International Survey of Low-Income and Rural Development Programs for the Electricity Sector

For the Development of the Indonesian Social Electricity Development Fund

Case Studies

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In cooperation with:
Institute of International Education
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Prepared for:
The Directorate General of Electricity and Energy Utilization

Ministry of Energy and Mineral Resources

Government of Indonesia

IIE-ERAG

DGEEU

Sponsored by:
The United States Agency for International Development Mission
Jakarta, Indonesia

22 January 2002

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Preliminary Draft

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Pursuant to:
USAID Task Order No. OUT-LAG-I-804-98-00012-00

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22 January 2002

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1. EXECUTIVE SUMMARY

This Research Report was commissioned to examine options for providing electric utility subsidies to low-income and rural energy consumers in the context of a larger restructuring of the Indonesia electric industry.

The Report examines many examples of low-income energy assistance programs from all over the world. The first group consists of energy efficiency programs, which seek to minimize the electric consumption of low-income consumers while meeting basic energy needs. Many of these are very promising in an international context, as they have the effect of reducing the amount of electricity which must be subsidized, and helping to alleviate electric generating capacity deficiencies which may exist. The second group are discounted rates for low-income consumers. Many different approaches are presented, some of which have less significant economic-efficiency impacts. A third group is made up of programs to provide bill payment assistance to low-income consumers. Again, these have a variety of economic-efficiency impacts. Finally, there are some options which do not fit neatly into any specific category. Most common among these are retail rate designs which are designed for all consumers, but which are most favorable to customers with small energy demands.

The Report also examines numerous examples of programs to extend electric service into rural areas. One group of programs involves installing distributed generating resources, particularly options using renewable energy technologies, to avoid the costs of extending transmission and distribution lines to remote communities. A second group of programs are those which subsidize the extension of transmission and distribution facilities. Some of these have been extremely successful in helping to transform rural economies. A third category involves programs to mitigate the rates paid by rural consumers. Some of these are supplements to subsidies for extension of transmission and distribution lines, while others are alternatives to such programs. A fourth group consists of rate design options implemented by utility regulators to mitigate rural electricity costs. The final category are programs to subsidize isolated remote diesel-based local power grids with funds from other areas.

The two general categories examined -- low-income energy assistance and rural energy assistance, are significantly interconnected. In most parts of the world, rural populations have lower incomes and less access to electricity than urbanized populations. The reasons that service has not been extended to rural areas are similar nearly everywhere. In many areas where rural electrification has occurred, local economic development efforts have been relatively successful, and rural poverty has been alleviated. In some areas, governments are now experimenting with the partial or complete withdrawal of rural subsidies, under the theory that the recipient communities have grown economically to where they no longer have a need for assistance.

This Report was prepared by a team based in the USA, but drawing on material available from throughout the world. In three regions, South America, South Africa and New Zealand, we retained research assistants to provide some local capability to enhance the final product.

2. PURPOSE OF THIS PHASE I REPORT

This research report is the first phase of a larger project to provide the Directorate General of Electricity and Energy Utilization (DGEEU) of the Government of Indonesia some ideas and tools to assist in designing a program to provide low-income electricity customer and rural electrification assistance within the context of a restructuring of the Indonesian electric utility industry.

This report provides examples of similar programs in use around the world. It does not make any recommendation for which programs are most appropriate for Indonesia to explore. Later phases of this project will examine in greater detail options that may be desirable in Indonesia, and propose specific options for detailed evaluation.

2.1. Phase 1: Research Report

This Phase 1 Research Report identifies more than fifty examples of programs implemented around the world to provide low income and rural electrification assistance. The majority of these are in North America, where many restructuring issues have been addressed. Where appropriate additional examples have been drawn from other regions.

This report consists of the following elements:

a) This Report, summarizing the findings of the research;
b) Appendix A: A set of Example Summary pages, one for each example discussed below;
c) Appendix B: An extensive set of reference materials relied upon in preparation of the Report, indexed by the Example supported.
d) Appendix C: A CD-ROM containing the Report, the Example Summary Pages, substantially all of the Reference Materials, and a number of additional publications relied upon in the preparation of the Report.

This preliminary January 21 Review Draft is being provided to a limited group of reviewers. Comments on this Draft Report are required by January 31 for incorporation into the Final Research Report. It is anticipated that the DGEEU will, on receipt of the February 10 final draft of this Report, identify specific options from those identified that they consider promising in the Indonesian context, and the research team will then develop more detailed discussions of those specific options. The identification of specific options by the DGEEU is required by February 20, 2002 in order to maintain the planned project schedule.

2.2. Phase 2: Policy Paper with Options for Indonesia

The second phase of this work will consist of a Policy Paper which identifies specific options for providing low income and rural electrification assistance in Indonesia. The Policy Paper will discuss a limited number of options in greater detail, so that the DGEEU can evaluate which of these is most promising for Indonesia. A draft Policy Paper will be provided for comment on March 1, prior to the finalization of the Phase 2 Policy Paper scheduled for March 31, 2002.

2.3. Phase 3: Presentation and Discussion

It is anticipated that the project leader, Mr. Jim Lazar, will travel to Indonesia in April or May of 2002 to meet with the DGEEU and other appropriate local entities to discuss the contents of the Research Report and the Policy Paper. This site visit will enhance the project leader's understanding of the future changes and the needs of the Indonesian electric utility system, and enable the DGEEU to draw directly upon the global experience of the project team and the specific knowledge of the project leader in particular.

2.4. Phase 4: Final Report with Recommendations

Approximately one month after the site visit to Indonesia, a Final Report on this project will be submitted, with specific recommended options for implementation in Indonesia. In the event that the DGEEU desires further assistance in the implementation phase, an arrangement for further assistance beyond the delivery of the Final Report will need to be arranged through USAID and IIE.

3. LOW-INCOME SUPPORT PROGRAMS

Programs to assist low-income consumers to better afford essential electrical energy services take many forms. These include energy efficiency programs, which help consumers reduce bills by reducing energy usage, discounted rate programs which reduce the bills, bill payment assistance programs which provide money to help pay bills, and some other options involving general utility rate design which may benefit low income consumers.

Each of these areas is discussed below, with references to examples and case studies from the project team's collective experience.

3.1. Energy Efficiency Programs

Energy efficiency programs can make utility bills more affordable for low-income consumers by helping them reduce their usage of electricity. By getting the same essential work done with less electricity, consumers benefit from lower bills, and utilities benefit from lower capital requirements and lower fuel costs. Environmental benefits also accrue from lower energy usage. In addition, in countries where the electric infrastructure is inadequate to meet all energy needs, or where growth is causing development of higher cost generating resources, efficiency programs for low-income consumers (or any consumer, for that matter) can result in improved reliability and lower costs for all consumers, not just benefits for low-income consumers.

3.1.1. Low-Income Efficiency Retrofits

Nearly every state in the USA and many other countries have programs in place to provide assistance with energy efficiency retrofits of low-income households. Typically these involve a combination of Federal funds and utility funds. The utility funds are most often justified by the avoided costs of providing electric supply as loads are constrained. These avoided costs include capital costs for new generating facilities, fuel, labor, and distribution losses. Most of the USA has space heating requirements, and these are the principal focus of these programs. The warmer areas of the USA often also define space cooling as an essential service, and provide assistance for cooling measures. In addition, assistance with efficient lighting and appliance upgrades are provided in some areas.

Most of the examples selected for this report have a common characteristic: low-income consumers receive energy efficiency improvements without a direct investment of their own money. By improving the energy efficiency of low-income homes by as much as 50 percent, the energy costs for these homes can be cut in half. To many analysts and policy-makers, this is the first and most important cornerstone of low-income energy assistance, especially where these customers are heavily subsidized by the government or other customers.

The first two examples, in California and Seattle, Washington, are substantially similar. Both rely on a combination of federal low-income weatherization funds plus local utility funds. Both have been in operation for two decades, originating with the oil, natural gas, and electricity price increases in the later 1970's and early 1980's. Both have reached a very large proportion of the target population. Both have relatively large annual budgets. The analytical techniques, funding mechanisms, and administrative methods of these

programs are applicable to any set of efficiency measures, not just the space heating conservation measures which are the focus of these programs.

The third and fourth examples, in New Zealand, had a different genesis. New Zealand was an early experimenter with utility restructuring. Today, wholesale supply, retail provision of electric power, and ownership and maintenance of distribution networks are three separate business enterprises. Four major entities are involved in wholesale supply and retailing, while ownership and operation of distribution networks is fully separated from these competitive businesses.

Initially, as a political concession to a large group of concerned environmental advocates, the restructuring process included the creation of an Energy Efficiency and Conservation Authority (EECA). The EECA was designed to acquire cost-effective resources through direct payment for savings, without a social focus. Within a few years, the political, economic, and social welfare issues associated with low-income energy efficiency became evident, and the EECA now applies a significant portion of its funding to low income consumers, particularly rural low income energy efficiency with a focus on individuals with health concerns. The Maori Housing Project, in New Zealand, includes an element of local economic development, providing job training to local unemployed workers to actually install the energy efficiency measures.

The final two examples here are from the United Kingdom. Like New Zealand, the UK was among the first nations to restructure it's electric utility industry, and initiated an energy efficiency system benefit charge from the beginning. Funding the Energy Savings Trust now principally benefit the Fuel Poverty Strategy (discussed in Example 3.3.1), of which a key element is the low income Home Energy Efficiency Scheme. This Scheme is nationwide in scope, managed by a single NGO contractor. We have provided information on the NGO, as well as a detailed example of one of the implementing local agencies, the Severn Wye Energy Agency.

Example: California Low Income Efficiency
Example: Seattle Low Income Efficiency
Example: New Zealand Energy Efficiency and Conservation Authority
Example: New Zealand Maori Housing Retrofit
Example: UK Home Energy Efficiency Scheme
Example: Severn Wye Energy Agency

3.1.2. Compact Fluorescent Lamp Installation

Historically, lighting is the first electricity end-use of which low-income households take advantage. In areas where space heating or air conditioning is either unnecessary or unaffordable, it remains among the largest uses of electricity in low-income households.

Incandescent lighting is cheap to install, simple, and reliable, but wastes energy. Compact fluorescent lamps provide 3 - 5 times as much light per kilowatt-hour of energy consumed. In areas where space conditioning is not a common element of low-income energy consumption, this can mean that huge percentage reductions in the amount of electricity demanded, and the cost of that electricity, can be achieved. In areas where air-conditioning is common, the cooler operation of fluorescent lamps also reduces air-conditioning power needs.

A number of programs have been developed to replace incandescent lamps in low-income households with compact fluorescent lamps. Notably, several of these programs have been stimulated by short-run shortages of electric supply, rather than long-term economic benefits.

The first example, Pacific Power, is a large investor-owned utility in the Pacific Northwest of the United States. This region is heavily dependent on hydroelectric generating capacity, and in 2000-2001 experienced a severe drought which resulted in soaring wholesale electricity costs and regional power shortages. Due to the dependence of California on power imported from the Pacific Northwest, this drought was one of the principal causes of the so-called "California Electric Crisis." Pacific Power responded, in part, by providing two compact fluorescent lamps to each of its residential consumers. Low-income consumers were able to obtain, additional lamps on request. The program was implemented on short notice, was completed in less than 60 days, and the energy savings were immediate. Other utilities throughout the states of Washington, Oregon, and California implemented similar programs during the drought; preliminary estimates are that approximately 10 million CFLs were installed regionwide.

The second example is a proposal that was made to PLN, the national electric utility of Indonesia, by the International Institute for Energy Conservation (IIEC) in 1999. This proposal noted that the retail rates charged by PLN were far below the average and incremental costs of new power supply, and that the utility could therefore actually hold down needed rate increases by implementing a lighting efficiency program. IIEC estimated that net savings (after all program costs, including lost revenues) of approximately 1.5 trillion Rupiah would be produced from the installation of 34 million compact fluorescent lamps.

A third example, which actually served as the basis for the IIEC proposal to PLN, was a retrofit by Electricite de France of 500,000 lamps in the Caribbean islands of Guadeloupe and Martinique, both administered by France. The utility's rates were far below the cost of diesel-generated electricity, the islands faced a shortage of generating capacity, and the utility was able to reduce capacity needs on the two island systems by approximately 7 megawatts with this program.

South Africa is taking a different approach. There, the national utility, ESKOM, has contracted with an NGO to operate a market-transformation program for compact fluorescent lighting. This program includes consumer education, wholesale and retail marketing incentives, and consumer subsidies.

The final example is in Brazil, where a severe drought in 2001 caused shortages of power on this hydro-dependent national grid. Actual curtailments of electric supply to all sectors of the economy were ordered, with penalties for any customers not reducing usage by 20%. In order to facilitate this reduction in the low-income sector, a local electric utility in the Sao Paulo area, Electropaulo, distributed 4 million CFLs to low-income households at no cost to the consumers.

Example: Pacific Power
Example: IIEC Proposal to PLN
Example: Guadeloupe/Martinique CFL Program

Example: South Africa Efficient Lighting Initiative
Example: Brazil Favela program

3.1.3. High Efficiency Fans

Ceiling fans are a major user of electricity in low-income households in hot-climate regions. The most common ceiling fan consists of a low-efficiency motor, often hand-wound. Even factory-built fans often use low efficiency motors. The highest efficiency ceiling fans can move the same amount of air with only half of the electricity.

The Regulatory Assistance Project conducted a training program in Energy Efficiency Promotion Policies in Hyderabad, India, during July 1999. During that program, participants expressed that the typical residential low-income household in India had one or two light bulbs, a fan, and a shared refrigerator. India has historically had state-owned utilities, which for political reasons, have provided basic residential electric service at a price far less than the cost of providing service. In addition, a significant percentage of residential consumers "bypass" the electric meter, taking service without payment, causing what are known as "non-technical losses." Therefore, the utilities typically lose a lot of money providing residential electric service.

Ceiling fans typically have a very high coincidence factor -- they nearly always operate at the time of the system peak demand. For that reason, providing *free* high-efficiency fans to low-income households would provide savings to the utility on fuel and generating capacity that would far outweigh the cost of the fans. In India, since the service was already being provided free or at below-cost prices, there were virtually no lost revenues to offset these savings.

Example: India Proposal of 1999

3.1.4. High Efficiency Refrigerators

After lighting and fans, the third major end-use of electricity in low-income households located in hot climate regions is typically refrigeration. Indeed, many countries establish home refrigeration as a national goal, and measure their efforts to alleviate poverty, in part, by the percentage of households having access to a refrigerator for storing perishable food items.

This purpose of this program was to develop and manufacture a high-efficiency refrigerator designed for use in apartments by lower income citizens. The unit devised uses about one-fourth of the electricity of the typical unit being replaced (10 - 20 years old), and provides energy savings that pay for the cost of the refrigerator in the first few years of operation. The program was designed so that low income housing authorities would purchase truckload quantities of these refrigerators at wholesale, greatly reducing the acquisition cost per refrigerator.

It should be noted that the refrigerators used in U.S. households, including low-income households, are much larger than those used in most of the world. A different type of refrigerator would probably be appropriate for a program implemented outside the USA. With relatively low penetration of refrigerators in Indonesia, it may be most useful to concentrate on efficiency standards for newly-manufactured appliances.

Example: Public Housing Refrigerator Program

3.2. Discounted Rates

After energy efficiency, discounted utility rates constitute the second broad category of energy assistance programs for low-income consumers. There are literally dozens of examples of special rate discounts for low-income households. Some apply to all households, based on income, while others are limited to low-income senior citizens, low-income handicapped citizens, or consumers already receiving some other form of low-income financial assistance.

There is a preeminent scholar in the field of low-income rate discounts. Roger Colton, a principal in the firm of Fisher, Sheehan & Colton (Belmont, Massachusetts) has written numerous books, papers, and expert testimony on the subject. Several of his publications are available for unlimited use (with attribution) on his firm's internet site (www.fsconline.com). Excerpts from one of his books, Funding Fuel Assistance (1996), describing many different rate discount programs, are included in Appendix A to this report, with several of the rate discount examples. The complete text of three of these publications is included in Appendix C, the supplemental materials CD-ROM.

Rate discounts for low-income consumers can take many forms. First, there are income eligibility standards for such rates. In the United States, these are typically set at some percentage of the federally-defined poverty level, or some percentage of the local median income. Second, there are programs which provide fixed monthly benefit, regardless of usage, programs which discount all usage, and programs which discount a portion of usage. Each of these approaches has different economic efficiency impacts, and different impacts on the energy and financial needs of the poor.

We have provided examples of many different types of discounts. The discussion below and the greater detail in the Appendices addresses how each affects both economic efficiency and the needs of the target population.

3.2.1. Straight Rate Discount

A straight rate discount is a fixed percentage reduction, which qualified low-income consumers receive on a utility bill. In the state of Montana, customers who meet the program standards for low-income energy assistance receive a 15% discount on their electricity and natural gas bills. This approach is simple, recognizes that the extreme cold climate in Montana implies that some households will have very large energy consumption, and assures that large families and those with significant space conditioning needs get a proportionate benefit. The disadvantage of this approach is that it provides an incentive for increased consumption during the space-conditioning season, when efficiency options may be more cost-effective.

Example: Montana Power Company

3.2.2. Income-based Discount

A number of utilities provide a graduate discount program, in which those customers with the lowest income receive the largest discounts. Public Service Company of Colorado tested such a scheme beginning in 1993. It provided a discount of 40% to customers with household incomes of 25% of the "poverty" level or less. The discount declined in steps so that customers with incomes of 76% - 100% of the "poverty" level receive only a 10% rate discount.

This has the effect of providing the most assistance to those with the greatest need. The actual credit to customers, was computed as a percentage of the estimated annual bill, but was credited to customers as a "fixed credit" mechanism (see Example 3.3.2, below), so that the month-to-month conservation incentives were not adversely affected by the discount.

Example: Public Service Company of Colorado

3.2.3. Usage-Based Discounts

A number of utilities provide usage-based discounts. Sometimes called "lifeline rates," these generally provide the largest discounts to the smallest levels of usage. The goal of this type of discount is to provide a significant savings to low-income customers for their essential electricity needs, but to not encourage excessive usage of electricity. In some cases, the discount is completely eliminated above some "reasonable" usage level. We have provided four examples of such discounts.

The first example involves the city of Burbank, California, a small municipal utility in the Los Angeles area, serving approximately 50,000 customers. This utility provides a 50% discount on the first 400 kWh of usage, a 25% discount on the next 350 kWh of monthly usage, and about a 20% discount on usage in excess of 750 kWh. By this design, energy for basic lights and appliances is provided at a very low rate, and energy for electric water heating is provided at a reduced rate. Customers who use large amounts of electricity, most often for air conditioning (i.e., usage in excess of 750 kWh/month) pay nearly the full rate paid by other consumers.

The second example is that of the largest investor-owned utility in California, Pacific Gas and Electric (PG&E). Pursuant to a decision by the California Public Utilities Commission, PG&E has historically provided about a 30% discount on all residential usage. During the California energy crisis of 2000-2001, PG&E was allowed to raise prices by an average of about 40%. The California legislature dictated that these increases were only to apply to usage in excess of the "conservation baseline" for most customers, and were not to apply to customers eligible for the low income rate discount. With these changes, low income customers now pay as much as 70% below the normal rate if their usage is very high. The economic efficiency impacts of this rate design are quite severe; the political and social factors leading to this legislative decision have not been examined.

Another example is the City of Seattle, one of the lowest-cost utilities in the United States, with a significant hydroelectric power resource, a very low-cost urban service territory, and a very socially motivated City Council. First, Seattle's residential rates of general application includes a three-block inverted rate design, with the initial block of usage provided at one-half the system average cost, and high levels of usage provided at two-

times the system average cost. From this steeply inverted rate design, Seattle grants a discount of 58% to low income customers in the first block, 63% in the second block, and 50% in the third block. The effect of this approach is that the largest discounts go to customers with the smallest usage, and the incentive to conserve at high levels of usage is greater.

In Arizona, a desert area where heating is not a major energy consumer, major utilities provide percentage discounts for essential levels of service, declining for larger users. The smallest levels of usage receive a 30% discount, while large low-income users receive no discount at all on usage in excess of "basic needs" amounts.

Example: Burbank, California
Example: California
Example: Seattle
Example: Arizona Progressive Rate Discounts

3.2.4. Percentage of Income Payment

A Percentage of Income Payment Program (PIPP) is a means of setting each customer's annual utility bill at a percentage of that customer's annual income that is determined to be "affordable." This is generally defined as 5% - 10% of total income.

A number of PIPP program have been established. The Clark County Public Utility District, near Portland, Oregon, established a PIPP program in the mid-1990's, which sets customer's bills at 9% of their income. This was determined to be an affordable level, leaving a reasonable portion of income for housing, food, clothing, and other essentials. Other PIPP programs have set this as low as 6%. This program was originally devised as a social welfare program, but evaluation by the utility has identified economic savings in reduced uncollectible bills, reduced termination of service costs, and other benefits to the utility.

Example: Clark County PUD

3.2.5. Marginal Cost Rates

In the late 1970's and early 1980's, the addition of new coal and nuclear generating capacity significantly drove up utility rates in the US. When surplus capacity resulted, short-run wholesale power market prices were far lower than average costs and retail prices. During the 1980's and early 1990's, many utilities in the USA established "economic development" rates for large industrial customers, setting their prices close to short-run marginal cost. Low-income advocates seized on this situation, suggesting that the same favorable treatment should be given to low income consumers. The logic was identical: industrial customers asserted that if not given discounts, they would not be able to operate, and the utility would not receive revenue from them, meaning that the utility would get no contribution towards its fixed costs. Low-income consumers took the same position: without discounts, the bills would be unaffordable, and the utility would not receive needed revenue from such consumers.

The state of Pennsylvania was a leader in this approach, with several natural gas utilities providing discounted rates to low-income consumers based on the commodity cost of the

gas, plus a small contribution to the fixed operating costs of the utility. Such a rate still exists at the Brooklyn Union Gas Company in New York.

Example: Brooklyn Union Gas Company, New York

3.3. Bill Payment Assistance

The third category of low-income utility assistance examined for this Report are programs to provide financial assistance to customers in paying their bills. These can take the form of cash grants or targeted bill reductions. Some of these programs are functionally identical to rate discounts, and the decision to address them in this section is somewhat arbitrary. While bill payment assistance programs tend to avoid some of the economic efficiency problems associated with rate discount programs -- i.e., encouraging the uneconomic use of energy through lower prices -- such programs often require additional administrative infrastructure to implement.

These programs take many forms, and the timing of assistance can vary. Some provide regular and predictable assistance. Others provide crisis assistance only when a customer is at-risk of having their service disconnected.

3.3.1. Federal Funding

Federal funds have been made available in many countries for low-income energy assistance. Some has been made available for low-income energy efficiency to reduce ongoing bills (see Section 3.1.1, above), while other funds are available for immediate payment assistance.

The U.S. Low Income Home Energy Assistance Program (LIHEAP) provides both forms of assistance. The majority of these funds are expended on efficiency, but a portion each year is set aside as an Energy Crisis Assistance Program. These funds are administered by the states, often through local community action agencies. This program is available nationwide, regardless of the form of utility system or the status of utility restructuring.

The United Kingdom, following implementation of their restructuring law, created a multi-agency task force charged with addressing Fuel Poverty. As with the LIHEAP program, the majority of these funds have been applied to efficiency programs to provide permanent benefits (see section 3.1.1, above), and a portion has been made available for cash assistance with energy crises. In the UK, this has been limited primarily to elderly consumers.

Example: Low Income Home Energy Assistance Program
Example: UK Fuel Poverty Strategy

3.3.2. Fixed Credit

The State of Maine created a program designed to provide energy assistance to low-income consumers without distorting the price signals in its overall rate design. It did so by estimating a customer's entitlement to assistance, dividing it by 12, and applying a fixed credit to each monthly bill.

The effect of this approach is that the customer actually sees the same rate as other consumers, and on a month-to-month basis, their bill varies in exactly the same amount as a non-participant, but they receive the benefit that is calculated for them in a monthly fixed amount.

This program could be described as either bill payment assistance or as a discounted rate.

Example: Central Maine Power Company

3.3.3. Percentage of Bill Credit

Another approach to achieving the same goal as the Fixed Credit is a Percentage of Bill Credit program established in Pennsylvania. This program computes an annual cost responsibility for each customer in much the same way as a Percentage of Income Payment Plan (see Section 3.2.4), but then applying the resulting annual credit in twelve identical monthly installments. The net effect is that the customer is expected to pay a pre-determined percentage of their income for utility service, but the monthly bills reflect actual usage, priced at normal rates, less a percentage which is based on the expected annual level of assistance.

This program could be described as either bill payment assistance or as a discounted rate.

Example: Columbia Gas Company, Pennsylvania

3.3.4. Waiver of Fixed Monthly Customer Charge

Most utilities have a fixed monthly charge for service (called a customer charge or a basic charge), plus a unit cost per kilowatt-hour consumed. Several utilities provide low income assistance in the form of a waiver of the monthly customer charge. Mason County Public Utility District #3, a small municipal utility in a rural area south of Seattle, obtains about 20% of its revenue from its fixed customer charge. For qualifying low-income consumers, this portion of the bill ($10/month) is waived.

This approach has the effect of providing exactly the same level of assistance to all qualified customers, and leaving the usage charge unaffected, so that customers have the same conservation incentive. From an economic efficiency perspective, this is desirable. It also eliminates any incentive such customers might have to go without utility service altogether - if they choose to use only the barest essential amount of electricity, their bill will be very small. The disadvantage cited by low-income advocates is that large families, who may need the most assistance, do not get proportionate help.

This program could be described as either bill payment assistance or as a discounted rate.

A program in South Africa, termed "Free Basic Electricity" is discussed in this report as a rural assistance program in Section 4.2.1, also fits the description of a waiver of the monthly customer charge. The South African program provides a free basic connection for a minimum customer load, with prepayment meters used to charge for actual usage.

Example: Mason Co. PUD #3
Example: South Africa Free Basic Electricity (Section 4.2.1)

3.3.5. Available Financial Resources

Ultimately, the ability of low-income consumers to pay for utility service is a function of their income and their other financial obligations. The Percentage of Income Payment Program (see Section 3.2.4) makes this calculation assuming that all low-income consumers can afford a uniform percentage of their income. The "available financial resources" approach measures these two factors -- income and other financial obligations -- individually for each consumer, and sets their utility bills at an acceptable portion of their available financial resources.

In the State of Iowa, which has an extremely cold winter, a calculation considering income, non-utility expenses, and an "affordable" heating bill is prepared for each individual consumer. The program pays for any amounts in excess of this. Funds for the program are provided by both the utility and by general taxes.

This program could be described as either bill payment assistance or as a discounted rate.

Example: Iowa Affordable Heating Payment Program

3.3.6. Direct Vendor Payment

In several states, programs have been set up where low-income assistance payments are made directly from social welfare agencies to the utilities. This has the effect of ensuring that the funds appropriates for these programs are actually paid to the utility, and are not diverted by the consumer. This assures the utility that they will receive a predictable amount of revenue at a predictable time.

The Direct Vendor Payment Discount takes this one step further. Because the utility has certainty as to the amount and timing of revenues, it grants the social welfare payment agency a discount from the otherwise applicable utility rates. This program results in lower working capital requirements and lower uncollectible expenses for the utility, thus justifying the discount.

Example: Direct Vendor Payment Programs

3.3.7. Bill Checkoffs

Numerous utilities have established voluntary check-off programs, whereby consumers can donate an amount of money over and above their utility bill in order to assist low-income consumers with paying their energy bills. Some utilities match these voluntary contributions with utility funds. In some cases, abandoned utility deposits are applied to such funds.

A relatively typical example is the Member Assistance Fund operated by the Salem Electric Cooperative. Members can donate any amount by paying more than their bill. All members are encouraged to "round up" their payments to even dollar amounts to do this. Each dollar of ratepayer contribution is matched by a dollar of utility contribution.

There are hundreds of these types of programs in operation in the USA.

Example: Salem Electric Cooperative Member Assistance Fund

3.4. Other Options

There are numerous other options for providing assistance to low income consumers in order to make electrical energy more affordable. This section describes several of these, which do not fit neatly into any of the categories outlined above.

3.4.1. Universal Service Fund

A "Universal Service Fund" is a pool of money collected from users of utility service in order to provide basic utility service at subsidized prices to target groups. In the USA, these are particularly well developed in the telecommunications area, since the USA undertook restructuring of its telecommunications industry more than a decade ago with the breakup of AT&T and the introduction of competitive long distance carriers. Until about 1990, surcharges on long distance calls provided subsidies for low income and rural telecommunications.

The Federal telecommunications Universal Service Fund is designed to provide support for five categories of consumers, including low income, rural, libraries, Indian (native American) areas, and rural health care. Some of these will be discussed in Section 4.3.1, for Rural Assistance. The program assists low-income consumers by helping them connect to the telephone system (by paying the initial costs of having telephone lines connected) and by providing for monthly bill reductions.

The effect of this program has been to preserve existing low income telephone service, permit more low-income consumers to apply for and receive telephone service, and to provide a reliable source of funding to subsidize this service.

As the electric utility industry has been restructured in various parts of the world, this Universal Service Fund approach has been emulated through the establishment of System Benefit Charges dedicated to energy efficiency, low income energy assistance, or both.

Example: Federal Telecommunications USF

3.4.2. Inverted Block Rate Design

Many utilities have adopted inverted block residential rate designs. These rates provide a basic allocation of utility service at a low price, and additional usage is priced at higher rates. Because most low-income households have lower energy use than average, such rate designs generally provide a benefit to a majority of low-income consumers. However, critics point out that some low-income households, particularly those with large families, use more than average amounts of electricity, and pay higher bills because of inverted rates.

There are many justifications for an inverted rate. First a utility with a limited amount of low cost power (from hydro or coal, for example), but which must pay market rates for incremental supplies, may implement an inverted rate to give each customer a fair allocation of the low cost supplies. Second, research shows that larger levels of residential

usage are correlated with space conditioning (heating and cooling), which in turn have relatively low load factors and high costs to service. Finally, during extreme weather a utility may be constrained in its supply of power, and an inverted rate is a way to ensure that those customers who limit their usage are not penalized.

Many utilities with inverted rates have separate rates for low-income consumers. The two approaches can be combined or separated. We have previously described Seattle's low-income discount to an inverted rate design.

Puget Sound Energy is a utility which gets about half of its power from low-cost hydroelectric sources, and the remainder from thermal generation. In 1975, it initially adopted an inverted rate design in the form of higher rates for higher levels of usage to reflect the poor load factor of electric space heating. Since 1980, the Washington Utilities and Transportation has ordered progressively larger increases to the end block of usage in order to provide a conservation incentive.

Pacific Power is a utility that gets only abut 20% of its power from hydro, but it has a number of older, cheaper coal plants as well. In a recent multi-year rate settlement, it agreed to apply no increase whatsoever to the first 600 kWh of service.

In the state of Vermont, the state government had an entitlement to a limited amount of hydroelectric power for a number of years from a dam that was located out of state, but which backed up water into Vermont. The state allocated this power to each utility in the state, provided that it was flowed through at cost to consumers. The result was that each utility provided a small amount of power each month to each residential consumer (about 240 kWh) at a very low price, with additional usage priced much higher. This hydro allocation ended some years ago, and this rate design was abandoned.

The state of California, as part of the collection of actions to recover from the 2000-2001 energy crisis, established sharply more inverted rates, with high levels of usage priced at nearly two times the previous level. This was done, in part, to permit zero increases to usage below the state-determined "baseline" level for each customer. As previously discussed in Example 3.2.3, low-income consumers were exempted from the highest increases to the final rate blocks.

Finally, in Chile, an effort to extend water and sewer service to low-income areas was established so that the initial basic provision of service was at a very low price, with much higher prices for additional usage. While the rate design was available to all consumers, low-income households were the principal beneficiaries.

Example: Puget Sound Energy – Washington
Example: Pacific Power - Washington
Example: Vermont Hydro Allocation
Example: Chile water / sewer expansion

3.4.3. Load Limiters

South Africa is a country with a substantial population of relatively wealthy (mostly white) professional and technical workers and farmers, and a very large population of

desperately poor (mostly black) workers. It is gradually extending electric service to the poor areas of the country. (See Sections 4.2 and 4.3, below).

To accomplish this without straining the capacity of the generation and transmission system, one method has been to extend service without meters to customers using what are called "load limiters." These are electrical devices that prevent customers from using more than a defined amount of power at any time. They are sized so that lighting, fans, and refrigerators can be used, if they are very efficient, but heating appliances (electric jugs, hotplates, and water heaters) cannot be used.

In Mafefe, a very poor township, this approach was used in order to avoid the cost of electric meters, meter reading, and variable billing to consumers. For small users, these costs can amount to one-third to one-half of utility service costs. This program has the effect of permitting a very minimal amount of service at low cost.

Example: Mafefe, South Africa

4. Rural Electrification Assistance

Throughout the world, rural areas have been the last to receive electric service. Private sector investors created utilities to offer electric service profitably in urban areas of most developed countries beginning in the 1880's. While such service spread into surrounding suburban areas over the past century, rural areas in much of the world remain unelectrified. About 2 billion people lack access to grid power. Many of these rely on diesel-generated power, which is an expensive, polluting, and non-renewable energy source, while most simply do not have electric service.

A multitude of approaches to providing rural electrification assistance have been and are being used. This report seeks to identify some of the most prevalent approaches, and some of the more promising options.

4.1. Energy Efficiency and Distributed Renewable Resources

One promising option for rural areas, particularly very small communities where access to the transmission grid is impractical is to install distributed generating resources using endemic resources, mostly renewable energy. Such resources reduce or eliminate dependence on diesel fuel, avoid environmental impacts, and provide reliable service.

The cost-effectiveness of renewable systems must be compared with the cost of expanding, operating, and maintaining central station generation, expanding transmission facilities, and the environmental costs associated with each. For this reason, when renewable systems are developed for remote, off-grid applications, a first priority is to ensure a high level of energy efficiency, as it is much less expensive to conserve energy than to generate it with small renewable energy systems.

This Report has identified a small collection of promising remote renewable system installations. There are literally thousands of other promising case studies of this type.

4.1.1. Grant-Supported Efficiency / Renewables

Because of the global interest in renewable resources, there are grant opportunities for installation of remote off-grid renewable systems. Many communities have taken advantage of these. We have looked at four such examples.

Alaska is as remote an area as any on earth. Many villages are accessible only by air, and may be hundreds of kilometers from the nearest source of grid power. The Alaska Villages Energy Self Reliance Program, and effort of an NGO, is helping three villages replace diesel units with a wind generator, a seasonal solar project, and a small hydro project. In each case, however, the program is starting with energy efficiency investments to reduce the need for generating capacity.

The Kaziba hydroelectric project in the Congo was developed to provide reliable power to a local medical hospital that serves a large geographic area. It previously relied on diesel generators. A total of $1 million was raised by the hospital for development of this system, mostly in the form of a grant from Norway. The project produces power that is surplus to the hospital's needs during off-peak hours, and this is sold to residents,

displacing kerosene lamps. The entire village is 40 km from the nearest electric transmission system.

Nepal is a country rich in hydroelectric potential, but poor in infrastructure and extremely poor economically. The Village Power Project involved installing a 5-megawatt hydroelectric system using donated turbines, local volunteer labor, and a limited amount of foreign aid, particularly technical assistance. The principal economic cost was to install a three-phase electric distribution system for the community.

The community of Yuxquen, Guatemala is 14 km from the nearest electric transmission system, which is across the border in Mexico. A donated wind turbine was coupled with a battery system and inverter to provide a minimal amount of electric power. The total cost, $17,500 for a 1.5 kw system, is expensive compared with central generating facilities, but a fraction of the cost of expanding grid power over 14 km.

Example: Alaska Villages Energy Self-Reliance Program
Example: Kaziba (Congo) Hydroelectric Project
Example: Nepal Hydroelectric Project
Example: Yuxquen, Guatemala Wind Turbin

4.1.2. Remote Solar Financing

Solar energy is a resource that is necessarily location-specific. In areas with a high amount of dependable sunshine, it is a very attractive resource. Increasingly in the USA, rural electric roadside signs are being fitted with solar systems rather than being connected to the nearest electric distribution system. Most of the US Navy's small island communication facilities in the South Pacific are now solar powered. The Coast Guard is using solar systems for navigation buoys.

A number of utilities have provided solar installations to remote locations as a part of their utility service. Idaho Power began such a program in 1990, in which it would own and maintain the solar systems, and customers would pay a fixed rate per kilowatt-hour for the power, based on the investment in the solar system. Public Service Company of Colorado currently offers a similar program.

In Swaziland, Africa, the Ministry of Natural Resources and Energy elected to install solar photovoltaic systems rather than diesel systems for a local medical clinic and six schools.

Example: Idaho Power Remote Solar Systems (Also PSCo)
Example: Swaziland School and Clinic Solar Program

4.2. Facility Construction Subsidies

The most commonly cited programs for rural electrification consist of government programs to subsidize the construction of transmission and distribution facilities into remote areas. The largest such program, the U.S. Rural Electrification Administration, has been emulated around the world. There are many other examples.

As with Roger Colton's work on low-income electric rate discounts, there is a pre-eminent organization in the area of rural utility facility development -- the International Programs

division of the U.S. National Rural Electric Cooperatives Association. This organization provides technical assistance throughout the world for rural electric system development, mostly on a volunteer basis. It is funded by the rural electric cooperatives of the USA, which is a group are a highly successful utilities serving millions of homes and farms in the rural USA.

4.2.1. Rural Electrification Administration / Rural Utility Service

One of many "New Deal" programs that helped to lift the USA economy from the depths of the great depression of the 1930's was the creation of the Rural Electrification Administration. The REA was originally created and endowed with Federal appropriations that it could lend to electric cooperatives at zero percent interest. This was the springboard from which USA rural electrification evolved. A total of $57 billion has been invested since 1930.

Today, the organization has been reconstituted as the Rural Utilities Service (RUS), as it includes some telecommunication functions. Today, having lost most of it's federal funding, it provides primarily below-market loans at interest rates of 3% to 5%. In general, while construction of transmission and distribution plant may be subsidized, maintenance and operating costs are not. Perhaps the most important lesson is that the start-up subsidies were largely one-time expenses -- most electric cooperatives in the USA today are fully self-financing. The successful rural economic development that followed electrification has helped to make them financially stable.

Brazil, like the Philippines and New Zealand, have emulated the USA electric cooperative funding model. The current program in Brazil is funded with about $200 million/year of funds generated by the national hydroelectric-based power system. These subsidies pay for expanding transmission systems into remote areas, and provide a source of funding for local cooperatives to develop distribution systems.

Alberta is a rural but wealthy province of Western Canada, with a fully restructured utility system including customer choice of generation suppliers. Individual customers seeking connection to the grid can apply for grants of up to $C5,250 Canadian ($3,500 USD). The provincial government provides this subsidy.

South Africa is in the midst of a massive program to extend electric service to townships are rural areas that do not receive power at the present time. The Government has made a massive commitment to provide all citizens with a basic basket of services, including "Free Basic Electricity." It is estimated that the annual subsidy required to reach the remaining 2.5 million households will be approximately $60 per year per household. It is expected that low-income consumers will be limited to basic essential service only -- using load limiters and/or pre-payment meters. Customers wanting larger connections will have to pay for the cost of extending service to their homes. This commitment is expected to take a decade to fully implement. Because it is the single largest commitment to electrification we identified in our research, we have provided extensive information on this commitment in Appendix B and Appendix C. As most of the beneficiaries are low-income households, this program could have been incorporated in Section 3, above as well; because it involves the extension of electric service into previously unserved areas, it was included in this section.

Uruguay is using an approach not unlike the earliest electric cooperatives in the USA. The national electric utility, UTE, is providing the basic components of power lines to local communities. The communities are then responsible for either hiring contractors or securing local volunteer labor to construct the distribution systems.

In Botswana, Southern Africa, a $3 million cost of extending service to two communities was shared between an international grant, a national park and luxury lodge near the community, and the national electric utility. A Line Service Charge mechanism was developed to provide for an equitable sharing of line extension costs between the recipients and the government.

Nepal is among the poorest and most rural nations in the world, with electricity reaching only a small number of the largest cities. A project now underway has identified a number of ways to reduce the construction cost of distribution facilities, including use of fabricated steel poles, simplified home wiring harnesses that can be self-installed, use of load limiters, and lower distribution voltages where distances are short. With these changes, they believe they may be able to reduce the construction cost of new distribution systems from $600 per customer to $120 per customer.

Example: U.S. Rural Electrification Administration
Example: U.S. Rural Utilities Service
Example: Alberta, Canada Rural Electrification Assistance Subsidy
Example: South Africa, Free Basic Electricity
Example: Uruguay Shared Cost Program
Example: Botswana Rural Electrification
Example: Brazil, Rural Electric Cooperatives

4.2.2. Franchise Requirements Under Privatization

One approach to "forcing" rural electrification is to make it a condition of the franchise or concession granted to a utility to serve an urban area. This is essentially a way of having urban areas subsidize rural areas which is functionally similar to the implementation of transparent subsidies. For reasons this Report has not examined, PLN has evolved using this model in Indonesia.

One example of this is in Guatemala, where a large concession to provide electric service was given to Ufacex, a Spanish utility, subject to a commitment to expand service into a large number of rural communities. The funding for the utility to do this was obtained through loans from the Inter-American Development Bank.

A second example is Waheke Island, a small island near Auckland in New Zealand, which is served with an underwater transmission line that was installed when the government owned and maintained the electric transmission system. New Zealand subsidized electrification from 1968 through 1997 with a small surcharge to the bulk power tariff. This program led to reticulated supply to around 98% of New Zealand's domestic consumers. Under the electric industry restructuring law, however, the distribution utility that acquired the line to Waheke Island as part of a much larger and profitable package is obligated to maintain and operated it until at least the year 2014. The line is clearly uneconomic, generating less in revenue than the annual maintenance costs. It is unclear if, or how, Waheke Island will be served after this mandatory period ends.

Example: Guatemala Rural Electrification Plan
Example: New Zealand Waiheke Island

4.2.3. Local Volunteer Labor Construction

One approach to constructing lines in rural areas is to use volunteer labor. This was addressed in Example 4.2.1, for Uruguay, above. There are many other such examples. The Salem Electric Cooperative was originally formed when a group of citizens pooled resources, including trees (for poles) and labor for construction. Electricity is a desired commodity in rural areas, and volunteer labor may be one way to extend facilities.

Example: Salem Electric Volunteer Line Construction

4.3. Rate Mitigation

The ultimate challenge for rural electrification is high cost. If the rate impacts can be mitigated, the demand for service can be expected to materialize. The USA has used a variety of different tools to mitigate high rates for rural utilities, the largest of which is the Rural Electrification Administration's low-interest loans discussed in 4.2.1 above. Other mechanisms, however, are also in use.

4.3.1. Universal Service Fund

Telephone service was restructured in theUSAa decade before it began in the electric industry. Therefore, the tools for rural assistance (as for low income assistance) are far more developed in the telecommunications industry than in the electric utility industry.

Every USA telephone user pays into a Universal Service Fund, designed to assure that virtually all Americans have access to telecommunication service. The fund provides $919 million per year for what are called "high cost" areas, mostly rural in nature. Additional subsidies are provided for low-income consumers (see Section 3.4.1, above), and for rural health care, schools, and libraries. One concern that economists have with such a program is that it encourages the population to migrate to (or remain in) rural areas, which may cause increases in the cost of other public services, such as health care, police, fire, and postal services.

In addition to the Federal subsidies for telecommunications through the Universal Service Fund, the states have their own programs to pick up where the Federal program leaves off. Washington State has a program that basically flows through the subsidies of the federal program, but adds to it a commitment to ensure that high speed data communications are available to rural areas, to prevent a "digital divide" between urban and rural areas from widening. This program is funded through a surcharge on non-rural basic telephone service.

Example: U.S. Telephone Universal Service Fund
Example: Washington State Universal Telephone Assistance

4.3.2. Fuel Fund

Remote areas that are served with diesel generating systems incur very high fuel costs, and therefore very high total electricity costs. The state of Alaska has a program for subsidizing these fuel costs, knows as the Power Cost Equalization Fund. This provides subsidies of up to 38 cents/kWh to some extremely remote communities. To prevent the subsidies from extending to rural commercial enterprises, the eligibility for this subsidy is limited to 500 kWh per month, enough for basic lights and appliances.

Example: Alaska Power Cost Equalization Fund

4.3.3. Low Density Discount

The Pacific Northwest states of Washington, Oregon, and Idaho include some very rural agricultural areas. While these areas have benefited from the financing provide by the Rural Electrification Administration in previous decades, the local electric utilities, mostly cooperatives, have much higher rates than other more urban utilities in the region. When Federal legislation was approved expanding the authority of the Bonneville Power Administration in 1980, it was also authorized to provide discounts on wholesale power sales to low-density utilities. Those utilities with fewer than 7 customers per mile (4 customers per km) of distribution line were granted discounts of up to 7% on wholesale power purchases. However, this program has an adverse element: the subsidy is earned based on density, but granted based on energy purchases. Most of the cooperatives flow the subsidy through the energy charge. The result is that these utilities have the highest distribution costs in the region (because of their low customer density), but the lowest per-kWh energy prices, because of the subsidy they receive on wholesale power purchases. The subsidies tend to accrue to the largest customers in the rural areas -- large irrigation farmers, food processors, and industrial facilities, rather than reducing the bills of rural farmers and residences. A lesson from this program is that the subsidies should be transparent and targeted, or they may be misdirected.

Example: Bonneville Power Administration Low Density Discount

4.4. Cost Averaging

Most utilities serve a mix of urban, exurban, and rural service areas, and most charge uniform rates across their service territories. The inevitable result is that urban customers subsidize rural customers. As utility systems expanded after 1900, utilities generally chose to not serve the most rural areas, but were sometimes obligated to by legal or political conditions.

4.4.1. Most Utilities: One System-wide Rate, But Limited Rural Service

The following is a typical example of a USA electric utility with one rate schedule for urban and rural customers. Avista Utilities serves the urban area of Spokane, Washington, plus rural areas in about a 100 km radius of the city. It charges a single residential rate schedule. The neighboring rural electric cooperatives, which serve exclusively rural areas, have significantly higher average distribution rates -- approximately $100/year more expensive than Avista's rates. With approximately 10,000 rural customers, Avista's urban consumers are subsidizing the rural users by approximately $1 million/year.

This approach is by no means unique to the USA. It appears that PLN retail rates have evolved using these same principles on a national scale.

This approach is not practical to reach all rural customers, because utilities lose money on the additional customers, ultimately becoming non-competitive in their urban service territories. In the USA, the unwillingness of investor-owned utilities to serve rural areas led to the creation of the Rural Electrification Administration.

There are a number of examples of utilities which have separate rates for urban and rural customers, charging each the cost of their electric service without subsidy, but these are the exception rather than the rule.

Example: Avista Utilities

4.4.2. Multi-Island Systems

Sometimes a single utility will serve a number of nearby islands with isolated, non-integrated generating systems. An example of this exists in the state of Hawaii, where Maui Electric provides service to the islands of Maui, Molokai, and Lanai. Maui is the largest system, and it has the wealthiest population. It has high voltage transmission facilities, combined-cycle generation, and other economies of scale. The systems on Lanai and Molokai are diesel-based, and have higher per-kilowatt-hour capital and operating costs. The Hawaii Public Utilities Commission has consistently required that about half of the premium in cost for the smaller islands be absorbed by Maui.

Example: Maui Electric

4.5. Isolated Diesel Systems

Throughout the world, small communities are served with diesel-generated electricity. In some places, this service is provided by a larger utility, and the utility subsidizes the service from its main grid revenues. Some excellent examples of this are in Canada, where some programs are relatively progressive, and others are economically inefficient.

4.5.1. System-wide rate for essential service

In British Columbia, electric service is provided for most of the province by BC Hydro, one of the lowest cost electric utilities in the world. While the majority of its service is provided in the more populated southern portion of the province using a 500 kV transmission grid, it serves a number of small communities with isolated diesel systems. BC Hydro provides these customers with up to 1,500 kWh per month at the "main-grid" rate, but additional usage is priced at the full cost of diesel-generated power. It has a similar program for business customers.

In Newfoundland and Labrador, on the east coast of Canada, a similar program exists, providing remote customers with 700 kWh per month at the main-grid rate, the next 300 kWh per month at an intermediate rate, and all usage over 1,000 kWh per month at the full cost of diesel generation.

Both of these utilities sell 98% or more of their power using the main grid, so that the cost of the diesel subsidies is a trivial incremental element that is charged to main grid customers. Because only an essential needs level of service is subsidized, customers do not substitute subsidized electricity for other energy needs, such as space heating; that is normally fueled by oil or LPG.

The Chatham Islands are about as remote a location as any in the world. Located over 1,000 km from the coast of New Zealand, some 100 families subsist on farming and forestry here. Prior to electric industry restructuring, the government provided an annual subsidy of $500,000 to support essential services, including electricity. Since that time, the subsidy has been abandoned, but the local Chatham Island Enterprise Trust was given a $12 million capital infusion. It has invested this sum in various productive enterprises, and is using the proceeds of those investments to subsidize basic services. It has elected to NOT continue the subsidy of electricity (instead diverting it to transport, health services, and other areas), because it found that the citizens could afford the unsubsidized cost of electric service at approximately $NZ.475/kWh ($.22/kWh USD). This is a case of a subsidy originally directed to rural electric service has been redirected to another rural assistance area.

Example: British Columbia
Example: Newfoundland
Example: New Zealand Chatham Islands

4.5.2. System-wide Rate for Isolated Diesel Service

While British Columbia and Newfoundland provide subsidies for only an essential level of service, some of the other Canadian provinces provide the "grid rate" to isolated customers regardless of their level of consumption. This is the case in both Alberta and Manitoba. The institutional structure through which this is done in the two Provinces is very different.

Manitoba is served by a traditional, vertically integrated, government-monopoly low-cost hydropower utility. A very small portion of the load is served with isolated diesel systems. The subsidy is absorbed in a uniform province-wide rate for the consumers of Manitoba Hydro. A uniform tariff under these conditions is hardly surprising.

Alberta is a fully restructured system, with investor-owned distribution utilities providing service, and consumers having full customer choice of power suppliers. The majority of the generation is coal-fired, and the tariffs, while relatively low by global standards, are among Canada's highest. Given the restructured nature of the system, Alberta provides this subsidy in a very different fashion. A remote customer served by diesel can still "choose" their power supplier from any of those serving the main grid. The difference between the cost of service from diesel, and the rate charged by the supplier, is absorbed by the transmission system, and charged to all customers connected to the transmission grid. This approach -- subsidizing customers NOT using the transmission system through higher charges to those customers who DO use transmission is the only way that the cost could be spread out province-wide under Alberta's restructuring law.

Example: Alberta
Example: Manitoba

5. NEXT STEPS

This research report is designed to provide a background of options for consideration in Indonesia. The next steps of this project are to move toward a set of proposals that are relevant for consideration in Indonesia.

5.1. Examination of Applicability of Alternatives to the Indonesian Context

We anticipate that DGEEU will review this material, and comment on those options which are most relevant for the Indonesian context. Those comments must be received by January 31, 2002 for this project to remain on the current schedule.

5.2. Policy Paper

Upon receipt of comments and revision of this draft Report, we will prepare a policy paper which outlines a number of options which we believe will be applicable in Indonesia to provide low income assistance and rural electrification assistance in a manner consistent with the proposed industry restructuring. That draft paper will be completed in March, according to the current schedule.

5.3. Presentation and Discussion

Following preparation of the draft Policy Paper, the project leader will meet with the DGEEU and other interested parties in Indonesia to discuss our findings and proposed recommendations. This visit is expected to include at least one site visit to a remote system, in addition to a general introduction to the system serving Java and Bali. This is planned for April or May, depending on the availability of key personnel.

5.4. Final Report with Recommendations

Upon return from this visit, we will prepare a final report with recommendations to conclude this phase of support to the development of the Indonesia Social Energy Development Fund.

6. APPENDICES

Each example above is addressed in greater detail in Appendix A, Example Summaries, according to the same numbering sequence. Much of the detailed material relied on in preparation of the report is provided in hard copy in Appendix B, Support Materials. Most of the material relied on in preparation of the report is also contained in Appendix C, the accompanying CD-ROM, in various common electronic formats.

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