³⁵Plunkett, pp. 4-5.

³⁶U.S. Bureau of the Census, p. 21.

³⁷Hjort, pp. 10 and 50.

³⁸Cecelski, p. 72.

for connection, housewiring, and appliances. To address this need, the project included provisions for housewiring aimed at lower income residents. But the 1981 Bangladesh paper reported a high rate of consumer demand for electricity, with most of the households that were signed up for service willing to finance their own housewiring. Because of this, there was some doubt about the necessity for including housewiring loans in the program.³⁹

Nathan Associates' and McCawley's Studies. In Colombia, Indonesia, and Nicaragua, surveys indicated that more general costs--which included monthly charges and cooperative membership fees⁴⁰ as well as hook-up charges--were all constraints to hook up.

Plunkett. Plunkett's survey in Pakistan cited institutional constraints to hook up:

Applications for connection were cumbersome and inconvenient, involving several trips to various offices, and much red tape...the lower the respondent's social class, and the less his education, the more confusing these procedures became.⁴¹

4. Household Use of Electricity

Many studies support the findings from the four AID evaluations that lighting, followed by appliance use, was the most widespread use of household electricity.⁴²

The studies indicate that among appliances, small appliances such as electric fans or irons were the most common. Such small appliances were noted to be relatively inexpensive and affordable even by poorer households.

³⁹AID, "Bangladesh," 1980, p. 16; and 1981, p. 8.

⁴⁰Nathan, II, p. 56; and McCawley, p. 68.

⁴¹Plunkett, p. 6.

⁴²See Philippine National Electric Administration/AID, "National Survey on Socioeconomic Impact of Rural Electrification," 1978, p. 12; Inter-American Development Bank, 1979, pp. 30-33; Inter-American Development Bank, p. 3; Nathan II, p. 56; Cecelski, p. 28; U.S. Bureau of the Census, p. 24 ff.; DAI, p. B-17.

Inter-American Development Bank. The IDB found that, despite the relatively high cost of larger appliances like refrigerators and televisions, a large percentage of families purchased them, regardless of income bracket. They also found that use of appliances (and types of appliances) varies by country. The IDB speculates that customs duties and the cost of credit for appliance purchase, which vary by country, are responsible for this finding.⁴³

5. Substitution of Electricity for Other Energy

Nathan Associates' review of the literature found little information in studies on the substitution of electricity for alternative energy. Reports from the Inter-American Development Bank, Hjort, and Tendler indicate little substitution of electricity for wood or charcoal in cooking.⁴⁴

6. Value of Electricity for the Rural Poor

Those who work in the field of rural electrification have drawn mixed conclusions on the importance the rural poor place on electricity. Some observers have found that in areas where little infrastructure existed and where no electricity was available, the poor did not cite electricity as a top priority. But other studies have shown a strong desire for electricity on the part of the rural poor.

The World Bank and Cecelski studies found that rural electrification was highly prized by the rural poor. Cecelski found the poor were willing to spend up to 20 percent of their income on electricity.⁴⁵

In Bangladesh sign-up response for future electrical hook-ups was greater than expected because of the strong desire in the rural sector for electrical service. Bangladesh rural residents cited enhanced social prestige as a reason for getting electricity.⁴⁶

⁴³Inter-American Development Bank, 1981, pp. 2-3.

⁴⁴Nathan, II, p. 53; Tendler p. 40; Inter-American Development Bank, p. 3; and Hjort p. 42.

⁴⁵World Bank, 1974, p. 11; and Cecelski, p. 27.

⁴⁶AID, "Bangladesh," 1980, pp. 10 and 14.

Yet other studies, such as Hjort's in Kenya, did not find that electricity was a top priority in rural areas. (Participants in the Rural Electrification Sector Meeting noted that studies in Indonesia and India reflected these findings.)⁴⁷

7. Household Productive Use of Electricity

Several suggestions have been made to redefine "productive" use of household electricity.

U.S. Bureau of the Census. The availability of household lighting may itself have had an effect on production by lengthening the day. BUCEN's study in Indonesia found that 25 percent of households with electricity used light for production in home business. In the Philippines, BUCEN found that 20 percent of electrified households had home businesses and that 95 percent of these used light for productive purposes.⁴⁸

Cecelski. A broader definition of "productive use" might include consideration of time freed for other labor by household machines like electrified water pumps and corn mills. Cecelski refers to a report on the Mexican PIDER rural development project in which saving several hours of work a day in lifting water and grinding corn for household use permitted time for irrigation and cultivation of home gardens.⁴⁹

8. Impact on Migration

Other studies found little evidence that electrification slowed down or stopped migration into the cities from the countryside.⁵⁰

⁴⁷Hjort, p. 84; and see Appendix F, Report on the Rural Electrification Sector Meeting, Section II. B., Household Use: Comments by Participants.

⁴⁸Comments by M. Hartz, U.S. Bureau of the Census, at Rural Electrification Sector Meeting, September 18, 1981, Washington, D.C.

⁴⁹Cecelski, p. 30. She cites a personal communication from Auguste Schumacher, June 1979.

⁵⁰See Cecelski, p. 46; Nathan, II, p. 63; Inter-American Development Bank 1979, p. ___; World Bank, 1974, p. 17; Hjort, p. 13.

9. Social Service Use

Public Lighting

Other studies note that outside lighting contributed greatly to area residents' feelings of security.

AID Bangladesh 1980 Project Paper. In a survey of rural areas to receive electricity, 30 to 40 percent of the respondents looked forward to better protection against thieves after outside areas were lighted.⁵¹

Plunkett and Hjort. In Pakistan and Kenya, studies also found that rural residents valued public lighting for the protection it provides from crime. (In Kenya, respondents further valued outside lighting as a protection against animals, ranging from snakes and scorpions to lions and elephants.)⁵²

Other Public Uses for Lighting

These include loudspeakers in mosques (Pakistan), public water systems (Philippines), and hospital service (Kenya).⁵³

Rural Electrification and Other Social Service Programs

Inter-American Development Bank The IDB found rural electrification widely regarded as an important social service, similar to water, health, and educational services. But at the same time the Bank found few projects that exhibited much concern for the social uses to which electricity could be put. The Bank therefore recommended that future projects pay more attention to the need to link rural electrification with social service delivery.⁵⁴

⁵¹AID, "Bangladesh," 1980, p. 14.

⁵²Plunkett, p. 5; Hjort, p. 58.

⁵³Plunkett, p. 5; Denton, p. 25; Hjort, pp. 13 and 85.

⁵⁴Inter-American Development Bank, 1979, pp. 18, 19, and 30.

Nathan Associates. Nathan Associates' review found substantial government and public usage of electricity. However, it also found instances where such use was a "mixed blessing" (e.g., Ecuador), when the public sector was in arrears in its payments, creating a burden for other categories of users.⁵⁵

B. Rural Electrification and Agricultural Development

1. Effect on Poor Farmers

Inter-American Development Bank. Studies by the IDB confirm findings by the four AID evaluation teams that rural electrification had little effect on small holdings (which often concentrate on basic grain production). The IDB suggests that this is due to traditional subsistence techniques that do not easily incorporate electric irrigation pumps or other modern methods, as well as a lack of knowledge and access to credit. The IDB found that capital-intensive operations such as dairy or poultry raising made more use of available electricity, although such operations frequently had installed their own autogenerators prior to area electrification.⁵⁶

2. Linkage to Other Development Programs

Inter-American Development Bank. The IDB experience suggests the benefit of linking rural electrification with other agricultural development programs. In its 1979 evaluation, the Bank found that many small farms that had been in the low-income category when they first hooked up to electricity, had subsequently prospered and had become part of the middle-income category. The IDB noted that this was especially true in areas where colonization, land settlement, irrigation, or other integrated agricultural development projects had been introduced.⁵⁷

Cecelski. Cecelski points out that the cost of electricity itself is a minor part of the total cost of operating a pumpset. Other costs include connection, digging a well, and the electric motor itself. Therefore, additional subsidies

⁵⁵Nathan, II, p. 56.

⁵⁶IDB, 1979, p. 31 ff.; IDB, 1981, pp. 2-4.

⁵⁷IDB, 1979, p. 32.

(e.g., liberal credit programs for equipment) are needed in addition to those for electricity.⁵⁸

AID Bangladesh Project Papers. AID-funded rural electrification projects in Bangladesh encourage agricultural and agroindustrial sign-ups. The Bangladesh Rural Electrification Board⁵⁹ plans to give priority to connections for such productive use.

C. Rural Electrification and Economic Development

1. General Findings

Like the four AID impact evaluation studies, other studies have found it difficult to prove a relationship between electrification and economic development.

Nathan Associates. Nathan Associates found no evaluative document able to prove "a direct linkage between availability of electricity and increasing income, despite the prevalence of this impact in purpose statements."⁶⁰

Inter-American Development Bank. The Bank found it difficult to link rural electrification with economic development in agriculture, industry, or commerce.⁶¹

Cecelski. Cecelski, too, found it difficult to prove a relationship between electrification and industrial development. Citing data from studies in India, Cecelski feels that the record is poor for the establishment of new small-scale industries in newly electrified areas. She notes that those industries that have appeared in various areas since grid electrification seem to be of the same type as those previously existing in the area (e.g., small flour mills, oil presses).⁶²

⁵⁸Cecelski, p. 73.

⁵⁹AID, "Bangladesh," 1980, p. 13.

⁶⁰Nathan, II, p. 51.

⁶¹IDB, 1979, p. 27.

⁶²Cecelski, pp. 40 and 76.

Other Studies. Differing from the studies above, other studies (Bangladesh and the Philippines) have concluded that rural industry has grown significantly after electrification in certain areas.⁶³

2. Effect of Rural Electrification on Employment

Nathan Associates and Inter-American Development Bank studies found little concrete evidence that increased employment resulted from rural electrification programs. In Kenya, Hjort found that electrified businesses were mostly family owned, and provided few job opportunities for others.⁶⁴

3. Productive Use of Electricity

Findings for productive use of electricity vary greatly. The World Bank found that rural productive use (farms, agroindustry, commercial-community use) varied among nine countries. Productive usage ranged from 75 percent and 80 percent (in Tanzania and India) to 40 percent and 45 percent (in Pakistan and El Salvador). In Kenya, Hjort found businesses used about one-third the total electricity consumed in areas that were "well electrified."⁶⁵

4. Linking Rural Electrification with Other Economic Development Efforts

Studies agree that rural electrification programs should be linked with other development efforts in order to assure full usage of electricity for economic development.

McCarthy. Concerning Indonesia, McCarthy comments that productive use of electricity "will not take off...unless the electricity supplies provide incentives, particularly connection cost incentives, for the initial start-up period of new small-scale industries." McCarthy also recommends incentives

⁶³Denton, p. 27 and AID, "Bangladesh," 1980, Attachment 2, p. 9.

⁶⁴Nathan, II, p. 55; IDB, 1979, p. 35; Hjort, p. 11.

⁶⁵World Bank, 1974, p. 10; and Hjort, p. 59.

to encourage industry to switch to central grid power and extensive advisory service to assist the switchover process.⁶⁶

McCawley. McCawley warns that electricity sales in Indonesia will remain well below target for small-scale industry unless general government economic policies foster industries that already exist in the area.⁶⁷

Cecelski. Looking at the Indian example, Cecelski stresses the interrelationship between key productive inputs such as credit, land, technology, and electricity. A change in the availability of any one, she feels, could affect an area's economic development. She comments:

It is important to keep in mind...that the demand for electricity is a derived demand; the demand for electricity for pumps is a result of the demand for irrigation; the demand for electricity for motor power in small industries derives from a demand for their products...thus, the benefits obtainable from electrification will depend equally upon complementary investment decisions and inputs, availability of credit...infrastructure, government information services, etc.⁶⁸

AID Bangladesh Project Papers. AID-funded rural electrification project plans recognize the need for linkage with other development programs and with other institutions. One result has been that targeted productive connections might be exceeded. Sign-ups show 30,204 irrigation/small industry sites compared to the 8,311 sites targeted.

5. Level of Development Necessary

Rural areas that make effective use of electricity in business, commerce, or agriculture appear to be those that have already achieved some degree of development prior to electrification.

The World Bank. The World Bank recommends locating rural electrification projects in areas where reasonably strong and growing demand for electricity already exists (e.g., an area

⁶⁶McCarthy, p. 2.

⁶⁷McCawley, p. 49.

⁶⁸Cecelski, pp. 16 and 20.

with reasonably good roads, rising wages and living standards, and growth of productive activities on- and off-farm).⁶⁹

Moon/NRECA. Moon suggests using criteria that include the existence of all-weather roads, consumer density, and the existence of local administrative expertise.⁷⁰

Cecelski. In areas where output and incomes are already increasing, Cecelski believes small industry outputs of consumer goods and agricultural implements should find ready markets. However, in less-developed areas, she points out that incentives are weak for entrepreneurs to use electricity in order to achieve higher output and profit levels. It is difficult for such entrepreneurs to raise the necessary capital for equipment and to find a market for the extra production. "If no markets can be found for extra production, then higher productivity simply means less employment, not a desirable result in the labor surplus economies of most developing countries."⁷¹

D. Rural Electric Organizations

1. Relationship of Rural Electric Cooperatives to Central Government Organizations

Nathan Associates, Inter-American Development Bank, and McCarthy. The strength and weakness of local electric cooperatives is often related to the support, or lack of it, that they receive from central authorities. The IDB has found instances where strong regional electric companies wanted to distribute the electricity themselves. And in Indonesia, McCarthy found that the cooperatives felt that the Ministry of Cooperatives was undercutting their power and autonomy.⁷²

⁶⁹World Bank, 1974, p. 54.

⁷⁰Moon, p. 137.

⁷¹Cecelski, p. 79.

⁷²Nathan, II, p. 35; IDB, 1979, p. 28; McCarthy, p. 3.

2. Cooperative Versus Other Organizational Forms

The World Bank. The World Bank found little evidence to suggest that one approach to rural electric organizations works better than another.

The merits of co-ops and other forms of local administration, as compared to the merits of supply from the utility, rest in the incentives to good management rather than in the incentives to consumers (which is one of the benefits which co-ops are thought to have).⁷³

Development Alternatives, Inc. Although believing that cooperatives were a preferred method of distributing electricity in rural areas, DAI found little evidence that cooperatives were providing many of their intended benefits. DAI suggested that in some cases it might be wise to promote rural electrification through either private companies or national authorities.⁷⁴

E. Financial Viability of Rural Electric Organizations

1. Forecasting Electricity Supply and Demand

McCawley comments:

Forecasting the likely effective demand for electricity in rural areas is an important exercise because demand will both determine revenue from sales and have an important bearing on unit costs. If tariffs are "too high," demand will be disappointing and the system will be underutilized, while if tariffs are "too low," the excess demand will need to be rationed and the implicit subsidies provided will be received by those lucky enough to be connected.⁷⁵

⁷³World Bank, 1974, p. 52.

⁷⁴DAI, p.59.

⁷⁵McCawley, p.47.

2. Electricity Rates

The World Bank. The World Bank notes that financial performance can often be significantly improved by appropriate attention to pricing policy. Furthermore, the Bank warns that it is important to establish a satisfactory pricing policy early in the program because of the exceptional unpopularity and difficulty of effecting price changes. The Bank feels that the two most common defects in tariff structure are the excessive use of declining block tariffs that do not correspond to marginal cost structure, and low tariffs that are often given to large consumers who are willing to pay more. And finally, the Bank found that in spite of the social and economic development aims of its investments, larger consumers frequently are subsidized the most.⁷⁶

Inter-American Development Bank. The IDB recommends adjusting rate structures so that the poor can afford a minimum monthly charge with loans or grants (from country sources) to help pay for individual connections. The Bank stresses the need to balance sufficient revenues with other economic and social impacts. An IDB study found that various tariffs were in effect in different areas. In some areas, urban users subsidized rural electricity consumption; in other areas, rural electricity rates were higher, reflecting the higher costs of delivering service to rural areas.⁷⁷

Cecelski. Cecelski found that cross-subsidies from domestic to industrial use appeared most common. Other subsidies were government subsidies (such as interest-free loans), which allowed operating and maintenance expenses to be met through revenues, or concessional rates from international lenders.

Cecelski also noted that in various developing countries of Africa, Asia, and South America, declining block structures were the most common. Large users such as industry paid towards the low end of the price spectrum.⁷⁸

Nathan Associates and McCawley. Nathan Associates and McCawley both warned against tariff structures that result in higher-than-average costs per kWh for residential use. An

⁷⁶World Bank, 1974, pp.34 and 41.

⁷⁷IDB, 1979, pp. 32 and 47; and IDB, 1981, p. 14.

⁷⁸Cecelski, pp. 63 and 66.

ideal tariff structure will encourage as many lighting customers as possible to purchase electricity, in keeping with the system's peak load capacity, and will attract other types of users so as to raise the overall load factor of the system.⁷⁹

3. Cost-Benefit Analysis

Nathan Associates. Nathan Associates found that cost-benefit analysis of rural electrification projects was conducted in only a few cases. The most important cost issues that needed to be addressed, Nathan Associates concluded, were comparative construction costs of central grid versus autogeneration systems, the relative power production costs of each system, and the relative administrative and personnel costs involved.⁸⁰

Cecelski. Cecelski felt that the following ought to be included in discussions of the costs and benefits: (1) cost of generation, (2) distance from the grid and population density, (3) the load factor (ratio of average to peak consumption for the system), and (4) the types of consumers who will be using the electricity.⁸¹

Inter-American Development Bank. An IDB 1981 report urges more cost-benefit analysis of rural electrification in comparison with other supply alternatives and stepped-up efforts to develop a standard methodology for cost-benefit analysis of electrification projects.⁸²

⁷⁹Nathan, II, p. 20; McCawley, pp. 47 and 50.

⁸⁰Nathan, II, p. 27-29.

⁸¹Cecelski, p. 51-52.

⁸²IDB, 1981, p. 17.

APPENDIX E

METHODOLOGY: FOUR AID RURAL ELECTRIFICATION
IMPACT EVALUATION STUDIES

by

Alice Davenport

I. BACKGROUND FOR THE FOUR COUNTRY STUDIES

In 1973, a congressional mandate required AID programs to attempt to reach the "poor majority" (as defined by per capita income, health, and nutrition status). With this new concern for the rural poor came criticism that infrastructure projects, such as electrification, do not have the impact of, for example, rural health, nutrition, and agriculture projects. Early evaluation studies were inconclusive on the benefits of rural electrification programs. Newer evaluations (e.g., Nathan Associates, Tendler, Cecelski) found existing project data inadequate for firm conclusions.

Since existing documentation did not provide sufficient information to evaluate the rural electrification sector as a whole, the Bureau for Program and Policy Coordination (PPC) undertook four country studies that attempted to supply needed information on the sector. The four countries chosen for studies--Costa Rica, Ecuador, Bolivia, and the Philippines--were located in Latin America and Asia, where the ID-funded electrification activity had taken place.¹ In choosing locations for these impact evaluations, PPC considered such factors as project maturity, availability of supplementary data, and ease of access to the country.²

For example, the Honduras project was not considered mature enough to justify an impact evaluation. And in Colombia, AID ceased its involvement in rural electrification so long ago that an evaluation study was not practicable.³

It was felt that Korean rural electrification efforts lacked sufficient data. Since AID was already funding an ongoing rural electrification impact evaluation in India (by Resources for the Future), another study there did not seem

¹AID has engaged in few rural electrification projects in the Near East and is not pursuing rural electrification as a project activity in Africa. (Practical Concepts Inc., "Patterns in Electrification Projects: An Analysis of AID's Automated Data," December 12, 1978. See Appendix E for a breakdown by country of AID electrification projects.)

²From host country sources, from AID, or from other sources such as NRECA.

³The Nathan Associates' report stated that in Colombia "the AID loan was a discrete project which expired over 10 years ago. There is no possibility of following up this activity after so long a period has lapsed." Nathan, II, p. C-22.

necessary. Also at the time of the evaluation studies, access was difficult to such countries as Pakistan, Nicaragua, or Afghanistan, where AID had been involved in rural electrification projects.

A. The Philippines

From 1968 to 1977 AID committed \$91.8 million in loans for rural electrification in the Philippines. This represented about 23 percent of the total project costs (estimated at around \$387.5 million).⁴

With an extensive rural electrification network already in place, and with central government commitment to electrify the entire country by 1990, the Philippines appeared to offer a fruitful field for study. In addition, Philippine rural electrification efforts emphasized individual household connections and the rural electric cooperative organization form, the model advocated by AID's sole rural electrification contractor, NRECA.

Extensive background documentation was available--the Nathan Associates' study lists some 46 documents relating to Philippine rural electrification. This included several evaluation reports.⁵ Finally, as a country facing a mounting bill for imported oil, the Philippines was representative of many developing countries in the same position.

⁴Nathan, II, p. P-8.

⁵Nathan, II, pp. P-10-P-14. Several examples are Herim et al., "An Evaluative Study of the Misamis-Oriental Rural Electric Service Cooperative," Research Institute for Mindanao Culture, Xavier University for the Philippines, 1975; Denton, F.H., "Philippine Rural Electrification: Social Analysis," undated (ca. 1976); Denton, F.H. Lighting Up the Countryside: The Story of the Electric Cooperatives in the Philippines, Development Academy of the Philippines, 1979. Nathan Associates' report comments: "A wealth of information and insight with respect to design, organization and implementation alternatives exists in the collective experience of hundreds of small private and municipal utilities which operate in the Philippines." (Nathan, II, p. P-94.)

B. Bolivia

Bolivia had several attractions as a study location. It had been a main focus of AID rural electrification efforts in Latin America. According to a study by Practical Concepts, Inc., 5 of the 11 Latin American Bureau electrification projects were located in Bolivia.⁶ The 1979 Nathan Associates' study had concluded "Bolivia offers some of the most promise for ultimately determining project effectiveness."

Two Bolivian projects, begun in 1973 and 1974 and obligating \$21 million, were chosen for study. These projects had reached sufficient maturity for an evaluation study, and there was adequate documentation. Development Alternatives, Inc. had, in fact, already designed an evaluation system (for the second Bolivian loan) which was to have provided baseline data for followup studies.⁸

In addition, the AID Mission welcomed an evaluation. The two main areas of AID's electrification efforts in Bolivia had been in the fertile south and on the harsher, colder Altiplano. The Mission hoped an impact evaluation might shed more light on the relative benefits of electrifying two such dissimilar areas. That is, could a better impact be achieved in the south than on the Altiplano with the same amount of money?

A final factor in the choice of Bolivia was an interest in investigating the relationship between rural electrification efforts and the unusually low energy prices in Bolivia.

C. Ecuador

From 1964 to 1972, AID funded three rural electrification loans in Ecuador, totaling \$5 million. Project design included cooperative and noncooperative subborrowers. (Funds went to three new rural cooperatives and to six existing private

⁶Practical Concepts, Inc., Appendix A.

⁷Nathan, II, p. B-24.

⁸Nathan, II, p. B-24.

electric companies.) This provided a ready-made comparison of the two forms of service delivery to the target population.⁹

Although the Nathan Associates' study did not recommend further evaluation efforts in Ecuador (on the grounds that AID's electrification loan activity had ceased), the study did find there was sufficient information available on Ecuador to provide "insight into some of the problems of rural electrification projects."¹⁰

The Mission itself was enthusiastic about an evaluation. The Latin American Bureau was planning followup projects in Ecuador, and the Mission wished them to have the benefit of an evaluation study of rural electrification efforts so far.

D. Costa Rica

Between 1965 and 1969, AID made loans totaling \$3.3 million for the purpose of electrifying three diverse areas of Costa Rica through member-owned cooperatives. (This loan was supplemented by \$818,000 in local funds.)

Although AID involvement had ceased in 1969, ICE (Instituto Costarricense de Electricidad) had, to some extent at least, pursued a program of rural electrification using the cooperative model.¹¹ Good documentation existed and several

⁹Samuel Bunker (NRECA) provides the following comment: "For the record, only one co-op ever received AID funds in Ecuador. Funds were scheduled for Daule and two others in the 1970 loan, but funds were not released until 1975, and by then the Daule cooperative had been taken over by INECEL [the national electric organization]." (Samuel Bunker, NRECA, memorandum dated September 30, 1980.)

¹⁰Nathan, II, p. E-24.

¹¹Several ICE technicians gave real support to developing cooperatives, but ICE, in principal, never really favored cooperatives. (Samuel Bunker, NRECA, memorandum dated September 30, 1981.)

previous studies had provided other useful perspectives on the impacts of rural electrification in Costa Rica.¹²

The final choice of four project locations was made by the rural electrification sector coordinator in the Bureau for Program and Policy Coordination, Office of Evaluation. The regional bureau evaluating staff assisted in the selections. Four studies were conducted between April and October 1980. Total cost of the four impact evaluations was \$66,525. (This included \$33,390 for operating expenses and \$33,135 for program expenses.)¹³

II. OVERALL SUMMARY OF EVALUATION TEAMS' METHODOLOGY

Of 20 team participants, 13 were AID employees. Teams were composed of people from a number of disciplines and with a wide range of AID experience. Team leaders were chosen on the basis of their professional qualifications and field experience. Team members who were not AID employees were social scientists or economists with local language capabilities and a familiarity with the country in which the evaluation was taking place. On occasion, the teams used the services of bilingual research assistants (e.g., Spanish/Aymara in Bolivia).

Preparatory workshops were held during which the teams defined the impact evaluation format and looked at specific project documents. Site selection criteria and timetables were worked out, and cables were sent to the Missions describing the proposed scope of work. Budget needs and travel details were ironed out.

During this period, team members also met with others, such as NRECA representatives, who had familiarity with the projects to be studied. AID Mission personnel and officials of the host country central government provided the teams with background material.

¹²For example, Ross, James, Cooperative Rural Electrification: Case Studies of Pilot Projects in Latin America. Praeger/NRECA, 1972 (includes chapter on Costa Rica); Davis et al., "Rural Electrification: An Evaluation of Effects on Economic and Social Changes in Costa Rica and Colombia," University of Florida, August 31, 1973.

¹³Average cost per evaluation was \$16,631 (\$8,347 for operating expenses and \$8,284 for program expenses). See Appendix C for individual project costs.

The four impact evaluation studies were conducted between April and October 1980. Each study took approximately 3 weeks, although the manner in which each team apportioned this time varied from study to study. For example, the Ecuador study differed from the others in that its team members did not conduct the household survey themselves. Rather, the local sociologist team member had his students conduct an in-depth household survey at one site, Santo Domingo, while the rest of the team made field visits to other locations.

Each team tried to visit as wide a range of sites as possible. Teams considered the following factors:

- Geographical, ecological, cultural, and economic variation
- Length of time the area had been electrified. Generally, teams preferred those areas electrified for longer periods over those that had been very recently electrified. The Costa Rica team, however, tried to include some sites that had been recently electrified
- Sites with a variety of consumers (residential, commercial, industrial, etc.)
- Ease of access to the sites (important because of the relatively brief time period allotted for each study)
- One team (Ecuador) sought a mix of cooperative and company forms to compare and contrast them as utility organizations
- Another team (Costa Rica) chose a mix of areas with cooperative, municipal, and national power company distributors.

In each area, the teams sought to contact a variety of users, e.g., residential, municipal, farm and agrobusiness, church, commercial, and industrial. Teams made an effort to interview people from different socioeconomic levels and to contact both adopters and nonadopters of electricity. The Costa Rica team sought a 50/50 male/female sample split. In addition, teams interviewed personnel from the local electric cooperative or company; from the national electric company; from local health, education, and social service institutions; and from other organizations that provided complementary services (e.g., credit unions, banks, irrigation agencies, potable water services, etc.).

The survey instrument varied among the studies. Two teams (Ecuador and Costa Rica) used a questionnaire. Most of the questions were closed-ended and addressed such issues as

productive use of electricity and income level of users. In Ecuador, the local sociologist team member directed a household survey that used a questionnaire form, while remaining team members gathered information by observation, interviews with officials, etc.

In contrast, the Philippines and Bolivia teams used unstructured interviews to gather data on household and other use.

None of the four teams used random sampling techniques, believing that with a limited number of cases, such techniques would not be helpful. Rather, the teams preferred to make an intuitive selection of respondents--using team members' expertise and local advice to ensure the broadest possible coverage of electricity users.

III. MAJOR ISSUES INVESTIGATED BY THE TEAMS

One major concern of all the impact evaluation teams was the effect of rural electrification on the poor. The teams were concerned with the following questions:

- Have the benefits of electrification reached the rural poor?
- What effect does electrification have on the quality of rural life?
- What effect does electrification have on industrial, commercial, and social service development in rural areas?

Three teams (Philippines, Ecuador, and Costa Rica) looked at the role of the cooperative form in rural electrification. The Philippine and Costa Rican studies discussed this issue in particular depth.

To greater or lesser degrees, all the studies touched on complementary programs that contributed to the success of rural electrification projects. (This would include economic development projects, electricity promotion programs, etc.)

Similarly, all the teams looked at the financial viability of the electric distributors (be they companies or cooperatives). Here, the teams took up such issues as rate structures, capital costs to consumers, and energy costs incurred in producing the electricity. In addition, the Bolivia team considered the relationship of financial viability and the

relatively expensive U.S. design standards used in AID-funded rural electrification projects.

IV. SUMMARY INFORMATION ON EVALUATION METHODOLOGY, BY COUNTRY

A. Costa Rica

1. Evaluation Team

- Paula O. Goddard, Team Leader (Bureau for Program and Policy Coordination)
- Gustavo Gomez, Management, Consultant (San Juan, Puerto Rico)
- Polly Harrison, Regional Social Science Advisor (USAID/Nicaragua)
- George Hoover, Engineer (Bureau for Latin America and Caribbean Region)
- Survey Team: Carlos Brenos Castillo, Ricardo Wing Arguello, Francisco Guido Cruz (Centro Investigaciones Sociales, San Juan, Costa Rica)

2. Costs of Impact Evaluation

Operating Budget:	\$ 6,705
Program Budget:	10,717
Total	<u>\$17,422</u> ¹⁴

3. Time

The study was conducted over a 3-week period in September and October 1980.

¹⁴Establishment of three cooperatives in Costa Rica had obligated \$3.3 million.

4. How Sites Were Chosen

The team chose to include sites in each of three AID-funded cooperative areas: in the area of a municipal power distributor and in the area of a national distributor. The study was carried out in the jurisdictions of Coopesantos, Coopeguanacaste, Coopelesca, Coopealfaroruiz, JASEC (Junta Administrativa de Servicios Electricidad) and ICE (Institute Costarricense de Electricidad).

Within each zone, the evaluation team chose:

- Sites that would reflect a variety of production systems
- Sites with adopters and nonadopters
- Sites not yet reached by electrification
- Sites in the same production zone but under the jurisdiction of different power distributors (to control for possible differences in distributor styles and relationships)
- Sites that had been recently electrified

The team visited a total of 17 communities in 8 counties in 4 provinces. The total sample was 96 households.

5. The Respondents

The team tried to choose respondents from different socio-economic levels, with a roughly 50/50 male/female sample split, and to include adopters and nonadopters of electricity. The team gathered data from 96 (structured) household interviews and from a number of unstructured interviews.

6. Survey Instrument

The team used a questionnaire with 61 questions, all closed-ended except the last one, which addressed perceived values and utility of electrification.

7. Procedure

At each location, the whole team had one morning's discussion with cooperative representatives. After the morning's discussion, the survey team conducted the household surveys. The other members of the evaluation team continued research at the level of cooperatives and other pertinent institutions (such as ICE and banks). These team members also interviewed different types and sizes of commercial and industrial users of rural electrification. (The household survey team dealt only with home commerce or industry that was part of or attached to the respondent's dwelling.)

8. Major Issues Investigated by the Costa Rica Team

- Do cooperatives serve the rural poor better than other available distribution systems? This included consideration of member participation, financial and technical viability of the cooperatives, rate structures, etc.
- Impact of electrification at the home/farm level and at the community/commercial level. This included consideration of economic growth in the area, and household, industrial, commercial, and social service use of electricity. The team also looked at the value Costa Ricans place on electricity.

B. Bolivia

1. Evaluation Team

- Edward Butler, Team Leader (Bureau for the Near East)
- Karen M. Poe, Anthropologist (Bureau for Program and Policy Coordination)
- Judith Tendler, Economist (Consultant)

All members of the evaluation team had extensive field experience in South America. The Assistant Evaluation Officer and the Engineering Officer from the Bolivian Mission assisted the team on specific tasks. Bilingual research assistants (who speak Spanish/Aymara and Spanish/Quechua) provided field support.

2. Cost of Impact Evaluation

Operating Budget:	\$ 4,440
Program Budget:	<u>18,607</u>
Total	\$23,047 ¹⁵

3. Time

The study was conducted over a 3-week period in May and June 1980. The team spent the first 2 weeks in the field collecting data. Members spent the final week in La Paz to obtain additional information and to prepare a preliminary draft of the findings. The findings were shared with the Bolivia Mission in a debriefing session.

4. How Sites Were Chosen

The team used the following criteria for site selection:

- Length of time the site had been electrified. Systems which were energized for longer periods were preferred over those recently completed or still under construction.
- Ecological and cultural variation. Sites were chosen that represented three distinct climatic and cultural areas of Bolivia.
- Ease of access to the sites for field visits. This was important because of the limited time available for the investigation and because of the great distances involved between regions affected by the electrification program.

The team chose four regional systems in Santa Cruz, Cochabamba, Sucre, and La Paz.

¹⁵Two loans to Bolivia from the United States had obligated \$21.3 million for rural electrification.

5. The Respondents

All team members conducted interviews with both household and productive (e.g., commercial, industrial, or agricultural) users. The team also interviewed staff from the National Electric Company and four distributing entities and consulted with personnel from other agencies that provided complementary services in each region--credit to small industries, irrigation development, potable water service, etc. The team sought to interview a variety of electricity users (residential, school, commercial, small industries, etc.) in about 30 towns and villages along distribution lines.

6. Survey Instrument

Interview guidelines were developed by the team and were modified as the evaluation progressed. Specific guidelines were used for contacts with utility and other agency staff. The team purposely maintained an open-ended interviewing style to facilitate the flow of information and to explore fully the interrelationships of electricity use with a wide range of social and economic activities.

7. Procedure

In each region, the team first visited utility management and technical staff for briefings on project problems and progress. Next, the team split up, and each member made field visits, following the different distribution lines radiating from the departmental capital into the rural areas around it. A variety of electricity users were interviewed in approximately 30 towns and villages along the entire distribution line, rather than preselecting communities and interviewees. "This enabled the team to determine impact in the unique context of each community and to pursue questions in greater depth, frequently selecting subsequent interviewees based upon information provided by previous informants."¹⁶

During the 3 to 4 days spent in each region, team members divided up analytic work by their interests and technical expertise. For example, the economist dealt with rate structures, the anthropologist concentrated on residential uses, the team leader looked at selected productive and social usage.

¹⁶Bolivia: Rural Electrification, p. E-2.

However, team members made an effort throughout the study to share information and to integrate their findings and analyses.

8. Major Issues Investigated by the Bolivia Team

- Impact of electrification on the quality of rural life. The team looked at households and social service uses for electricity and at people's attitude towards electricity.
- Impact of electrification on economic development in rural areas. This included a review of the role of promotional programs in rural electrification.
- Consideration of the effects of loan practices, rate structures, and high technical design standards on the financial viability of the utilities.

C. Ecuador

1. Evaluation Team

- Judd L. Kessler, Attorney, Team Leader (Bureau for the Near East)
- Janet Ballantyne, Economist (USAID/Peru)
- Robert Maushammer, Economist (Bureau for Latin America)
- Nelson Romero Simancas, Sociologist, Regional Planner (Ecuador Consultant)

Team members were chosen on the basis of their professional qualifications, extensive field experience, and fluency in Spanish.

2. Cost of Impact Evaluation

Operating Budget:	\$7,950
Program Budget:	<u>1,481</u>
Total	\$9,431 ¹⁷

3. Time

The study was conducted over 17 days in August 1980. While the AID team members visited various sites in Ecuador, Lic. Simancas' student teams conducted a week-long household survey in Santo Domingo.

4. How Sites Were Chosen

Choices of locations identified for site visits by the team were modified after the team's arrival in Quito. Sites finally chosen were:

- A cooperative at Santo Domingo and a company at Santa Elena. AID had been involved with both projects over a period of time and they presented widely varying topographic, productive, and demographic characteristics. In addition, they gave the team an opportunity to compare the cooperative and company forms of utility management.
- Daule. Daule had been the site of the only other AID-assisted cooperative that had operated for a significant time. But the Daule cooperative had been taken over by Ecuador's national electric company and merged with the company serving the nearby city of Guayaquil. The team felt that studying the failure of this cooperative might shed light on other issues in rural electrification.
- Ambato. Santo Domingo, Daule, and Santa Elena are located in the lowland coastal area of Ecuador (an area that contains almost half the country's population). Ambato, by contrast, is located in the mountainous area of central Ecuador which holds almost all of the remaining population.

¹⁷Between 1964 and 1972, AID extended three loans (total = \$5.8 million) to the Government of Ecuador for rural electrification.

The house-to-house survey was conducted only in Santo Domingo because of AID's extensive involvement in electrification in the area, the area's economic growth, and the availability of good baseline data. Although Santo Domingo is not representative of the rural areas of Ecuador, the team felt that the combined characteristics of the region, including large nonelectrified areas side-by-side with electrified ones, would provide useful data.

5. The Respondents

At each site, the team contacted:

- Individuals who had played a significant historical role in the development of the local electric enterprise
- Representatives of local branches of government institutions (e.g., the National Development Bank)
- Local health and social service organizations
- Residential, commercial, and industrial users and nonusers of electricity

6. Survey Instrument

The household survey, administered in Santo Domingo only, was developed in cooperation with Lic. Nelson Romero Simancas (who had lived and studied in the Santo Domingo area for 14 years). The survey was in the form of a questionnaire with 38 questions, most of them closed-ended. The questionnaire was aimed at such issues as identifying productive uses of electricity, impact on family and community life, income levels of users and nonusers, family outlays for all forms of energy, participation in community groups, and aspirations for family and community improvement. The AID team members used this survey as an empirical reference point for their necessarily more subjective judgments.

7. Procedure

The team spent several days in Quito refining the preliminary evaluation design that had been prepared in Washington, D.C., identifying and interviewing officials of key government

agencies and working with Lic. Simancas on the survey questionnaire design. The team modified the choice of locations originally identified for site visits.

At each site, the team contacted representatives of key organizations and various users and nonusers. At the same time, Lic. Simancas and his students conducted a household survey in Santo Domingo. The questionnaire was administered to over 600 households and businesses involving 3,200 persons.

The team spent the last 4 days in Quito collecting further backup materials and writing a preliminary draft of the evaluation report.

8. Major Issues Investigated by the Ecuador Team

- The role of cooperatives in rural electrification. The team considered the success of one Ecuadorian cooperative (Santo Domingo) and looked at the reasons the cooperative form was not successful elsewhere in Ecuador.
- The impact of rural electrification of poor households. This included a discussion of household, commercial, industrial, and social service uses.
- The relationship of rural electrification with broader political and economic trends and with other development efforts.

D. Philippines

1. Evaluation Team

- David H. Mandel, Team Leader, Project Development Officer (Bureau for Near East)
- Peter F. Allgeier, Economist (Bureau for Program and Policy Coordination)
- Gary Wasserman, Special Assistant, Political Scientist (Bureau for Program and Policy Coordination)
- Gerald Hickey, Anthropologist (Bureau for Asia)

- Robert Salazar, Social Scientist (Consultant)
- Josephine Alviar, Social Scientist (Consultant)

2. Cost of Impact Evaluation

Operating Budget:	\$14,295
Program Budget:	<u>2,330</u>
Total	\$16,625 ¹⁸

3. Time

The study was conducted over a 3-week period in April 1980.

4. How Sites Were Chosen

- The team restricted its selection to cooperatives that had been energized for at least 4 to 5 years. Since these older cooperatives had expanded, the team could look at recently electrified barrios within each cooperative.
- The team chose cooperatives with a full range of consumers--residential, commercial, industrial, irrigation, public buildings, and street lighting.
- The team also considered such factors as a range of rate levels, examples of self-generating and distribution-only cooperative service areas with high incidences of poverty, service areas offering agricultural opportunities of major importance to the Philippines, and geographic dispersion among the country's major island groups.

The sites chosen were at Calaca (Batangas Province), Daet (Camarines Norte Province), Manapla and Bacolod City (Negros Occidental Province), Tolosa and Tacloban City (Leyte Province), and Naga City (Camarines Sur Province).

¹⁸Total AID rural electrification investment in the Philippines has been \$92.15 million.

5. The Respondents

At each site the team met with the interviewed cooperative management and staff. In interviews in the poblaciones and barrios, the team actively sought interviewees who would help the team obtain maximum variety. A random selection was not considered appropriate for such a small number of sites. Team members sought interviews with persons who used electricity in business enterprises, school directors, health personnel, the parish priest, municipal officials, members of the cooperative board of directors, rural bankers and shopkeepers, individual farmers, farm laborers, fishermen, carpenters, and casual workers. The team tried to include adopters and nonadopters of electricity.

6. Survey Instrument

The team visited two cooperatives as a single team to refine research approaches and to familiarize themselves with each other's areas of inquiry. The interviews were relatively unstructured but intensive (each usually took over an hour). "The objective of the interview was to understand the conditions of rural life for the interviewee, how that individual responded to the introduction of electricity in the area and what that individual perceived to be the effects of electrification upon himself or herself and upon the community."¹⁹

7. Procedure

Prior to the study, the team reviewed literature on rural electrification and on the Philippine setting. The team also held a series of interviews in Washington, D.C., to gain additional background information and to develop the team's scope of work. Interviewees included AID staff previously associated with the project, NRECA personnel, U.S. Census Bureau staff involved in a Philippine survey of power use, and experts on rural electrification in other institutions (e.g., IBRD, Resources for the Future).

Three days were spent in Manila with AID Mission and staff of the National Electrification Administration of the Philippines to collect background material on areas considered for field work. The team members visited two cooperatives together

¹⁹The Philippines: Rural Electrification, Appendix I.

and concluded that it would be necessary to spend 3 to 4 days in each service area of the cooperatives studied. At each site, the team started with a half-day orientation and a series of interviews with cooperative management and staff. The rest of the site visit was spent interviewing people in the poblaciones and barrios.

After the field interviews, the team returned to Manila for discussion of preliminary findings with AID Mission and NEA staff. NEA provided additional information that had been unavailable in the field.

8. Major Issues Investigated by the Philippines Team

- -- Rural electrification and economic development. What complementary inputs are necessary for economic development in an area?
- Rural electrification and the poor. Have the benefits of electrification reached the poor? What has been the impact on the quality of life?
- The degree to which the cooperative form of organization has stimulated development.
- Financial viability issues. These include a consideration of rate structures, market compositions, relationship of electricity and rising energy costs, expansion of the system, etc.

APPENDIX F

REPORT ON THE RURAL ELECTRIFICATION SECTOR MEETING

(Washington, D.C. September 18, 1981)

by

Alice Davenport

I. INTRODUCTION

The Rural Electrification Sector meeting, sponsored by the AID Office of Evaluation/Studies Division, was held on September 18, 1981, at the State Department, Washington, D.C. Participants included representatives from various bureaus of AID, other international donor agencies (e.g., the World Bank), and the private sector. Approximately 50 participants at the day-long meeting, representing varying disciplines, expressed diverse views on the impact of rural electrification.

After meeting together in an introductory plenary session, participants divided into two discussion groups, each with a moderator and two discussants. The discussants gave short presentations on findings from the impact evaluations covered in the sector summary paper, before opening up the discussion to other members of the group. The following topics were discussed: The impact of rural electrification on households and ; the impact of rural electrification on agriculture and commercial/industrial use; utility and major policy questions in rural electrification. In a final plenary session at the end of the day, discussion group moderators reported on the conclusions of their workshops, identified major questions that remained, and gave several policy prescriptions.

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II. FINDINGS AND DISCUSSION: HOUSEHOLD USE

A. Findings of the Four AID Evaluation Studies

There were three main findings from the studies: (1) connection rates were high and included a substantial number of the rural poor, (2) electricity's major impact on households came from its social uses, and (3) productive use of electricity in the home was limited.

B. Comments by Participants

-- Reaching the rural poor is only one of a number of factors determining the location of rural electrification programs. For example, in Brazil, Argentina, and Colombia, electrification is a function of density. Electric lines follow roads, and customers tend to be located along these routes. Placing electrical lines along roads may be less expensive because population density is often greater than in outlying areas, but such households may not include the poorest, who are often located away from the roadways.

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In India, other criteria are used in selecting areas to be electrified. Electricity is introduced on a regional basis, with irrigation use emphasized, and there is limited concern for household hook-ups or the socioeconomic levels of those houses that do hook up. In the Philippines, another pattern was followed, but here, too, the socioeconomic makeup of area households was not often considered. Originally, priority for rural electrification in the Philippines was based on an area's need for small-scale industry, for agrobusiness, fishing, etc. Within each region the role of establishing priority was eventually turned over to the local cooperative boards, where a mix of political and financial concerns predominated the selection.

-- It is possible that the urban-rural dichotomy is overstressed in locating rural electrification in developing countries. Perhaps a better way of looking at this issue is to ask how long the time sequence is between electrifying towns and electrifying remote hamlets.

-- There is some evidence that rural electrification tends not to reach the poorest persons in the population. Some studies, such as the University of Florida survey, showed that those households with electricity have tended to be wealthier, more educated, and to hold more land than those without electricity.

-- Electricity is highly valued by rural residents. People will hook up, not only because electricity is "good," but because it is cost-effective. Electricity has been found to be price-responsive. Consumers will occasionally be influenced by cultural feelings for or against electricity use, but generally the decision to hook up is made when electricity is viewed as the least expensive energy alternative. The question is, at what cost will people hook up and how much subsidy is built into the tariff? All rural electric systems are subsidized because of uneconomical low load factors. And because of the high value rural residents place on electricity, there may be valid political reasons for government subsidization.

-- Another view suggests that the decision of a household to hook up depends on factors other than the cost-effectiveness of the electrification (e.g., households might be influenced by the reliability of the electricity or by promotions on appliances).

-- In India, the growth of household electrification has been relatively slow, especially among the poorest villages. Unreliable service has been a factor in limiting demand for household hook-ups. Those households which do have electricity indicated that rural electrification has improved the quality of their lives. And, as found in the four AID impact evaluations, little of the electricity was used for home industry or home business.

-- A noteworthy fact is that those who work in the field of rural electrification present conflicting information about the importance the rural poor place on electricity. Some observers have found that in areas where little infrastructure existed and where no electricity was available, the poor did not cite electricity as a top priority. In Indonesia and India, for example, electricity was well down on a list of desired items (e.g., after roads or potable water). However, other studies in Pakistan and Bolivia showed that the rural poor desired electricity second only to roads. It is possible that preference rankings for various infrastructure items may be a function of familiarity (e.g., it covaries with experience).

-- It was argued that household "productive use" of electricity may have been too narrowly defined in the four AID impact evaluation studies. The U.S. Bureau of the Census survey in Indonesia suggested that the availability of household lighting itself had an effect on productivity by lengthening the day. In addition, electricity-powered radios and televisions allow people to become better informed and may thus have an important indirect influence on productivity.

-- Widespread publicity is often neglected in rural electrification projects, yet is vital to the full use of the system, encouraging the use of electricity in the home, on the farm, etc.

III. FINDINGS AND DISCUSSION: SOCIAL SERVICE USE

A. Findings of the Four AID Evaluation Studies

Without explicit linkage to programs designed to develop social services (e.g., health clinics, adult education), electrification was only marginally used to improve social service in an area.

B. Comments by Participants

-- An underlying issue in this area of rural electrification is the unresolved question of whether rural electrification should be considered a social or a consumer good. Educational systems, for example, are judged on the basis of their social service benefits. Most countries view the social benefits of education as worthy of heavy government subsidization. Few question the value of such heavily subsidized social services.

But planners find it difficult to determine whether rural electrification is a social service or a consumer good. This is an important distinction, because criteria for "success" will be different depending on the point of view. It is possible that planners lean toward the "rural electrification as a consumer good" theory since social service benefits are extremely hard to measure in discussions of the costs and benefits of a system.

-- Rural electrification is being used to some degree for social services ranging from public lighting to health clinics, although the extent of use may be less than expected. Part of the reason for disappointing levels of social service use may lie in the fact that sources of decision-making in developing countries are often highly centralized. Social service organizations simply do not have the "response capability" of, say, private entrepreneurs who, given some available capital and skills, can make immediate productive use of available electricity. A major recommendation is that linkages must be strengthened to sources of decisionmaking in the social service sector to support their "response capability" to electrification.

-- Up until now, AID and other donor agencies may not have devoted as much planning effort to social service linkages as they should have. Such linkage is as important for the success of an rural electrification project in social service terms as the choice of the type of poles, lines, etc. is in technical terms.

-- There is a close relationship between social service development and economic development. That is, as an area develops economically, pressures grow for social services for the residents of an area.

-- A final question emerging from the discussion of social service use was the following: If a major project goal is developing social services, then is rural electrification really the best way to spend development funds? That is, would more be gained if the funds were invested directly in health or education rather than in rural electrification? Further, since rural electrification is a highly subsidized investment, is such an investment (sometimes supported by a highly regressive tax system) desirable in terms of reaching the poor and in providing social services for them?

IV. FINDINGS AND DISCUSSION: AGRICULTURAL PRODUCTIVE USE

A. Findings of the Four AID Evaluation Studies

The studies found that the most important impact of rural electrification on agriculture was indirect--through the growth of processing plants (e.g., rice mills) or farm service industry (e.g., equipment repair shops--and little use was made of electricity for irrigation or other on-farm uses except in large, relatively sophisticated farming operations such as dairying.

B. Comments by Participants

-- In agricultural use, as in household use, there is the problem of defining "production." In agriculture, can we limit a discussion of productive use to electricity used in motorized machinery? For example, could production be defined as new planting practices that may be adopted because of information disseminated through television? Off-farm (indirect) agricultural uses of electricity do seem to be more widespread than on-farm uses, and it is true that such off-farm uses of rural electrification often encourage productivity among area farmers. But such analysis is still measured in terms of the rural electrification used for motorized machinery. A wider definition of "productive use" should be considered.

-- Disappointing levels of electrical use for irrigation are related to the lack of linkages to social services and other complementary development inputs. Irrigation is a sophisticated farming process that requires knowledge of double cropping as well as access to fertilizer and a marketing system. In areas where electrified irrigation is appropriate, electricity is necessary but not sufficient for successful use of irrigation methods.

In the Philippines, AID is involved in small-scale irrigation projects that are trying to more fully use already existing electrical capacity. The real issue in these project areas was the lack of subsidization for irrigation. Planners expected that farmers would pay for the cost of the system. These costs included electric pumps and additional equipment to protect these pumps from brownouts and blackouts. Many farmers could not afford such costs.

-- With time and a good rate structure, one can increase the use of electricity for irrigation. But this is much more

difficult to attain where diesel-generated power is used: diesel-generated irrigation systems are generally small, and in many cases rapidly rising diesel costs are pushing pumped irrigation past the point where it is economical.

-- Philippines rural electrification programs did not include funding for linkages to encourage irrigation use. The project paper for the Bangladesh project, in contrast, includes linkage plans.

-- A study by Resources for the Future of India's rural electrification program suggested that potential for ground-water irrigation should be closely studied in locating electric lines. In areas with canal irrigation, for example, electrification did not have much impact on irrigation patterns. Planners in areas with attractively cheap hydropower, such as many areas of Africa, must be careful in assuming that irrigation will work in any given electrified area.

-- India, which has already encouraged use of electricity for irrigation pumpsets, is taking a hard look at grid extensions because of rising costs. Planners are considering providing electricity for pumpsets only and using the released funds for other rural development efforts.

-- It is possible that electrified irrigation systems resulting in double-cropping practices can encourage rural employment. However, in rural electrification, as in other sectors, AID may have vastly overestimated job creation effects of the investment.

V. FINDINGS AND DISCUSSION: COMMERCIAL/INDUSTRIAL PRODUCTIVE USE

A. Findings of the Four AID Evaluation Studies

It was found that commercial establishments and industries hooked up earlier and used more fully electricity if they were larger or if they were located in a market town where existing levels of economic development were relatively high.

B. Comments by Participants

-- In discussing productive output in an area, one will never be able to verify that economic growth was the result of rural electrification or that the growth would have occurred anyway without the rural electrification program. In other

words, it is a chicken and egg question: Which comes first, increased production or electrification? The likeliest way to deal with this question is to look at relative development levels as a continuum and to view rural electrification as merely one input in a process of growth--and to see electric energy as merely one choice among many.

-- While looking at the benefits of rural electrification for industrial production, one must also look at harmful consequences, such as possible displacement effects of new industry on the local rural farmers.

-- Although there is clearly a time factor in spreading the productive benefits of electrification (it takes time for local entrepreneurs to take advantage of the existence of electricity), there are nevertheless some areas where there is little potential for growth at all without massive infusions of other development aid. In such areas, electricity on its own will not produce hoped-for benefits.

VI. FINDINGS AND DISCUSSION: RURAL ELECTRIFICATION ORGANIZATIONS

A. Findings of the Four AID Evaluation Studies

The studies found that most AID-sponsored rural electrification organizations were well managed and delivered electricity to rural areas that would not have been served without AID intervention, and electric cooperatives did little to enhance democratic participation by the rural poor, although cooperatives did appear to help in keeping electric systems from being totally centralized by powerful national or regional utility systems.

B. Comments by Participants

-- The cooperative form for rural electrification organizations does not seem to have met planners' goals for participatory involvement. However, there is still much room for discussion about the definition of a "good" rate of participation. One may look at the number of members at meetings, the way members are involved with the management of the cooperatives, how basic decisions are made (are resolutions that are introduced by members then circumvented by management?) and commitment within the cooperatives to giving rural electrification to the poor. There may not be one key index for member responsiveness. Observers have found widely varying degrees of

member attendance at meetings, but figures compare favorably with attendance figures in the United States for rural electric cooperative meetings.

Other criteria for judging the success of the rural electrification cooperative form might be the responsiveness of the cooperative to consumer complaints, or the effectiveness of the cooperative in delivering electricity to its members. The degree of local technical involvement and the sustainability of the system may also be good indicators of the impact that an rural electrification cooperative has had on local participatory levels.

-- An interesting dichotomy is posed by the observation that in some cases (e.g., Indonesia), rural electrification cooperatives may not work unless the government creates a separate national rural electrification management entity. Other participants observed that local organizational entities that can control their own operations tend to be better managed. For example, rural electrification cooperatives that collect and control their own revenues have a vested interest in and responsibility for the system's continued functioning.

-- It is reasonable that rural electrification utility organizations should be judged on the basis of effective delivery of service, not on the levels of local participation in the cooperatives. Colombia, for example, has no cooperatives, but has a national rural electrification approach that produces the same end result as the cooperatives in terms of delivering electricity.

Some donor agencies are concerned with strong, uniform standards for implementation and evaluation. Such concerns may encourage centralized control over the rural electrification process and may limit the amount of influence of the local cooperative members. Some participants pointed out that strong central control, as in the Philippines, may be the key to the success of a program and does not necessarily result in less responsiveness to local concerns.

-- Cooperatives do not always provide cheap electricity, even with government subsidies. A study in the Philippines found that cooperative customers pay more for electricity than any other group of customers in the Philippines (including private rural electric companies).

-- Rural electrification cooperatives may not have fully met all the original participatory or cost-benefit goals envisioned by planners, but they may have provided a number of unintended benefits. First, there is the possibility of a spread effect from good management practices. Second, the cooperatives seem to be more influenced by local environments

than are central systems and, thus, cooperatives seem to provide a counter to centralized power.

VII. POLICY QUESTIONS

The following general discussion ties together a number of important points that were made at the rural electrification sector meeting and that have policy implications for AID. This section does not attempt to resolve all the policy issues that were raised; some questions will need more research before conclusions can be drawn. However, enough information is available on many of the issues discussed by the participants to suggest some important policy guidelines for AID in its future activities in the rural electrification sector.

A. The Objectives of Rural Electrification: Is Rural Electrification a Social Service or a Consumer Good?

In the past, rural electrification project planners have been unable to resolve whether electrification should be viewed as a social service or as a consumer good. The view of electricity as a consumer good frequently clashes with the political views of host-country governments that may see rural electrification as a social program that helps redress urban-rural imbalances. Participants generally felt that a range of objectives were valid for rural electrification systems. From the point of view of a host-country government anxious to show tangible concern for its rural population, rural electrification is an ideal social service program. Rural electrification ranks high in implementability and in replicability when compared to other revenue-generating social services like health care or public water systems. The fact that rural electrification is relatively easy to implement (because it is a tried and true technology) has made such programs very attractive to host countries and to AID in the past.

Political benefits of reaching rural residents with rural electrification are not always included in cost-benefit analyses. But rapid dispersion of electricity to rural households may, indeed, be a benefit that should be considered. Analysts should look at the reasons underlying such political benefits, and ask what it is worth to governments to obtain such benefits. Besides the political support of rural residents for a government, such benefits could include discouraging rural-to-urban migration, repopulation of underused areas, or defense objectives.

As energy and construction costs increase, fewer and fewer rural electrification projects will be affordable by governments, and many may wind down activity in the rural electrification sector. However, it is possible that cost-benefit analyses that factor in the social and political benefits would show good reasons for governments to continue rural electrification activities, in spite of higher costs.

B. Equity Issue

If rural electrification is viewed totally, or in part, as a social service, there are serious questions of equity to consider. It has been suggested, for example, that rural electrification may enhance regional differences between electrified and nonelectrified areas. In rural electrification projects, concern for regional equity has led to situations such as one in Pakistan where the host government required rural electrification in all provinces, even though electrifying some areas was very hard to defend on a cost-benefit basis. In such instances, it may not follow that development efforts must use funds for the same purposes in all areas to be equitable. Grid systems may not be suitable in some areas. Other energy systems, or other development efforts, may make better use of the development funds.

There is also some reason to believe that introducing rural electrification into a poor area may contribute to local inequities by enhancing societal stratification. The rich may be able to make far more use of electricity than the poor, through the use of appliances or farm or industrial machinery (which may be too expensive for the poor). As an example, before electricity is available for refrigeration, all villagers, rich and poor, must market daily. But after electrification, rich villagers who can afford electrification may change their daily marketing routine and thus set themselves off from the rest of the village.

Finally, it is not yet clear, judging from available studies, that electricity is the most sought after service in the poorest rural areas. Before assuming that the introduction of rural electrification will solve equity problems, planners should determine if electricity is desired by the local people over other projects such as roads or health clinics.

C. Where and How Should Rural Electrification be Introduced:
Economic Development

Rural electrification project plans have included expectations for economic as well as social benefits, and there are two ways of viewing the questions of economic development. One holds that electricity is a catalyst to development: once electricity is provided, other development follows naturally. Another view states that development is not spontaneous, that it requires many complementary development efforts.

The former position pins a great deal of faith on the capability of local farmers and entrepreneurs to respond and use electricity when it is made available. If rural electrification is viewed in this way, an argument can be made for placing rural electrification projects in areas that have already achieved a "development breakthrough," that is, in areas where education, capital, and marketing mechanisms already exist that can easily make use of electricity. Benefits to the poor could be expected to come from a "trickle-down" effect as the area develops economically.

The other view, that rural electrification is only one of many necessary complementary development efforts, has different implications. This viewpoint would encourage linking rural electrification projects with health, education, or agricultural development projects, for example, and would thus seem to encourage the introduction of rural electrification into the poorest, least developed areas that need all these services.

However, this dichotomy may be posing the question too starkly. In the real world, choices in rural electrification would be made on the basis of specific situations that could incorporate elements of both these views. In India, development of the agricultural production sector was seen as the key to generating demand for electricity. Thus, India has a subsidized rate structure for productive agricultural uses of electricity such as electric pump sets, and the hope is that once these inputs to agriculture increase production and incomes, more and more demand for electricity will be generated.

In some areas of India, local entrepreneurs have shown the capability to respond to available electricity. In Punjab, for example, studies have found a certain amount of spread effect as small factories electrify their operations. But Punjab has been called the "Switzerland of India" and had a relatively high level of development before widespread rural electrification efforts. The role of electricity as a catalyst in development has not been widely noted in other areas of India, where low load factors of 10 to 20 percent are still a problem. Implications are that if the government wishes to enhance the

economic development of a poorer area such as Bihar, it must introduce a wide range of complementary development inputs along with rural electrification.

In the future, as pressures mount for allocation of scarce resources, it may be that international funding agencies will be more likely to introduce expensive rural electrification programs in areas like Punjab, where development is more likely to take off on its own, than in areas like Bihar, where many other interventions will be needed. It may be that in areas like Bihar, equity questions may be answered by investing development funds in other projects, such as road-building, that could be more fully used by the poor for economic development.

D. The Role of Rural Electrification in Development

Many developing countries will be faced with some difficult energy choices in the future: how to reduce oil import dependence, especially for middle distillate supply (e.g., diesel fuel); how to reduce serious problems of deforestation as population growth presses up against smaller and smaller amounts of this traditional energy source; and how to improve the efficiency of energy used (wood, for example, has only a 5 to 8 percent energy efficiency conversion). Each of these problems interrelates; solving one may exacerbate another.

Given these problems, in a future where, except for isolated cases, there will be little cheap, reliable energy available, assumptions about rural electrification as a cheap energy source may have to be dropped. The question will become: how can specific energy needs be met in a cost-effective, reliable, and socially acceptable manner? The attraction of rural electrification as a tried and true, easily implementable technology will continue, but planners will have to look at development priorities and determine how rural electrification fits in with other sectors. Rural electrification should be seen as a sophisticated kind of energy which may or may not best meet an area's energy needs. Planners should ask if lighting or shaft power are the most important energy needs. Or perhaps process heat (for agricultural processing or cooking) may be the biggest potential use for electricity. The goal will become one of finding the best energy strategy for a particular developing area.

In India, for example, it may be desirable to use biogas for heating, cooking, and pumping. If electricity were used for lighting, this would free kerosene or diesel fuel to be used in the transportation sector, where there is no readily substitutable energy supply. But in Nepal, which has great

hydropower potential, tapping this hydropower for rural electrification may buy time to solve severe deforestation problems that beset the country. In this case, electricity may be the best energy choice for all rural energy needs.

E. The Costs and Benefits of Rural Electrification

A major roadblock to discussions of rural electrification as one major energy strategy available to developing countries is the difficulty of determining the basic financial assumptions that can be made about rural electrification. Much work needs to be done on the costs and the benefits of an rural electrification system. Issues include:

- The cost of money and the role of government subsidies
- The cost of energy (which has increased by a factor of 10 since early AID-funded rural electrification systems were designed)
- Financial viability of a system (how capital and current costs are being paid out)
- Costs and benefits of central grid and of autogenerated power
- Analysis of a government's political commitment to rural electrification (If rural electrification is a major political commitment, a government may want to proceed with a rural electrification project no matter what the cost.)

One of the difficulties in this kind of analysis is attempting to measure social benefits of rural electrification. If energy costs were low, it might be sufficient justification for the project to know that rural electrification does improve the quality of life in rural areas and that rural electrification provides an important psychological benefit as a tangible first step to modernization. But as cheap energy becomes more and more difficult to find, and as the cost of rural electrification rises, planners will need to take a closer look at rural electrification's benefits--in other words, they will need a more sophisticated knowledge of why rural electrification is "good."

All attempts to assess intangible benefits present their own problems:

- Using tariffs (what people are willing to pay for electricity) as a proxy for social value may not take

into account substantial, politically motivated subsidies by the country's government.

- Proposals to use the change in pre- and post-electrification real estate values (to quantify the benefits of household electrification) pose the problem that there is little or no market for land in many developing countries.
- To assess the social benefits of rural electrification, the costs and benefits of other social services should also be weighed. It is difficult to assess how much such programs as health clinics or adult education classes are worth.
- Attempts to measure behavioral differences in households with or without electricity as a way of assessing social benefits may not tell the full story. For example, factors other than the availability of electricity may have led to a person's reading at night in an electrified household (newly acquired literacy, for instance).

F. What Should Be AID's Future Role in Rural Electrification?

The following three major recommendations emerged from the discussions outlined above:

1. AID should look at rural electrification as a means and not as an end (i.e., rural electrification should be seen as one of many ways for meeting the energy needs of a given area). The major question should be how specific energy needs can be met in a cost-effective, reliable, and socially acceptable manner. Rural electrification should be seen as a sophisticated kind of energy that may or may not best meet an area's energy needs.

2. In order to fully assess the value of rural electrification in meeting the energy needs of an area, AID should conduct studies that will give a clearer picture of the costs and benefits of rural electrification systems. This is particularly important in a time when energy costs are rising while available development funds are decreasing.

3. If rural electrification is determined to be an appropriate development activity, AID must find ways to make its shrinking budget more effective. Because of funding considerations, AID may have to limit its involvement in infrastructure projects such as rural electrification in the future. Several suggestions have been made on the most effective ways for AID

to be involved if such is the case. Emphasize AID's involvement in all levels of rural electrification projects only in Security Assistance countries where sufficient funds are available. In Development Assistance countries, leave most of the financial involvement in rural electrification to multilateral organizations and develop a limited role for AID in rural electrification. Such limited activity could include involvement in pilot projects of innovative energy systems and at key points such as institution-building, credit for small-scale institutions, or loans for connections. AID could also be active in the broader role of assisting developing countries to plan for their overall energy needs (which is in keeping with the recommendation to view rural electrification as only one of many energy choices). Technical assistance on construction and maintenance of rural electrification systems should be closely linked with capital financing of the system, whether the donor agency is AID or, more likely, a multilateral lending organization.

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