ISSUES AND OPTIONS FOR RURAL ELECTRIFICATION IN SAPP MEMBER COUNTRIES AND RURAL ELECTRIFICATION PLANNING IN LESOTHO

(Contract No. LAG-I-00-98-00010-00)

Submitted to

Energy and Environment Training Program (EETP)
Global Bureau
The U.S. Agency for International Development (USAID)
Ronald Reagan Building
1300 Pennsylvania Avenue, N.W.
Washington, D.C. 20523

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March 30, 2003

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ISSUES AND OPTIONS FOR RURAL ELECTRIFICATION IN SAPP MEMBER COUNTRIES

ACKNOWLEDGEMENTS

This report entitled "Issues and Options for Rural Electrification in SAPP Member Countries and Rural Electrification Planning in Lesotho" has been prepared by CORE International, Inc., under its Energy and Environment Training Program - Indefinite Quantity Contract (EETP IQC) with the U.S. Agency for International Development (USAID). The Office of Energy & Information Technology within the Bureau of Economic Growth, Agriculture & Trade (EGAT) and the USAID Mission in Gaborone, Botswana directed all work performed by CORE International.

The preparation of this desk study required extensive research as well as field work in Lesotho. CORE's experts worked closely with officials from a number of countries in the region through the SAPP Coordination Center in Harare, numerous Lesotho Government ministries and agencies, in addition to various consumer associations and other stakeholders in Lesotho. The officials from these entities, and many others, provided valuable insights that significantly added to the quality and substance of this report. CORE would like to make a special mention of the following officials from Lesotho and the SAPP Coordination Center who supported the preparation of this report:

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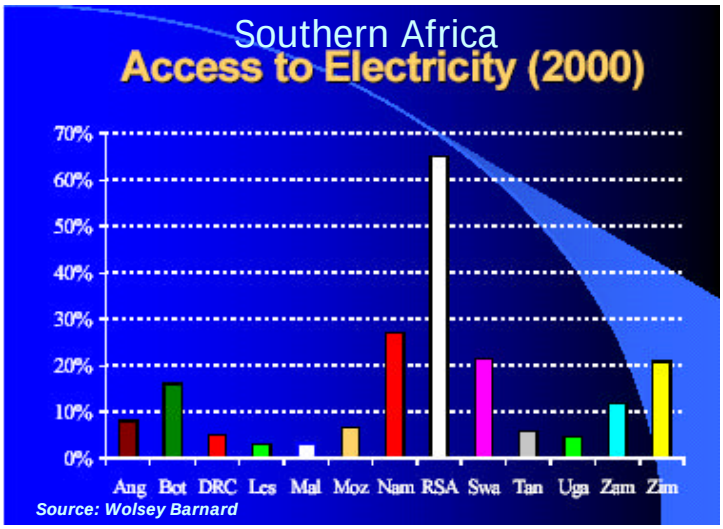
CORE International would like to specifically acknowledge the technical guidance provided by Dr. Kevin Warr, Program Analyst, USAID/EGAT/EIT, Washington, D.C. and Mr. Lovemore Bingandali, Infrastructure Advisor, USAID Regional Center for Southern Africa.

EXECUTIVE SUMMARY

The rural energy situation in Southern African countries is similar to that in other developing countries in the sense that rural areas are typically dependent on off-grid electricity systems, especially in areas that are remote and have a low density of demand. For large rural areas, close to the main urban areas, the typical approach used by developing countries to provide electricity is extension of the national or regional grid. Given the nature of demand, the delivery cost of electricity is generally higher than that in high-density urban areas. Most developing country governments, therefore, routinely subsidize rural energy, which has a direct impact on rural development.

Electrification levels in SAPP member countries are low. South Africa has the continent's highest electrification levels at approximately 70%, while the average level for the Southern Africa Development Community (SADC) member countries is 20%. Exhibit I shows the percentage level of energy access for the SAPP member countries and Uganda.

Exhibit I: Access to Electricity in SAPP Member Countries and Uganda

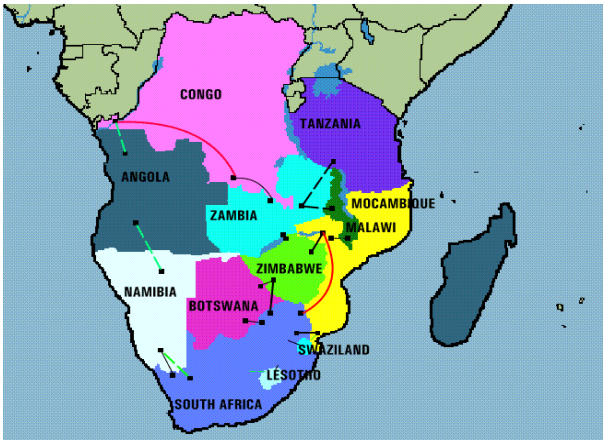


The level of access is changing, as both SAPP member and SADC member governments are starting to realize the importance of rural electrification to the economic development of rural areas. A number of countries have committed themselves to electrification goals for the short to medium term. For example, in Zambia, approximately 18% of the population has access to electricity at the present time. The Zambia's Rural Electrification Program aims to bring this figure to 50% before 2004.

Efforts have been made to collectively establish regional organizations to address economic development issues such as trade reform as well as promote regional economic integration. The Southern African Development Community (SADC), for example, was established in 1992 and has the primary focus to improve the environment for sustainable development in the region through the harmonization and rationalization of the policies and strategies of member countries. The South African Power Pool (SAPP), created in 1995, has the regional development goal of linking SADC member states into a single electricity grid for cost effective power and resources sharing.

Exhibit II shows the current electricity interconnections of the SAPP.

Exhibit II: SAPP Member Country Electricity Interconnections



Many of the SAPP countries have national energy plans and some have progressive and sustainable energy strategies that their neighbors could benefit from. This is particularly apparent in the area of rural electrification.

Rural electrification is important to the development of all rural economies but many such programs worldwide have not yielded the economic benefits commensurate with their investment costs. In Southern Africa, the rural population is generally disbursed in remotely located individual villages or clusters of villages. These potential consumers at the household and small industry level have, even in the most ideal circumstances, a low density for demand for electricity. This low demand makes grid extension cost prohibitive. Therefore, off-grid and decentralized electricity systems can be a more effective option.

Recent advances in both the technologies for off-grid systems, as well as the implementation strategies for such RE programs have resulted in successes in numerous developing countries including Bangladesh, Kenya, and Sri Lanka. As for advancements in technologies, solar PV systems, biomass systems, micro

and mini-hydro equipment, and wind energy units, have become significantly less costly, have become more reliable, and are more readily available as compared to even five years ago. These systems are known to be safer, benefit the environment through renewable resource use, and can substitute for traditionally environmentally harmful and/or costly fuels.

New strategies for implementing off-grid RE programs have been successfully implemented by analyzing, then correcting, the mistakes that have been made in traditional donor-financed RE program implementation approaches. The traditional approach required significant investment by donors and governments alike. Governments generally sought to make electricity available to rural populations as cheaply as possible by subsidizing its cost. This well-intentioned policy has not proven to be sustainable. The programs were not designed to create a cost-recovery based revenue stream because of the belief that rural populations - who are often poor - would be unwilling and unable to pay for electricity. In addition, the administration of the programs was centralized and the government often acted as the primary implementer. The result was that as delivery systems broke down due to poor or non-existent maintenance at the local/village level, more government and donor support was needed. The cliché for the traditional RE program was that 'as soon as the donors leave, so does the developmental impact.'

The need for RE to serve as a stimulus for economic development in remote and isolated areas still remains and best practices have shown that even some of the poorest rural populations are willing and able to pay for energy service delivery, even at a higher rate than urban consumers. However, the preconditions are that the service be reliable and of a high quality.

New approaches to RE development that are being developed and adapted include (i) encouraging private sector led participation, and (ii) involving the broader stakeholder community in all facets of the program including local management. These new decentralized schemes have had an immediate impact on economic growth in the rural areas by creating a culture for entrepreneurial skills development. Several best practices show that these programs are sustainable as any up-front government subsidies can be withdrawn after a period of time. Some examples of the institutional options for RE implementation include Rural Electric Cooperatives (RECs), Concessions, Franchises, and Energy Service Companies (ESCOs), which are discussed in detail in the body of this Desk Study.

Private Sector Led Participation in Rural Electrification: Private sector led participation in RE development is of interest to governments that are under severe pressure to explore other options for financing power sector investments when public funds are simply not enough to support the needed level of investments. Typically, when private sector companies see a need in the market

place they will try to capitalize and profit from the need through the provision of a particular service. In the case of RE, the private sector is faced with some glaring challenges. These include (i) a lack of a tradition of financing in the rural areas (no banks, no or little tradition of lending, no tradition of saving by the potential customer to make up front capital investments; e.g. for a home solar PV system); (ii) government prohibitions against natural resource exploitation, e.g. government policies which have the government as the sole owner of water use rights (prohibiting the development of mini- and micro-hydro schemes by the private sector); (iii) government tariffs which raise the costs of imported equipments up to 50% of their actual costs; etc. The private sector sees the RE market as one fraught with high risks and one unlikely to yield a commensurate return on investment.

Governments can serve as enablers for RE project development by directing market forces to drive its development. The best way for governments to do so is by proactively reducing private sector risks while providing a fair framework for businesses to operate. Enabling activities for the public sector to engage in include removing barriers that impede the diffusion of effective sustainable energy initiatives; removing subsidies which make alternative energy/alternative fuel use undesirable; designing and support schemes to finance mini- and micro-projects; adapting norms and regulations which take into account emerging sustainable energy technologies; adopting a more balanced and productive fiscal system in the energy field; stimulating competition; and contributing to both individual and institutional capacity building.

Governments' Role in Involving the Broader Stakeholder Community: Governments play a critical role in creating the enabling environment for cooperation amongst the private sector, the public sector (national, regional, local level), the financial sector, and the end user - including increasing 'social trust' in RE development programs. While the private sector involvement may increase efficiencies and alleviate some government financial burden, consumer and local participation in the design and implementation of RE programs has proven to dramatically enhance the sustainability of RE programs. Based on best practices, the World Bank has characterized this role very well in its "Best Practice Manual: Promoting Decentralized Electrification Investment" (Please see section IV.B.1 of this report).

> *"Governments need to assign clear responsibilities for off-grid system development and develop the necessary 'enabling environment' for RE programs to take root and prosper. Where an enabling environment is created that provides for more responsibilities to be placed in the hands of decentralized energy service providers and rural organizations and stakeholders, the more likely the program will succeed."*

In addition, governments need to look at all options, both in approach and in terms of most suitable technology options. Governments can play a role in ensuring a level and fair playing field in terms of competition for suppliers, equal access and ease of entry by new suppliers, and fair competition for grants, concessional funds, subsidies, tax breaks, and so on.

This Desk Study is designed as a reference document to facilitate discussions among participants from the Government and the stakeholder community in a Workshop on Rural Electrification Planning to be held in Lesotho in April 2003. The Desk Study focuses on best practices for, and lessons learned from, RE programs and projects worldwide. It presents a snapshot of the status of RE from the development point of view and describes the challenges and approaches to various critical issues related to the planning process of RE within the framework of the sustainable rural development for poverty alleviation. It is meant as a tool to assist the SAPP member countries when designing rural electrification programs and strategies.

Annex I provides selected reference materials and Annex II provides an extensive bibliography on the subject of rural electrification.

I. SAPP MEMBER COUNTRIES' BACKGROUND

A. REGIONAL ECONOMIC BACKGROUND

This Chapter discusses key elements of the economic background and provides a summary of the status of the energy sector in SAPP member countries based on best available information. The discussion has been kept limited in order to define the context within which all rural electrification planning needs to be carried out by the individual countries.

1. The Overall Regional Economy

Despite the weak external environment, growth in Africa held up relatively well in 2001 compared with other parts of the world. Although this growth is slowing slightly, final indicators will likely show a respectable growth in 2003. Conditions and prospects vary widely across individual countries. The key influence on the outlook for much of the Southern Africa region continues to be the interaction between commodity market developments, the conduct of economic policies, and the extent of conflict and other sources of civil tension.

In 2001, the combined Gross Domestic Product (GDP) for SAPP countries was estimated at $163.9 billion (see Table 1). SAPP member regional economies are structurally diverse and at varying stages of development. South Africa, the region's most developed economy with a GDP of $113.3 billion, nearly doubles the combined GDP of the other Southern African countries. While the region's economies grew at a combined rate of approximately 2.2% in 2001, the substantial external debt of individual states remains one of the region's greatest challenges. During the same time frame, the economies of Zimbabwe and the Democratic Republic of Congo (DRC) declined, and hyperinflation was rampant [DRC (337%) and Zimbabwe (77%)]. Angola, which showed growth above the combined rate also suffered from hyperinflation at a rate of 153%.

Total regional exports in Southern Africa, including intra-regional exports, were $48.5 billion in 2001. As a whole, Southern Africa had a $5.3 billion trade surplus for 2001. The region's major export commodities were energy products (oil and coal) and various minerals including diamonds, gold, and copper.

Recent increases in oil prices clearly support the outlook for Africa's oil producers, but are having an adverse effect on the many other commodity exporters in the region who are also the region's poorest countries. This negative effect has outweighed the modest pickup in non-oil commodity prices. That said, both strong and weak performers can be found within each of these groups, with the quality of domestic policies and the extent of conflict having a key impact on whether countries have been able to resist the external downturn or not.

Table 1: Economic and Demographic Indicators

Country	Gross Domestic Product (GDP), 2001E (Billions of U.S. $)	Real GDP Growth Rate, 2001 Estimate	Real GDP Growth Rate, 2002 Projection	Per Capita GDP, 2001E	Population 2001E (Millions)
Angola	$8.3	3.4%	11.2%	$610	10.4
Botswana	$5.1	8.9%	4.2%	$3,057	1.6
D.R. Congo	$7.0	-4.3%	2.7%	$134	53.6
Lesotho	$0.8	3.2%	2.9%	$386	2.2
Malawi	$1.5	3.0%	5.3%	$133	10.5
Mozambique	$2.4	10.5%	9.5%	$132	19.4
Namibia	$2.9	2.7%	4.0%	$1,538	1.8
South Africa	$113.3	2.2%	2.0%	$2,492	43.6
Swaziland	$1.2	2.0%	2.5%	$1,117	1.1
Tanzania	$8.9	5.1%	5.7%	$247	36.2
Zambia	$3.1	5.2%	4.3%	$301	9.8
Zimbabwe	$9.4	-7.9%	-15.0%	$761	11.4
Total/Average	**$163.9**	**~2.2%**	**~2.1%**	**$813**	**201.6**

Sources: DRI/WEFA; Central Intelligence Agency World Factbook 2001; International Monetary Fund; World Bank - Adopted

More historical data on SAPP countries' selected macro-economic indicators are shown in Table 2 below.

Table 2: Growth of Output *(at constant 1995 market prices)*

Country	GDP / PIB (Millions of 1995 $)		Annual Growth Rate %		Per Capita GDP / PIB Per Habitant (Constant 1995 $)		Annual Growth Rate %	
	1990	2000	1991-1999	2000	1990	2000	1991-1999	2000
Angola	6 189	6 647	1.1	2.1	647	506	- 2.1	- 0.8
Botswana	3 574	5 979	5.0	7.7	2 883	3 879	2.7	6.5
DRC	8 203	4 368	- 6.0	- 6.1	222	86	- 9.0	- 8.6
Lesotho	768	1 117	3.9	3.3	457	549	1.9	1.9
Malawi	1 234	1 739	4.0	1.7	131	154	2.2	0.8
Mozambique	1 967	3 380	6.2	1.6	144	185	3.0	0.4
Namibia	1 677	4 156	11.4	3.3	1 220	2 366	8.6	1.4
RSA	144 763	172 074	1.6	3.4	3 980	3 973	- 0.2	2.0
Swaziland	1 121	1 542	3.3	2.5	1 457	1 667	1.4	0.8
Tanzania	4 808	6 513	2.9	5.1	185	185	- 0.2	2.6
Zambia	3 716	3 978	0.5	3.6	462	382	- 2.1	1.3
Zimbabwe	6 703	7 818	2.4	- 5.1	655	619	0.3	- 6.8

2. Energy Sector Overview and Status of Rural Electrification

This section summarizes key aspects of the overall energy sector and the status of rural electrification in SAPP member countries based on best available information.

2.1 Status of Energy Provision in SAPP Member Countries

SAPP countries as a whole are a net energy exporter. In 2000, SAPP countries collectively consumed (see Table 3) 5.397 quadrillion British thermal units (Btu) of commercial energy (1.4% of total world consumption) and produced 9.32 quadrillion Btu (2.3% of total world production). Also in 2000, the region generated 118.03 million metric tons of carbon emissions (1.9% of the world total). The region's dominant economy, South Africa, accounted for 84.9% (4.64 quadrillion Btu) of energy consumption, 77.4% (7.21 quadrillion Btu) of energy production, and 88.8% (105.85 million metric tons) of the region's carbon emissions.

Table 3: Total Energy and Carbon Dioxide Emissions, 2000

Country	Total Commercial Energy Consumption, (Quadrillion Btu)	Total Commercial Energy Production, (Quadrillion Btu)	Net Energy Exports, (Quadrillion Btu)	Carbon Dioxide Emissions (Million metric tons of carbon)
Angola	0.090	1.621	1.531	3.60
Botswana	0.053	0.025	-0.028	0.95
D.R. Congo	0.104	0.111	0.008	1.10
Lesotho	0.004	0.000	-0.004	0.05
Malawi	0.020	0.010	-0.011	0.24
Mozambique	0.031	0.073	0.042	0.36
Namibia	0.025	0.000	-0.025	0.32
South Africa	4.643	7.213	2.570	105.85
Swaziland	0.022	0.009	-0.013	0.32
Tanzania	0.058	0.024	-0.034	0.68
Zambia	0.095	0.086	-0.010	0.59
Zimbabwe	0.252	0.144	-0.108	3.97
Total	**5.397**	**9.316**	**3.918**	**118.03**

Sources: Energy Information Administration - Adopted

Commercial energy resources in the region are diverse, with significant reserves of coal, petroleum, and natural gas. Electricity in Southern Africa is generated through thermal or hydroelectric resources (with one nuclear facility in South Africa). Natural gas is becoming more significant to the region's energy sector as fields off Mozambique, Namibia, South Africa and Tanzania are developing.

Due to the region's relatively small urban population (approximately 25.4%), access to commercial energy sources is limited. Biofuel accounts for approximately 75% of total final energy demand in the region. The countries with the highest rates of biofuel consumption are Tanzania, Mozambique, Zimbabwe, Zambia, and Malawi.

In the Southern Africa region, the energy sector is still driven primarily by issues of supply instead of demand. There is little focus on the demands of the energy users. Sustainable solutions of energy provision should consider energy consumers and their priority needs on the one side, which the development cooperation agencies should look carefully at funding energy interventions that helping provide sustainable solutions, on the other side. Research on better donor agency interventions, including pilot projects, should focus on developing end-use efficiencies, cleaner technologies, renewable resources, and the market for these renewable energy and energy efficiency technologies. Many of the technologies in question are already commercialized, and others need further development and/or adaptation to suit conditions in Southern Africa. Emphasis should be placed on making the technologies affordable.

Governments of the region are generally faced with the lack of financial resources to fund rural electrification. There is a need to restructure the domestic energy sector to provide an enabling environment for the attraction of private sector financing as well as dissemination and exploitation of renewable and energy efficient technologies. Multi- and bi-lateral donors can provide part of the funding needed for the implementation of rural electrification programs. Development cooperation agencies can provide capacity for Southern Africa governments to find and access the information that they need, and fund regional research and development and cooperation, in order to get the best value for their investment. Government seed money is a part of the financing and the private sector may be the best source and most critical component for funding the remainder if sustainable electrification at the desired level of 100 percent is to be accomplished.

Programs addressing development cooperation priorities (centering on poverty alleviation, job creation, and the improvement of basic services such as education, health, and water supply) often depend on sources of energy that are secure, affordable, and appropriate to the end-user. This is why the energy sources and the service technologies have to be well thought out and end-users must be approached and involved at the early stages of project preparation in order for programs to be successful. End-users cannot be expected to agree to the use of inappropriate or costly technologies. Also, many end-users cannot afford to pay for costly systems.

2.2 Regional Cooperation and Coordination Among SAPP Countries

Many of the SAPP countries have national energy plans, while some have progressive and sustainable energy strategies that their neighbors could learn from. Effort should be made to ensure that the lessons that have already been learned are shared with those who could benefit from them. Economies of scale may only be achieved if countries work in a coordinated way to develop regional strategic plans. Ensuring consistency in regulations and standards among the SAPP countries will give energy service providers and manufacturers of adapted renewable energy technologies access to larger markets. Identifying the common problems and sharing research activities among countries will begin to build capacity in all countries, instead of just the favored few.

The regional trade of energy among SAPP members is also extremely important. Large energy projects are viable only if their potential markets include several countries in a region.

2.3 Electricity Within SAPP Member Countries

Southern Africa's total installed electric generating capacity was 53,6 GW at the beginning of 2000, the majority of which is thermal (see Table 4). Total electricity generation for the region in 2000 was 226.76 billion kilowatt-hours (bkwh). Net hydroelectric generation was 28.76 bkwh, with Zambia (7.78 bkwh), Mozambique (6.77 bkwh) and the DRC (5.30 bkwh) being the largest generators. In 2000, total regional electricity consumption was 211.19 bkwh, led by South Africa's 181.52 bkwh (85.1%). Zimbabwe (10.48 bkwh, 4.9%), Zambia (5.8 bkwh, 2.7%) and the DRC (4.58 bkwh, 2.2%) were the next largest electricity consumers.

Table 4: Electricity Overview, Billion Kilowatt-hours except where noted

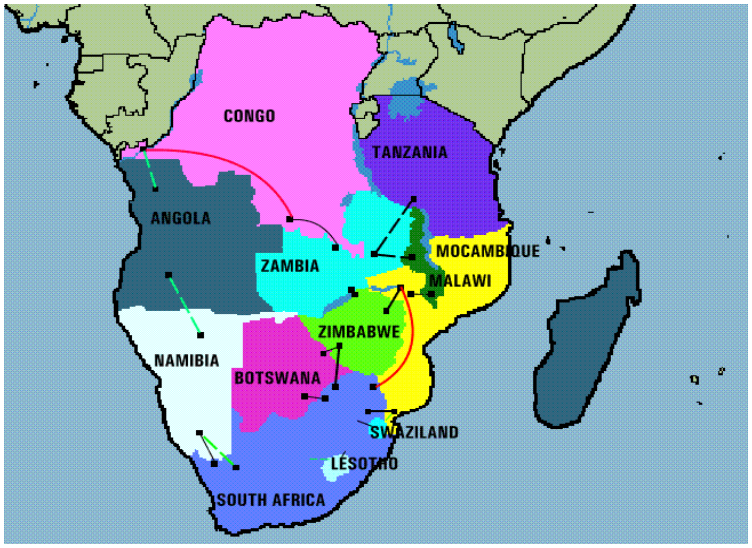
Country	Consumption, 2000	Generation, 2000	Installed Capacity, 1/1/2000 (gigawatts)	Exports, 2000	Imports, 2000
Angola	1.11	1.12	0.586	0.00	0.00
Botswana	1.45	0.50	0.217	0.00	0.99
D.R. Congo	4.58	5.40	2.473	0.50	0.06
Lesotho	0.10	0.01	0.01	0.00	0.00
Malawi	0.77	0.83	0.308	0.00	0.00
Mozambique	0.93	7.02	2.388	5.70	0.10
Namibia	0.89	0.03	0.00	0.00	0.86
South Africa	181.52	194.38	43.110	4.55	5.29
Swaziland	0.90	0.36	0.131	0.00	0.56
Tanzania	2.62	2.77	0.620	0.00	0.05
Zambia	5.84	7.82	1.786	1.54	0.10
Zimbabwe	10.48	6.43	1.881	0.00	4.50
Regional Total	**211.19**	**226.76**	**53.6**	**12.29**	**12.51**

Sources: Energy Information Administration - Adopted

The South African Power Pool (SAPP) was created in 1995. It aims to link SADC member states into a single electricity grid. The national utilities currently participating in the SAPP are: (i) Angola's Empresa Nacional de Electricidade (ENE), (ii) Botswana Power Corporation (BPC), (iii) DRC's SNEL, (iv) Lesotho Electricity Corporation (LEC), (v) Malawi's Electricity Supply Commission (Escom), (vi) Mozambique's Electricidade de Mocambique (EDM), (vii) Namibia's NamPower, (viii) South Africa's Eskom, (ix) Swaziland Electricity Board (SEB), (x) Tanzania Electric Supply Company (Tanesco), (xi) Zambia's ZESCO, and (xii) Zimbabwe's ZESA. Although the power grids of Angola, Malawi and Tanzania are not yet connected with other SAPP member grids, interconnection plans for the three countries are in varying stages of development. SAPP's coordination center is located in Harare, Zimbabwe.

Figure 1 shows the existing electricity interconnections in SAPP member countries.

Figure 1: SAPP Member Country Electricity Interconnections



2.4 Rural Energy and Electrification Access

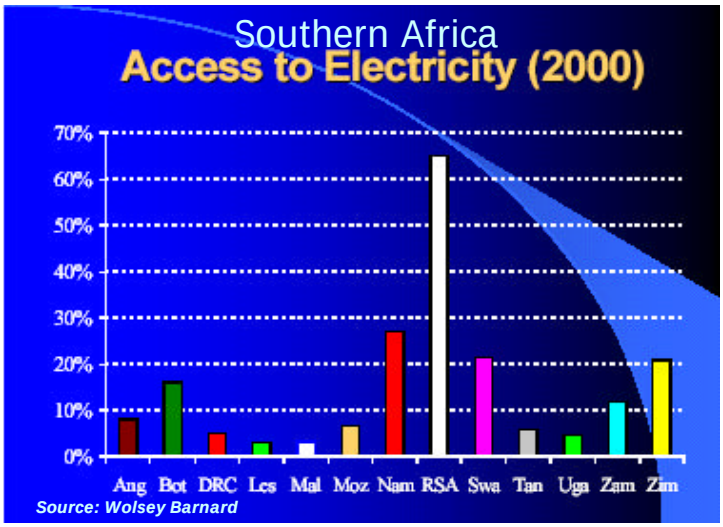
The rural energy situation in Southern African countries is similar to that in other developing countries in the sense that rural areas are typically dependent on off-grid electricity systems, especially in areas that are remote and have a low density of demand. For large rural areas, close to the main urban areas, the typical approach used by developing countries to provide electricity is extension of the national or regional grid. Given the nature of demand, the delivery cost of electricity is generally higher than that in high-density urban areas. Most

developing country governments, therefore, routinely subsidize rural energy, which has a direct impact on rural development.

Electrification levels in SAPP areas are low in most of the countries, especially when compared with Europe and North America. South Africa has the continent's highest electrification levels at approximately 70%, while the average level for the Southern Africa Development Community (SADC) region as a whole is only 20%. Figure 2 shows the percentage level of energy access for the SAPP member countries as well as Uganda.

The level of access is changing as SADC governments are starting to realize the importance of electrification for the well-being of local economies. A number of countries have committed themselves to electrification goals for the short to medium term. For example in Zambia, approximately 18% of the population has

Figure 2: Access to Electricity in SAPP Member Countries and Uganda



access to electricity at the present time. The government's Rural Electrification Program aims to bring this figure to 50% by 2010. Namibia's goals are to improve social conditions by bringing electrification to 250,000 households by 2010; and Zimbabwe has extensive plans to use solar power to provide lighting in rural homes and bring power to small and medium rural industries. Table 5 shows the disparity in electrification of urban vs. rural areas in various SAPP member countries.

2.5 Off-Grid Electricity Systems and Technologies

As most land areas in Southern African countries are generally ample and the rural population is dispersed in individual villages or clusters of villages, these

remotely located areas have a low-density electricity demand. This low demand is not amenable to the grid extension model for providing RE as they are prohibitively costly. Therefore, the role of off-grid decentralized electricity systems is becoming increasingly important.

The off-grid decentralized electricity systems can involve various types of technologies. These may include diesel generators, micro-hydro, solar, and biomass technologies. In most countries in Africa, solar and biomass technologies are more commonly used. However, there has not been an appreciable application of these technologies. It should be noted that recent developments in solar and wind power technology are making these forms of generation more and more attractive, particularly in the context of rural Africa. Despite their technical feasibility and gradually reducing cost factors, there are widespread constraints to their applications.

Table 5: Access to Electricity in a Number of SAPP Countries (Urban vs. Rural Population)

Country	Percentage of Households Electrified	
	Urban	Rural
Malawi	11.00%	0.32%
Tanzania	13.00%	1.00%
Lesotho	14.00%	4.00%
Mozambique	17.05%	0.66%
Zambia	17.85%	1.39%
Namibia	26.00%	5.00%
Botswana	26.48%	2.09%
Swaziland	42.00%	2.00%
Zimbabwe	64.72%	0.60%
South Africa	74.6%	27.2%

Source ESMAP, The World Bank 2000 (modified)

2.6 Constraints to RE Applications

Some of the main constraints to RE applications in Southern Africa are similar to other developing countries throughout the world. These include the following:

- A lack of government support and commitment toward policies to encourage renewable energy technology based RE systems;
- Cost disparities between grid connected and off-grid RE applications;
- Insufficient incentives for private companies and investors to participate in the development and delivery of RE;
- Inadequacy of regulatory functions applicable specifically to grid-connected and off-grid systems;

- Undefined and ill-targeted subsidies and an absence of mechanisms to remove subsidies once the programs are sustainable;

- A lack of creative public and private sector partnerships to develop market-based solutions to RE;

- Difficulties for central government ministries and planners to actively involve local leaders, village chiefs, and town officials in RE planning in order to facilitate locally driven strategies rather than centrally imposed policies and programs;

- Low regard for the explicit recognition of the value of linkages between rural electrification and rural development at the central planning level; and

- Inadequate programs for consumer education, public participation and acceptance, and political acceptance of the role of rural electrification in economic development.

Some of the above barriers can be overcome through the effective reform and restructuring of the power sector. The various countries within the Southern Africa region are at various stages of the reform process and the approach that a country takes to this process can have a tremendous impact on rural electrification programs.

2.7 Power Sector Reform and Restructuring

Reform and restructuring of national utilities has been a worldwide trend in recent years, with privatization of state organizations aimed at bringing greater efficiency to the industry. In SAPP member countries, almost without exception, governments have reviewed their policies in order to allow for private participation into the industry. In some cases the motivation for privatization has been strengthened by World Bank recommendations to do so.

Many SAPP member electric utilities are suffering from financial difficulties. The major negative implication of this situation is their inability to raise the sufficient revenue needed to maintain, upgrade, and expand the existing systems and networks. To rectify this situation, a highly recommended policy approach is to commercialize, unbundle, and eventually privatize the power sector. This is often encouraged even where state boards have improved or are considered to be well run, but are hampered by politically imposed tariff structures.

Data on the status of initiated power sector reforms, as well as key power sector performance indicators for SAPP member countries are summarized in Table 6 and Table 7.

Table 6: Status of Initiated Power Sector Reforms in SAPP Countries

	Ang	Bot	Les	Mal	Moz	Nam	RSA	Swa	Tan	Zam	Zim
New legal framework	x		x	x	x	x	x	x		x	x
Unbundling & IPP's			x		x	x			x	x	x
Private sector participation	x				x	x		x	x	x	x
Third party access					x	x			x	x	x
New regulatory framework	x		x		x	x	x	x	x	x	x
Reorganization of distribution	x				x	x	x			x	
Tariff reform	x		x		x	x	x	x	x	x	x
Utility commercialization	x		x	x	x	x		x	x	x	x

Source: Francis Masawi, Transmission Director, ZESA-1999, modified for Lesotho 2003

Table 7: Key Power Sector Performance Indicators of Eight SAPP Members

Country	GNP per Capita US$	Energy Consumption per capita (kgoe)	Average Revenue (US$/Kwh)	System Loss %	Rate of Return (%)	Consumer per employee	Electricity produced per capita (Kwh)	Generation Capacity Factor	Debt Service coverage Times	Average receivable days
Botswana	2530	408	2.37	7.10		14				
DR Congo	220	71	0.64	12.00	-15.40	33	160			232
Malawi	230	41	4.67	14.10	15.10	22	85	46.30	1.90	66
Mozambique	80	59	7.75	14.00	10.00	99	30	2.40		110
Swaziland	1050	285	3.21	10.40	7.20				1.65	
Tanzania	100	37	4.88	19.80	6.80	26	36	23.40	1.63	135
Zambia	460	309	2.07	7.00		29	935	36.40		
Zimbabwe	650	517		9.00	13.80	42	949	53.60	1.10	67

Source: The World Bank

Successful power sector reform and restructuring efforts bring about structural, regulatory and ownership changes which all can have a varying impact on poor and rural populations. For example, the reform process can impact prices through a price increase due to investments in new capacity. However, in the long-term, prices drop as more competition is introduced into the market. In the case of subsidies, however, even as the electricity industry moves toward cost-reflective tariffs, governments often maintain subsidies for the poor. The largest impact for poor and rural populations during the reform process is likely those affecting access programs. Access programs are often put second to the

challenge at hand of reforming the overall power sector which is primarily focused on grid electrification. Often, during the first phases of the reform process, new programs for rural electrification, and especially grid connected electrification, are put on hold. Studies should be done in advance of the implementation of the reforms in order to ensure that mistakes are not made and that rural groups are not isolated from the process.

B. COMMON KEY SOCIAL AND ECONOMIC DEVELOPMENT POLICY ISSUES

All of the SAPP member countries face numerous development challenges which become even more relevant with respect to planning for rural electrification. It is useful to review these issues and challenges as they define the boundary within which the ambitious goals of rural electrification need to be attained.

1. Development Issues

Southern Africa is home to countries at multiple stages in the overall development cycle; however many of these countries are managing some similar development issues brought on by geographical, political, and social circumstances. These include:

1.1 The HIV/AIDS Epidemic

Considered a monumental threat to stability and growth in the region, the HIV/AIDS virus currently affects millions of people in Sub-Saharan Africa. Efforts are being made to treat the sick and educate the masses of the dangers of the disease; however the effect on human capacity in each of these countries will be profound.

1.2 Poverty and Persistent Famine

Food resources are scarce in many parts of Africa. Natural disasters such as floods and political mismanagement of food resources have the opportunity to create large-scale devastation. Individual access to food and clean water remains a major issue in many parts of Southern Africa, as does the economic effect of a large percentage of the population languishing in poverty rather than contributing to the economic growth of the country. This issue is a major impediment to any sort of sustainable national growth and must be addressed on a large scale.

1.3 Political Stability

Economic development is most likely to happen during periods of relative stability. Governments with consistent political leadership are able to buy into reforms and implement them effectively, and the general public will stand behind

them. Countries that are experiencing conflict are most likely to ignore long-term development goals while focusing on the present. In that respect, nations such as Angola and the Democratic Republic of Congo have only recently been able to attend to their respective national development programs. As long as leadership remains intact and no serious domestic or foreign conflict emerges, these countries have a much better chance at enacting an effective development agenda.

1.4 External Debt

A major factor affecting continued growth, and certainly improved growth, is the external debt that most countries are trying to manage. While some countries have sought relief through the Heavily Indebted Poor Counties (HIPC) Program, others are barely managing to control their levels of debt. In spite of persistent challenges, and with the assistance of international donors, GDP growth has occurred almost across the board, and strategies have evolved which address the issues that will continue to affect Southern Africa into the future.

2. Challenges and Opportunities

Efforts have been made to collectively establish regional organizations to address economic development issues such as trade reform, as well as promote regional economic integration. For example, the Southern African Development Community (SADC), established in 1992, has the primary focus to improve the environment for sustainable development in the region through the harmonization and rationalization of the policies and strategies of member countries. Membership includes all 12 of the SAPP countries, in addition to two other neighboring countries (Mauritius and Seychelles). Uganda is currently awaiting entry into the Community. The SADC Trade Protocol was seen as a giant step towards this end as it has been able to reduce internal trade barriers and encourage trade between countries. Regional free trade is believed to be possible by 2008. In addition, attempts are being made to end strict exchange controls in preparation for a possible single currency in Southern Africa in the long-term.

Working in consistent partnership with neighbors, as well as international donors, provides a strong platform to implement necessary reforms that would create a positive climate for sustainable development. The steps taken towards regional integration in the last 10+ years have been significant, and point the way to further growth and regional development in the coming years.

In light of the various regional and national challenges in Southern Africa, there are competing regional priorities coupled with significant opportunities for growth. The respective governments, donors, and regional organizations need to carefully balance all factors against each other as they move forward. In just the last ten years the environment has changed significantly and positive changes

will continue to have positive impacts on the region. The common challenges facing the Southern African countries and the opportunities that they afford are worthy of discussion.

2.1 Challenges

One of the main challenges facing the governments of Southern African nations is that of involving the general public both politically and economically in the overall country planning aimed at sound economic development. Due to political, social, and economic factors a large percentage of each country's population are not contributing to overall welfare, but are rather struggling to survive. In order for development programs to succeed, this must change.

Another key challenge in achieving development goals is the scaling up of all productive and social activities and widening the development options and opportunities that enable people to work efficiently and effectively. Much of this can be affected by the increased access to fundamental tools for survival such as food, clean water, and energy. Levels of poverty, unemployment, and the gap between rich and poor in the region mean that millions of citizens have yet to gain access to basic services, and are therefore unable to focus on contributing effectively to society.

Fiscal policy reform is also considered a major challenge in many of these countries. In order to capitalize on the generally positive climate that exists and prepare themselves to capitalize on future foreign investment, these countries must be prepared to institute the necessary reforms to their national policies which would make them more attractive as emerging growth markets. These reforms need to be instituted in many sectors of the political and economic spectrum, and in many cases have already begun on quite a large scale thanks to government and donor intervention. Fiscal policy reform is necessary to address the problems of inflation and chronic indebtedness that persist. Many countries have succeeded in controlling skyrocketing inflation and stabilizing exchange rates, while also managing their debt load. However, disciplined and ongoing attention to existing fiscal policies and adoption of modern policies across the region is crucial to economic success.

Trade reforms implemented by each government and facilitated through organizations such as SADC and the Common Market for Eastern and Southern Africa (COMESA) will be a challenge in these countries as they seek to standardize regional practices in order to take advantage of the export potential of each country while creating a viable regional trading community. As mentioned previously, the region has an overall trade surplus of over $5 billion, primarily in oil and minerals, and this advantage must be exploited. Meanwhile, regional trade policy agreements would give each country a chance to specialize in those products which they have a comparative advantage in and therefore

become more productive. The regional sharing of power (through SAPP), as well as water and food, would further many social and economic goals.

A final challenge is the need to develop country infrastructures and the inability to fund such development through domestic resources. Since debt is a chronic problem for many of these nations, funding often needs to be found elsewhere through donors, IFIs, and regional organizations. Countries must pursue a variety of strategies in order to enhance their internal infrastructures.

2.2 Opportunities

The move towards regional integration in the past 10 years presents the SAPP countries with the opportunity for growth and development. Reduced tariffs and disappearing legal and political barriers will allow for a freer flow of products and services between nations while also allowing them to take advantage of resources which may be plentiful in one country, but scarce in another. Once all countries are willing to agree to policy reform and domestic change that will facilitate this integration, the results will benefit each of them.

In light of the recent increase in regional stability, highlighted by the end to widespread conflict in both the DRC and Angola, the opportunity exists for countries to focus on their own development needs and look beyond political tension. Although countries such as Zimbabwe are still working through domestic conflict, others should seize the chance to capitalize on the current environment and build up their domestic infrastructure. An important consideration here is also foreign investment. A sound political atmosphere as well as a stable government will make the region much more appealing to foreign investors.

An important reason that growth throughout Southern Africa has been modest is that the economies have been slow to diversify beyond their primary economic strength(s). The strength may be oil, minerals, diamonds, or agricultural goods, however lack of diversification means that the economies are vulnerable and growth can stagnate. Economies will only achieve high rates of growth when they achieve efficiency in different sectors. In most Southern African countries, the manufacturing sector is only in its infancy with tremendous opportunity for further growth and investment by domestic and foreign firms. Growing human capacity, inexpensive labor, as well as inexpensive construction costs potentially make this a very attractive market. The potential to diversify into areas that have traditionally gone untapped will vary from country to country, however ultimately this must occur in each country in order to achieve optimum economic health.

Willingness on the part of governments to embrace and institute policy reform provides a crucial opportunity for development across many sectors. Policy reform, whether it stems from domestic or foreign initiatives, will help to make the region more competitive. Significant steps have been taken in recent years to

effect reform in the areas of trade, fiscal management, workers rights, rule of law, and poverty reduction and this trend looks to continue. As long as this trend towards change and away from the status quo is maintained, progress appears to be likely.

In addition to internal measures which the countries have options to implement, outside countries are also presenting additional opportunities. For example, in December 2001, the U.S. Congress enacted the African Growth and Opportunity Act (AGOA) which provides all but three of the SAPP countries with preferential tariffs on exported commodities to the U.S., assuming that these countries continue to promote market based economies and other policies which are deemed consistent with U.S. interests. This provides the countries in the region with additional opportunities for trade expansion and incentives to diversify their respective production levels.

3. Energy and Sustainable Development

An important lesson in energy planning is to design national and local energy programs that lead to sustainable development of communities and countries. The link between availability of reliable energy services and sustainable development has become increasingly more important. Yet, at the both at the national and local planning levels this link often is missed resulting in programs that do not yield sustainable development. This is especially true in the case of rural electrification planning. The following key issues further define the energy-development dynamics.

3.1 The Link between Development and Energy Services

Development is a complex process, fraught with cross-cutting and interrelated issues. Within their economic and social development policies, developing countries realize the importance and need for ensuring the supply of sustainable energy resources and services. In the early stages of development, almost all developing countries face the steep increase of energy intensity per unit of GDP. In many developing countries, especially in Africa, citizens and small businesses have little or no access to energy services. Businesses and other types of productive activity, on one hand, and improving social activities and public services on the other, are the engines of economic and social development. It is important to note that as much as energy services can do to complement trends towards development, the failure to provide these services can distort the development of a nation's economic success.

The energy service requirements of developing economies are diverse and fall across many sectors. These include rural agriculture, small industry, private and public services, and transportation.

- Rural agriculture -- Water pumping for irrigation and other related production as well as agriculture processing activities

- Small industries -- Food processing (including fish smoking, crop drying, timber drying, tobacco and tea processing, and bread baking)

- Households -- Household lighting, cooking, baking, water pumping and heating, and entertainment

- Public Services -- Public services such as health, education and other social activities

- Transportation -- Transportation for the distribution of goods, workforce, etc.

Despite the demonstrated linkage between access to electricity and economic development, most governments and analysts still feel that the added cost of providing electricity to rural areas has not yielded commensurate economic benefits. Often the argument is that access to electricity has not produced the economic development and industrial growth that was envisioned at the start of a particular rural electrification (RE) initiative. Other argue that the lack of economic benefits is not the result of the electrification of rural areas not performing, but rather the manner in which the programs were designed that resulted in the failure to achieve results. Past experience has shown that RE systems break down due to poor or non-existent maintenance and a lack of spare parts. The cliché is that as soon as the donors leave, so does the developmental impact. New approaches to RE encourage private sector led initiatives and also introduce market mechanisms. This new approach achieves a higher rate of sustainability which in turn results in higher positive economic impacts.

3.2 Energy and the Economy

For people living in poverty, satisfying basic needs such as an adequate supply of food, shelter, potable water, and sanitation are the main priorities. These must be satisfied before a community can become efficient and effective. A systematic approach to addressing these issues inherently involves increasing the level of energy services available to the general public. Once these very basic necessities are provided for, communities will focus on services that will improve their standard of living, including health, education, and better transportation.

Energy is also a key tool for making production processes more efficient. Goods which are dependent on the availability of energy can be produced in greater quantities and in a more efficient manner with a regular energy supply, thereby making them more affordable to consumers. While the up-front costs of

providing regular energy service to both urban and rural areas of a country is daunting to most governments, the resulting effect can be profound on the economics of most industries and have a widespread effect on the country's overall economy.

Diversification of energy resources and services furthers economic activity in both rural and urban areas when used in different income-generating activities. In the broader economic picture, diversifying energy supply sources improves economic security by lowering dependence on one or two finite primary forms of energy and by reducing the heavy economic burden of energy imports. Furthermore, competition resulting from the introduction of new players into traditional state monopolies helps to improve the economic performance and efficiency of the sector while also lowering prices to the general public.

3.3 Energy and the Environment

There are inherent environmental risks in providing and expanding energy services in developing countries. Health risks are among the most notable since the increased levels of production in manufacturing and other industries can result in negative consequences to the water supply and to air quality. The poor are most often exposed to these associated risks since they are usually most vulnerable to any degradation to the environment.

Environmental degradation poses additional challenges to governments attempting to provide access to energy services across all sectors. Expansion must be approached strategically so as to prevent sudden environmental impacts that can be harmful in the long-term. This can be addressed in a variety of ways including the introduction of cleaner fuels and more efficient public transportation systems.

An issue of great relevance to energy services is the effects of global climate change. The developing world has already been affected in a very real way as patterns of rainfall and drought have changed due to altering regional climatic conditions. The developing world's energy-related impact on this global phenomenon has been limited to date. However, as their role in the world economy grows it will be important to consider wise strategies which will allow them to improve their countries' standards of living while also minimizing negative environmental consequences to the climate.

3.4 Energy as a Tool for Sustainable Development

Sustainable development combines, (i) social development, (ii) economic development, and (iii) environmentally friendly use, and protection of, natural resources. A sustainable energy policy and implementation strategy would supply the kind of energy services that people want, when and where they want

them, while advancing social development and minimizing the environmental impacts of energy use.

A sustainable energy policy and related strategies can be used as a tool to address integrated development goals. Such a policy needs to include the creation of an environment more favorable to consideration of sustainable energy practices and technologies under prevailing conditions, and targets the introduction of specific technologies in ways that would increase energy services for the entire community. To be effective, the strategy has to address policies across a range of conventional sectors where there may exist some hesitancy to change the way in which energy is provided.

II. POTENTIAL RURAL ELECTRIFICATION OPTIONS

Typically, there are three types of rural demand centers that planners must address in designing a rural electrification plan:

1. Villages far from existing infrastructure and where RE is used primarily to improve the quality of life in households;

2. Areas that are more or less proximate to an existing network and will be electrified eventually, where the total increase in economic activity is not expected to outweigh the costs of electrification; and

3. Areas where greater supplies of electricity could result in significant value added in agriculture – pumping, cold rooms, processing, mixing of feed, etc.

The typical approaches used by most developing country governments are based on using international bilateral grants to address the demand for households. Loans from International Financial Institutions (The World Bank, The Asian Development Bank, The African Development Bank, etc.) have traditionally supported electrification in areas near an existing network; whereas energy service companies have played an active role, with some form of concessional financing, in providing RE to high agricultural areas.

This section provides a summary of the most widely adopted technical, institutional, and financial options for RE development in selected countries.

A. TECHNICAL OPTIONS

The basic technical options available to government planners for developing rural electrification programs and providing rural electricity are classified in two categories (i) grid-connected systems and (ii) off-grid decentralized systems. These approaches are suitable for different demand patterns and have different economic and financial performance.

1. Isolated Off-Grid Systems

Off-grid systems are typically decentralized and isolated and meet rural electricity demand at the individual household level or at the village level. Essentially this involves the use of one or more renewable technologies. In some cases, village level off-grid systems for locations away from the main grid are being planned. They involve small independent power producers (IPPs). Off-grid small IPPs in rural areas are viewed by most investors and energy developers as financially risky as they are not governed and protected by a power purchase agreement (PPA) between the producer and the utility.

The most common off-grid systems continue to be very small, utilizing one or more renewable technologies. This means extraction and delivery of energy from solar, biomass, mini hydro, wind, etc. With increasing environmental considerations, these technologies find relatively easy acceptance among both producers and consumers. Renewable energy technology has a number of advantages including (i) less environmental impacts, (ii) reduced reliance on fossil fuels, (iii) modular design permitting scheduled implementation, (iv) well demonstrated safety, and (v) smaller scale applications providing economic opportunities to a larger number of market players.

Africa has vast renewable energy resources, with more than 3,140 TWh (Terawatt-hours) of exploitable technical hydropower potential, more than 9,000 MW (Megawatt) of geothermal potential, substantial solar and biomass potential and, in some countries, significant wind potential. The following discussion summarizes some of the most widely used technologies for isolated off-grid rural electrification systems.

1.1 Biomass Systems

Fuels derived from biological sources (e.g. wood, animal waste, farm by-products) are termed as biomass based systems. These are very popular in many countries and are widely used both at the individual household level by the consumer and in more organized manner by the community, NGOs and private providers. In many countries in Africa, biomass is very commonly used in rural areas at the individual household level. However, its utilization has yet to be systematically organized. Some of the benefits of non-wood biomass energy systems are (i) reduction in greenhouse gas emissions, (ii) reduction in agricultural & forestry residue waste disposal, (iii) a decrease in reliance on importing petroleum products, and (iv) greater community acceptance as a feasible source of technology for small rural communities. This is not the case with wood fuel, which is not sustainable due to the absence of reforestation and is considered environmentally unacceptable due to impacts on habitats, human health through burn emissions, etc.

Biomass accounts for the largest consumption of energy in African countries, in many cases up to 60-70%. Large-scale biomass applications include co-generation, ethanol production, large-scale biogas production, large-scale briquetting, and direct combustion for process heat and gasification. These processes produce heat, electricity, liquid fuels, solid fuels and combustible gases. Sugar is produced in a number of Southern Africa countries and can be used for co-generation. It is a major agricultural export for Malawi, Mozambique, and Zambia. The potential for electricity production from bagasse is high. Other large-scale biomass applications include biogas production, briquetting and direct combustion of biomass. Large-scale biogas production which is low-cost and environmentally sound can facilitate decentralized electricity generation in areas

with no access to the grid. Table 8 provides details on some large scale biomass applications in SAPP and other African countries.

During the past two decades, substantial efforts have been directed towards the modernization of small-scale biomass energy systems, including the technologies for charcoal production, improved stoves, briquetting and household biogas.

Table 8: Some Large-Scale Biomass Applications in SAPP countries

Large Scale Biomass Applications	Experiences In Africa
Ethanol Production	Within Eastern and Southern Africa, ethanol is being exploited on a large-scale in Zimbabwe, Malawi, and Kenya.
Large Scale Biogas Production	The development of large-scale biogas technology in Eastern and Southern Africa is still in its embryonic stage, but its potential is promising. In South Africa, research results indicate that major urban centers can produce about 120 MW from landfills and sewage.
Briquetting	There are large-scale functional briquetting plants in Malawi, Zambia and Zimbabwe.
Direct Combustion	It was estimated in 1990 that direct combustion of biomass accounted for just under half of the industrial energy consumption in the SADC region. In Malawi, the tobacco industry depends heavily on biomass to meet its energy needs. Zimbabwe also uses significant amounts of fuel wood for tobacco curing.

Source: Afrepren

1.2 Micro-Hydro Schemes

In some cases, isolated micro hydro schemes for the provision of electricity to populations located in the vicinity of river systems have proved very useful as isolated off-grid rural electrification systems. In Sri Lanka, for example, the Ceylon Electricity Board (CEB), through local NGOs, has implemented several micro hydro facilities with local communities. These facilities are managed outside of the CEB system.

Micro-hydropower facilities plants can be designed as multipurpose projects -- flood control, irrigation etc. -- in order to improve their economic performance. The advantages of hydropower are well known and hydropower is accepted as a clean, domestic and renewable resource, which provides inexpensive electricity that is absent of environmental pollution, and which also maintains the potential for recycling of water for other uses, etc.

Small hydro technologies have the potential to provide small quantities of decentralized electricity supply, particularly in the rural areas. Table 9 and Table 10 show the number of sites and the extent of utilization of small hydro schemes in selected SAPP countries.

Table 9: Potential Small Hydropower Sites Identified in Selected SAPP Countries

Country	Number of sites	Year of reference
Lesotho	22	1995
Zambia	20	1995

Source: Afrepren

Table 10: Small Hydropower Utilization in Selected SAPP Countries (MW)

Country	Harnessed (MW)
Zambia	4.50
Tanzania	4.00
Lesotho	3.54
Malawi	1.52
Botswana	1.00
South Africa	0.40
Swaziland	0.30
Mozambique	0.10

Source: Afrepren

A number of studies have been undertaken to estimate the potential of small-scale hydropower in Lesotho and 22 sites have been identified. Four of them have been developed with a total of 3.5 MW installed capacity. Zambia has several sites for small hydro development. The estimated potential is 45 MW, of which only 10% has been exploited. In Malawi, there are six privately owned small hydro stations mainly on tea estates. In Tanzania, only one small hydro station is operational.

1.3 Methane from Landfills at the Municipal Level

Landfill gas is produced from the decomposition of municipal waste and is approximately 50% methane. It is typically collected through wells drilled into the landfill, which are connected by a plastic piping system. The gas can then be used for a variety of applications. This option for off-grid energy systems is applicable only at the municipal level, as large landfills are needed in order to produce sufficient landfill gas. Therefore, this RE approach is not applicable to remotely located small villages.

1.4 Solar Photovoltaic Systems

Essentially solar PV systems capture energy from the sun and convert it to electricity through photovoltaic cells or thermal process. This is a very practical alternative to extending power distribution lines to remote and low-density populations. It has been widely used in rural areas around the world. It has also been used in many urban areas because of its environmental benefits and its potential to reduce demand for fossil fuels. Solar energy can be used for lighting, refrigeration, and water pumping. In addition to these individual applications, larger scale projects can provide power for centralized grid systems. Solar energy systems are easy to operate and require low maintenance. It is a free and abundant resource and batteries store energy during night and cloudy periods. Important applications of PV systems include rural electrification (lighting and power for nomadic herdsmen); water pumping and treatment; health care (for storing vaccines and medicines in PV refrigerators; communication (PV-powered radio telephone or repeaters); agriculture (solar pumps for water pumping); transport and navigation aids (PV-powered navigation and signal lamps); security (PV-powered security lights); households and office appliance (ventilation and air conditioners, emergency power and battery rechargers). Some concrete examples of PV applications include:

PV refrigerators are being used increasingly in the region for preservation of medical and veterinary vaccines. PV vaccine refrigeration has been recognized by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) as a suitable technology for preserving vaccines in remote health centers. Although the initial cost of a PV vaccine refrigerator exceeds that of a kerosene refrigerator, sometimes by a factor of two, the running costs of PV refrigerator are quite low.

PV communications systems are being utilized to improve national networks in many countries of Southern African region – in Zambia, Mozambique, Zimbabwe, Botswana, Malawi, and Tanzania.

Solar powered water treatment systems have been used in the region to sterilize water by sand filtration and ultra-violet sterilization. These systems are in most cases combined with solar-powered water pumps.

The decrease in the cost of photovoltaic (PV) systems realized in the last three decades, and innovative financing schemes have made PV systems affordable to many rural households and communities. The reliability of PV systems has also continued to improve even in remote rural areas with limited access to qualified maintenance support. Box 1 describes some key components of a US $300 million solar energy program approved in 2002 by the World Bank. Highlights of this project includes very creative financing which involving many co-financiers -- IDA, GEF, local micro-finance institutions, households, communities, and several NGOs.

Reliable region-wide data on the dissemination of PV technologies are not yet compiled, but available information for selected countries indicates growing use. In Africa, there are about 36 distributors and manufacturers of PV systems. In the region, only South Africa and Zimbabwe have manufacturers of PV modules.

Solar energy development has been reported in various countries of the Southern African region including in Lesotho and South Africa. Recent experiences in the region show that other forms of the electricity supply can be unreliable, especially during droughts that adversely affect the generation of hydro-electricity. This provides further justification for the expansion of a decentralized rural electrification strategy with a significant PV component. Box 1 describes some key components of a US $300 million solar energy development program in Bangladesh.

Box 1: US $300 Million For Rural Electrification and Renewables Project in Bangladesh - Developing a Viable Solar Energy Market in Rural Areas

The Rural Electrification and Renewable Energy Development Project aims to expand access of environmentally-sound energy to remote communities in Bangladesh. It will extend the electricity system to nearly 700,000 remote households and small businesses. The project will support stand-alone generation and distribution systems such as privately-operated small renewable energy projects. As one of its key goals, the project aims to support the development of a viable solar energy market in rural areas. Over its 15-year life, the project will reduce global output of greenhouse gases. The project will offset production of carbon dioxide by replacing kerosene use with carbon dioxide-free renewable energy sources. The total project cost is US $298.30 million, of which US $190.98 million will be financed by an interest-free credit from the International Development Association (IDA) and a US $8.2 million grant from the Global Environment Facility (GEF). The balance is being financed by US $6.78 million from local micro-finance institutions, households, communities and NGOs, and US $92.34 million is

Source: World Bank, Press Release, June 25, 2002, Adopted

1.5 Wind Energy

Wind energy is available as a result of uneven heating of the earth, which provides for energy to run wind turbines and produces electricity. Small wind turbines have proven to be an appropriate technology for off-grid electricity generation for rural areas with access to sufficient wind.

There is a lack of consolidated data on wind energy resources in most of the countries in the Southern Africa region. It has been reported that Africa as a whole has an estimated wind power potential of 1,200 GW (gigawatt), compared to the world estimate of 6,050 GW of average possible production. The most widely used wind energy technologies are wind pumps and wind turbines. Due to the low wind speeds, most of wind energy systems operating in Southern Africa are used for water pumping and not for electricity generation. The development of wind energy continues to be hampered by the absence of adequate measurements of wind speeds and potential, especially at the micro-level. In remote areas with high wind potential, wind pumps make economic sense for large agricultural livestock farms as they are more reliable then diesel pumps, which often face fuel supply problems. There are several wind pumps installations in Southern Africa, and most of them are located in South Africa. These include Zimbabwe, Tanzania, and Botswana. Local manufacturers of wind pumps are reported in Kenya and Zimbabwe.

Renewable energy technologies offer a viable source for off-grid rural electrification systems. The basic advantages of these systems include (i) safety and reliability, (ii) environmental benefits, (iii) cost effectiveness, (iv) low maintenance, and (v) entrepreneurial business opportunities. They are proven to be excellent means for meeting social energy needs. However, these technologies continue to be still costly for most consumers. Table 11 provides estimated cost of some renewable technologies in Eastern and Southern Africa. The next development step is to expand the scale of these applications to the commercial level and institute an enabling environment whereby the private sector can be encouraged to see these RE opportunities as business opportunities.

2. Distributed Power and Micro-Grids

A variety of both conventional and renewable technologies are in use in many rural areas. The primary factor that has dictated the acceptability of distributed and modular generation systems has been the unit cost of delivered electricity. These systems should be considered as potential options for rural loads in those SAPP member countries that have cost-effective access to the national or local grids. Figure 3 provides a cost comparison of various technologies for rural applications.

As the data in Figure 3 shows, cost per kWh (kilowatt hour) varies widely by order of magnitude. These costs, and the institutional infrastructure available for the application of these distributed systems, are the primary factors that determine the extent of success of any rural electrification program with the goal of increasing the access of electricity to rural populations.

Table 11: Estimated Cost of Renewable Energy Technologies in Eastern and Southern Africa

	Estimated Cost of Renewable Energy Technologies						
	Cost of 50Wp PV system (US $) 2001	Cost of 100-litre Solar Water Heating system (US $) 2001	Wind Pumps(US$)	Biogas (US $)	Average Electricity Tariffs in USc per kWh (1998)	Diesel USc per litre - 1998	Gasoline USc per litre - 1998
Angola						19.0	38
Botswana	833	520	7,114		4.70	29.0	31
Eritrea	1,125				12.00	23.0	37
Ethiopia				700	6.00	25.0	36
Kenya	625	950	3,700		10.00	54.0	70
Madagascar						33.0	47
Malawi	1,515	550			6.00	45.0	51
Mauritius	1,200	380			8.50		
Mozambique	1,200	650			4.90	41.0	55
Namibia	1,000	610			5.40	36.0	38
South Africa	984	550			4.35	39.0	43
Sudan						26.0	33
Swaziland	1,136	580			5.05	36.0	37
Tanzania	1,318	500		1,538	10.68	57.0	63
Uganda	1,037				10.00	74.2	94
Zambia	1,200	625	4,206	1,653	3.85	49.0	53
Zimbabwe	826	300	3,387	1,115	4.01	22.0	26

Source: Afrepren

Figure 3: Cost Comparison of Distributed and Modular Generation Technologies

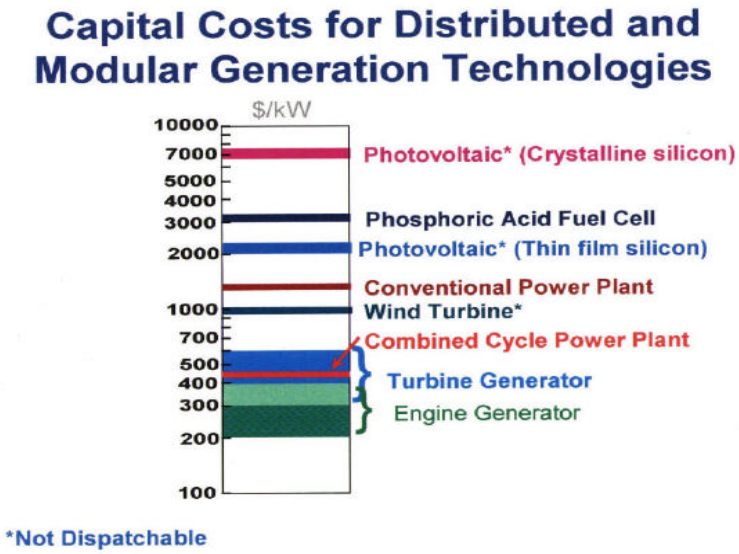


Table 12 provides typical system efficiencies and their dispatchability, which are also important in decision-making.

Table 12: Summary of Distributed Generation Technologies

	Dispatch-Ability	Capacity Range	Efficiency
Engine Generator	Yes	500 kW to 5 MW	35%
Turbine Generator	Yes	500 kW to 25 MW	29 - 42%
Photovoltaics	----	1kW - 1MW	6 - 19%
Wind Turbine	----	10 kW - 1MW	25%
Fuel Cells	Yes	200 kW - 2MW	40 - 57%

Source: Wan Adelman, 1995

Note: Efficiencies of renewable energy technologies should not be compared directly with those of fossil technologies, since the fuel is unlimited.

There are a few examples of medium size RE systems (500 kW to 1.5 MW) that have been developed using diesel and wind power. Typically, these systems require a grid connection or a micro grid. A few projects in this size range are being developed in Cape Verde, Mauritania, and Morocco.

Considerable interest is developing in other micro grid projects based on hydropower. Mini hydro schemes (500 kW to 10 MW) and micro hydro (less than 100 kW) are being looked at for specific sites for both micro grid and stand-alone applications. The most inhibiting factor for wide scale implementation of such RE schemes continues to be their cost and not the technology.

3. Grid Extension

Although traditionally rural electricity has been provided by an extension of the national grid, it has invariably required some form of sustained subsidy in order to increase access to rural consumers. In some cases, mini or micro grids have been used for small diesel-fired power plants and mini and micro hydro schemes. However, these systems too have required subsidies from the government. Experience worldwide has confirmed that grid-based RE systems have not been economical in most rural applications, primarily because of low demand density and a lack of collections of revenues due to the inability of consumers to pay for service at the rate of service.

As a general policy, most governments are looking to off-grid decentralized RE systems, which invariably make renewable energy technology-based systems the most attractive options. Such systems can be scaled to the size of the demand; are mobile; require low maintenance; and have less risk. The capital costs are also scaled, as these schemes can be implemented at a schedule to correspond to the availability of capital.

In the case of most of the SAPP member countries, initially, renewable energy based off-grid systems may offer the best option for remotely located rural populations. At the same time, planning should begin on a pilot basis for small-scale grid connected systems for rural areas adjacent to the national grid. The role of IPPs will need to be developed to provide them with the needed incentives and guarantees in order to shift the financing burden away from government budgets.

B. INSTITUTIONAL OPTIONS

A variety of institutional models are in application in different countries for designing and implementing rural electrification. Each has its own strengths and weaknesses. While no single model can be lifted and applied on a wholesale basis to any country, these models offer food for thought and provide attractive elements that can be incorporated into an eventual RE model for SAPP member countries.

The most talked about and the oldest model for rural electrification is the Rural Electrification Administration (REA) model used in the U.S. since the 1930s. The underlying principle and the driver for this approach was the belief that rural communities in the U.S. could only be economically developed if they were able to receive reliable and affordable electricity. The REA model is based on the extension of the grid for rural electricity loads.

The REA program was funded by the U.S. Department of Agriculture (USDA). The same agency funded a program for increasing agricultural productivity. Both of these programs were aggressively funded and offer the most glaring testimony to the linkage between rural electrification and rural development. In 50 years of existence, the REA program has yielded impressive results; less than 10 percent of the loans ever defaulted. It has developed over 3,000 rural electric utilities (REUs) that serve over 30 million rural residents across the U.S. Collectively, they provide approximately 18 percent of the total electricity in the U.S. to customers in almost every state.

Although initially funded by the U.S. government, the program is now funded also by the Cooperative Finance Corporation (CFC) which has assets of over $7 billion and continues to serve the needs of rural customers. A number of countries have adopted this model, most notably, Thailand and Costa Rica.

The following section describes key elements of a number of institutional models such as cooperatives, concessions, franchises, and micro enterprises that have been used in many countries.

1. Rural Electric Cooperatives

A rural electric cooperative (REC) is a type of electric utility that is owned by the members it serves. Its profits, or margins, are put back into the cooperative to help run the business efficiently, or are returned to the customer-owner. A co-op exists solely to provide high-quality service at the lowest possible price for its customers and owners. The RECs offer membership on a voluntary basis with a democratic member control on management and operation. They enjoy autonomy and independence. Key features of successful cooperatives include a targeted education, training, and public information program; cooperation among cooperatives such as forming electric cooperative associations; and a concern for the community they serve.

The most basic difference between an electric cooperative and an investor-owned utility lies with the REC's membership structure and management approach. In a business corporation, the number of shares of stock each investor holds determines control. Electric cooperatives (co-ops) are owned and controlled by the consumers they serve. Members participate in the operation of the co-op by electing a board of directors to determine the rates and type of service(s) they receive. The co-op's board of directors is responsible for establishing the cooperative's basic policies, goals, and strategies. The board also hires a manager to execute those policies.

Another fundamental difference is that co-ops are not-for-profit organizations. The not-for-profit status of RECs provides greater facility to their operation and enhances their ability to pass on the savings resulting from tax savings to their customers through reduced electricity prices. Box 2 provides a brief summary of the very successful rural electric cooperative model in Bangladesh. The Bangladesh model consists of the Rural Electrification Board (REB), a national body, acting as an Apex entity and 67 rural electric cooperatives referred to as PBSs, which operate as individual member-owned rural electric distribution companies. The impressive success of this REB/PBS model is demonstrated by the fact that system-wide losses are around 10-11 percent and the collections over 98 percent.

The "universal service" concept also separates not-for-profit rural electric utilities (REUs) and public utilities. Public utilities are required to provide electricity to their service areas, on demand, for a price. This leads to a basic difference in the manner the RECs and Investor Owned Utility (IOUs) set tariffs. In the case of the RECs, the board of directors of the co-op set rates, although government can and may exercise some form of control.

National Rural Electric Cooperative Association, International, Ltd. (NRECA International), the most experienced entity in the U.S. on U.S. RECs, has recommended the following key factors that guide the operations of any cooperative. They are quoted here:

Box 2: Rural Electricity Cooperatives in Bangladesh – A Success Story

The rural electric cooperatives – which in Bangladesh are named PBSs system in Bangladesh are patterned after the rural electrification program in the U.S. PBSs distribute grid electricity to rural communities. Developed under the government's Rural Electrification Program, some PBSs, in serving their members, are involved in renewable energy applications. USAID, working together with the Government of Bangladesh over the past 30 years, has had great success in rural electrification. This program promoted the establishment of the Rural Electrification Board as a semi-autonomous APEX agency under the government of Bangladesh, using rural electric cooperatives for service delivery. The PBS system now brings electricity to over 20 million people across rural Bangladesh. Highlights of this program include:

- 67 rural electrification cooperatives (PBSs) have been established and several more are planned to be established in the next few years;
- 121,000 kilometers of electrical line installed;
- 3.14 million metered connections, providing service to over 20 million people;
- Over 30,400 villages provided with electric service;
- Almost US $100 million billed and collected annually from consumers;
- Over US $1 billion invested in rural electrification (this includes multilateral donors and the government of Bangladesh);
- System loss for the rural electrification program remains around 10-11 percent compared to 30-35% for the national utility;
- 10,000 direct jobs and more than 30,000 additional jobs created for electricians and manufacturers of electric components.

Source: The U.S. Agency for International Development, Adopted

1. Voluntary and Open Membership - Cooperatives are voluntary organizations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political, or religious discrimination.

2. Democratic Member Control - Cooperatives are democratic organizations controlled by their members, who actively participate in setting policies and making decisions. The elected representatives are accountable to the membership. In primary cooperatives, members have equal voting rights (one member, one vote) and cooperatives at other levels are organized in a democratic manner.

3. Members' Economic Participation - Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following purposes: developing the cooperative, possibly by setting up reserves, part of which at least would be indivisible; benefiting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.

4. Autonomy and Independence - Cooperatives are autonomous, self-help organizations controlled by their members. If they enter into agreements with other organizations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.

5. Education, Training, and Information - Cooperatives provide education and training for their members, elected representatives, managers, and employees so they can contribute effectively to the development of their cooperatives. They inform the general public, particularly young people and opinion leaders, about the nature and benefits of cooperation.

6. Cooperation Among Cooperatives - Cooperatives serve their members most effectively and strengthen the cooperative movement by working together through local, national, regional, and international structures.

7. Concern for Community - While focusing on member needs, cooperatives work for the sustainable development of their communities through policies accepted by their members

The Bangladesh Rural Electricity Cooperatives in Bangladesh success story, described in Box 2 was implemented jointly by the USAID and the NRECA. With its success of bringing electricity to over 20 million people in 30,000 villages, the guiding principles of the Bangladesh model offer many elements that should be considered when designing a model REC approach to RE development.

2. Concessions

Another model, with limited success, is for the government to offer franchises to local and international NGOs or businesses to design and implement off-grid utility systems for specified RE applications. In principle, the government can divide the various rural load areas into discrete areas/packages and offer concessions to private parties either to generate and distribute or to buy electricity from the national utility and distribute it to the consumers. Box 3 describes a framework for rural electrification concessions recommended by the World Bank.

Consideration of this approach requires a major regulatory reform to address issues of subsidy and competition in the electricity market. Some countries are considering this approach. However, given the fact that electric utilities in most developing countries are national, vertically integrated monopolies, introduction of private power generators would require an unbundling and restructuring of the national utility and the promulgation of a transparent privatization policy, in advance.

Box 3: A Proposed Framework for Rural Energy Services Concession

Public Authority: selects a concessionaire through competitive bidding; provides subsidies on investment and controls quality of services and price commitments

Public Authority Provides Concession: for limited geographical areas and long-term periods

Concessionaire is obligated to: provide electricity services to rural customers anywhere in the area; carry out maintenance, repairs or replacement to ensure continuity in energy service; and provide all necessary information for control by the regulator

Concessionaire is a Decentralized Services Company
Concessionaire is under local authority; led by local people; required to make a capital investment; allowed to partner with other investors; must commit to 15 to 20 years of service; and must service 10,000 - 15,000 households

Target Markets for Concessionaire

- Households of 5 to 10 persons with a monthly income of US $30 - $60 which $6 to $10 are dedicated to energy. (Lighting, radio, television - in substitution of candles, kerosene, etc.)
- Small craft industries - Mill, repair and soldering workshops, etc.). (Lighting, fridge, power (motor), etc.)
- Institutions - health centers, schools, local administrations, etc. (preservation of goods and foodstuffs)

Working Conditions -- Some basic rules
Users pay at least all running costs and part of investment; initial investment is subsidized, local companies managed by local people

Recommendations

- Strategy to be based on needs analysis
- Best answer is always: multi-services provided by multi-energies
- Income generation necessary for sustainable development
- Reliable and cost-effective technologies available
- Institutional and financial tools available
- Private/Public partnership essential

Source: The World Bank, 2002

Box 4 provides a description of a concession program for rural electrification in South Africa which includes a pre-payment system.

Box 4: Rural Electrification via a Concession Program in South Africa

RAPS is a newly created enterprise with a core business activity to supply electricity and other energy products to the rural community in South Africa. The strategy is to establish privately owned energy stores, called RAP Stores, to oversee the service and maintenance of PV solar systems as well as the supply of complimentary energy products and equipment. The local stores would be established as RAPS' franchises and would receive intensive training by RAPS and standardization of products and services. An innovative feature of RAPS implementation plan is to use a pre-payment system. With this system, the users purchase tokens or cards from the franchises or designated community place. These tokens or cards are then inserted into the solar home system and energy services can be accessed – without the prepaid token, the system won't work. This approach to collection reduces the risk of not receiving regular monthly payments from the users.

RAPS has evolved along with the national government's program to expand the provision of electricity in the rural areas. The RAPS business plan is based on the government concession program. This program establishes rural concessions of 80,0000 households. Following a proposal process, private companies were selected to implement a fee for service PV rural electrification program, receiving a government subsidy of ~3000 Rand per household (~US$450) as part of the program. RAPS was selected as one of the concessionaires. The government regulatory and approval process for the concessions has not advanced as rapidly as originally forecast. While RAPS is still in line to participate, it has had to seek out additional business opportunities while the concession process is delayed.

Source: UNEP, AREED, 2001

3. Franchises

Another model that has received some consideration is for governments to move the management of RE programs outside of the government by offering franchises to private companies, financial institutions, or private contractors through a competitive selection process. Typically, this approach requires governments to allocate funds, either from the national budget or from international donor aid, and to provide contracts to franchisees to implement the RE program with the government overseeing the progress and linking performance to any subsequent renewal of the franchise. This approach has not been very successful as the franchisee and consumer often are not able to come to an agreement on risk sharing for financial risks associated with nonpayment of electricity equipment by the consumers. In fact, in the case of donor-financed RE

programs, in recent years, the donors have gone directly to the NGOs and local development banks to implement rural energy programs. An interesting example of this approach is the World Bank/Global Environment Facility $30 million Energy Services delivery Project in Sri Lanka. Another example is the IFC supported PV project in Morocco, described further in Box 5.

4. Micro-Enterprises – Energy Services Companies (ESCOs)

Another option for governments is to develop a policy and investment climate that would induce micro-enterprises and local distributors of energy equipment (solar PV systems, batteries, etc.) to implement off-grid renewable energy applications in remote villages. Bangladesh, Sri Lanka, Peru, Zambia, and Indonesia are a few of the countries that have sporadically used this model.

An ESCO sells energy services to the consumers. It retains ownership of the energy service system. An electric utility is, by definition, an ESCO. Cooperatives, NGOs, and private companies can also function as ESCOs. Examples of such ESCOs include the Zambia Solar Home Systems ESCO Project as described in Box 6. Typically, a rural ESCO procures solar home systems in bulk from regional distributors or on the international market, installs the system and services the power-generating components (which, at a minimum, include the PV module and support structure). The ESCO is also responsible for financial management and administration. ESCOs may also retain ownership of controllers, inverters, and batteries, so that customers pay only for energy service.

The ESCO model has several advantages: (i) the monthly cost to the consumer can be reduced by spreading the cost of the solar home system over a period comparable to its physical life (more than ten years), (ii) the smaller monthly payment makes the system more affordable, allows the ESCO to serve a larger number of consumers creating the needed mass of minimum demand and providing for cost-effective maintenance and administrative service, and (iii) procuring in bulk reduces the equipment costs.

On the other hand, by aggregating demand, the ESCO can obtain favorable financing terms that are not generally available to individual consumers. ESCOs are often eligible for low-interest loans, as well as grants from private or public sources. They are generally considered to be more creditworthy than individual rural customers. The favorable loan terms can then be passed on to customers in the form of lower service fees.

Box 5: Franchises and Renewables - 'McSolar' Franchises to Open in Morocco

In the McSolar Franchises and Renewables Project, Marrakech-based NOOR Holding, S.A. will purchase solar photovoltaic (PV) equipment and sell it to villagers and village enterprises through a series of village energy stores throughout Southern Morocco. NOOR will provide centralized purchasing of PV-based equipment, such as battery-charging systems, battery-powered lanterns, and the PV panels themselves. Its bulk purchases will help keep product costs down for the franchisees and their customers. NOOR will also provide training and other assistance to help 100 village energy stores per year get established and thrive, and may engage in some PV module manufacturing or assembly.

NOOR approached the International Finance Corporation (IFC) for financing. The IFC considered the existence of 40,000 unelectrified villages as an opportunity ripe for a rural solar electrification project. But the project was deemed too small and outside the IFC's area of expertise. So the IFC asked the U.S. firm E&Co to work with NOOR to prepare a business plan. E&Co, a nonprofit energy investment service funded by the Rockefeller Foundation, drafted a business plan and financial strategy for NOOR.

The project involves four capital flows. *First*, equity will be raised for NOOR's start up and working capital. *Second*, debt will be raised for the energy stores in the form of a credit line to be administered by NOOR. *Third*, capital will be raised in order to offer two-year financing to energy store customers in a manner similar to how some automobile manufacturers offer financing to buyers of their cars. The customer loans will be managed by an agricultural extension bank or other Moroccan consumer credit facility. The *fourth* and largest financing package will involve loans, administered by NOOR, to existing village electricity systems ("minigrids") to replace poorly performing diesel generators with solar systems and high-efficiency end-use devices. The diesels would be used for back-up power.

In the project's first three years, $4.7 million will be required at roughly a 60-40 debt-equity split. E&Co will invest $150,000 of its own, and is helping NOOR obtain an additional $450,000 in equity in order to get the project off the ground. Local investors have expressed interest in the project, as have some Western investors, including electric utility companies. The IFC is evaluating the investment potential of the project, and is providing referrals to investors and advice on project structuring. NOOR expects a 20 to 30 percent return to investors.

According to E&Co, the most significant feature of the project lies in its ability to take advantage of large-scale purchasing power not available to local entrepreneurs while supporting a network of village franchisees (the "NOOR Web") who know the local conditions and people. Called the 'McNoor' project based on its structuring similarities with the McDonalds franchise, the profitability of NOOR will depend upon its success in helping village stores become profitable.

Source: Clean Energy Finance, 1996

Despite its attractive features, the ESCO model does present some disadvantages: (i) an ESCO generally requires an existing organization, since setting up a new ESCO is difficult and expensive, (ii) a sustainable ESCO model will need a broad base of local acceptance and support, apart from the qualified personnel required to perform the provision of electricity service, (iii) a full cost-recovery mechanism must be in place in order to ensure the program's sustainability -- programs that rely on grant funds for initial capital investment, must, at a minimum, secure payment to cover recurrent costs.

Box 6: ESCOs and SHSs Implemented Successfully in Zambia

With about 60% of the Zambian population living in rural areas and only 2% of the rural population having access to electricity, the Government has prioritized rural electrification.

A pilot project intended to develop a mechanism for providing electricity services to rural households is currently using Solar Home Systems (SHS), which are run by rural based Energy Service Companies (ESCOs). The strategy of this project is to provide increased access to electricity-based services in rural areas where the population is willing and able to pay for amenities like electric lighting, listening to the radio and watching television. The strategy is to demonstrate a framework through which electric services based on solar energy can be provided in rural areas in an economically sustainable manner. At the end of the project, a framework for providing credit, technical support and operational support to rural based ESCOs will have been initiated and tested. This project is targeting three rural communities/areas in the Eastern province of Zambia. The project, started in June, 1998, was aimed at installing, on pilot basis, Four Hundred (400) Solar Home Systems (SHS). Each SHS has a 50Wp panel, 4 lights (9-11W), battery (80-105 Ah) and a power point for a radio or small TV. The total cost of each SHS (including installation costs) is roughly US$1,100). The SHS are run by a locally based Energy Service Company (ESCO). The locally based ESCO is operational at the community level and installs, maintains and collects fees from rural customers to whom PV-system services are supplied. The profits of the ESCO are proportional to the number of customers that are serviced and thus act as an incentive to identify and contract new customers.

While in the initial project phase, ESCO runs the systems on behalf of the Department of Energy as they could not afford to repay the capital cost at commercial interest rates. The long-term objective however, is that the ESCO has the ownership of the PV equipment and thus the responsibility for the proper maintenance of it. *What the ESCO sells is an electricity service and not the technical equipment.* Contracts between the ESCO and the local customer regulate the proper functioning of the equipment as well as the timely payments of service fees.

Experiences gained so far show that it is not possible for the service fee to fully capture the capital cost, unless the repayment cost is long e.g., 20 years. *The fee is however able to cover the ESCO running costs.* At current service fee levels, there is great market potential for commercial driven SHS. After completion of the 100 SHS for NESCO (one of the ESCOs), 300 customers were

already on the waiting list. By end of 2001, 75 and 100 un-serviced customers were already demanding for the systems in *Chipata* and *Lundazi*, respectively (two other areas where two other different oh ESCOs operate). Each beneficiary household pays a monthly average service fee of about US$8. Payment of service fees is on average more than 80% of ESCO expected income. When compared to agricultural credit schemes in the same area, the level of service fees paid is very high. At current service fee levels, there is great market potential for commercial driven SHS. Preliminary findings show that (i) the capital cost for SHS need to be subsidized to enable rural people access PV services; (ii) a substantial number of rural households who desire SHS are able and willing to pay the service fee, which in some cases is higher than that paid by urban electricity consumers, and; (iii) technical expertise can be built at rural level to ensure long service time of SHS. These preliminary findings are being used to drive policy for rural energy service access as well as further refine the ESCO concept as an option for rural electrification in Zambia.

Policy Issues. The issue of subsidies is important in the project, as it will determine how ownership of the systems will be transferred to the ESCOs. Since the ESCOs can receive the systems freely, they have to meet part of the capital cost. The level of subsidy is yet to be determined. This project raises several energy policy issues: (i) when given proper assistance, households can commit enough resources to acquire modern energy services, even if those energy services do not meet their heating requirements, (ii) payments for energy services should be flexible enough to accommodate rural settings since rural incomes sources are limited and income is only realized at particular times of the year, and (iii) it is not possible to provide rural people with modern energy services without considering the issue of subsidies.

Adapted based on: Rural Energy Access: Promoting SHSs In Rural Areas In Zambia – A Case Study, O.S. Kalumiana

Since ESCO administration can result in significant overhead costs on a household PV program, a relatively large number of customers is required for an affordable and sustainable program. The charge for administrative overhead costs (administration, collection and technical services) varies widely. For example, in a small 600-household program proposed by Sarvodaya in the Southern Province of Sri Lanka, administrative costs are estimated at 12% of the initial installed cost. This sum covers the cost of collecting fees, administration, servicing (through technicians with a ratio of 1 per 60 systems), technician and administration transportation costs, supplies, tool kits, and training programs. This compares with a 10% administrative charge levied by the Rural Electric Cooperatives in the Philippines for their relatively small household PV programs. In parts of Indonesia, where many more solar home systems are deployed, consumers are only charged a shipping and handling fee of Rp. 25,000 ($12.50) at the time of installation and a bill collection fee of Rp. 6,000/year per system (less than $3, or about 0.5 percent of the installed cost). Maintenance costs are borne directly by the customer.

C. FINANCING APPROACHES

Similar to the challenges that we face in designing the optimum institutional models for different elements for rural electricity delivery (grid connected, micro-grids for distributed generation, and individual household systems), financing of rural electrification schemes also poses significant challenges. In fact, all too often the common feeling among the planners and financing experts is that rural electrification projects are not attractive candidates for financing as the collections are generally poor due to either a lack of willingness or a lack of affordability to pay on part the consumer. Nonetheless, many rural electrification schemes have been creatively financed and are sustainable. This section, therefore, reviews a few attractive approaches for financing rural electrification.

Rural electrification can be provided through different models -- grid extension (which is mostly utility-based), off-grid systems, and individual stand-alone installations such as Solar PV homes. Financing mechanisms depend on the model selected and the institutional arrangements regarding the ownership and operation of a certain system. Naturally, the status of reform in the power sector plays a significant role in facilitating funding and attracting private investment in rural electrification.

Countries wishing to install large hydroelectric dams to supply electricity grids or to extend grids often have a cadre of financing options available to them. Unlike with larger power schemes, countries wishing to install small micro-hydro systems or solar PV systems -- or countries that seek to enable entrepreneurs or communities to do so -- have more difficulties, and need to develop adequate mechanisms and instruments in order to successfully provide rural electricity access. The traditional forms of RE financing as well as important approaches to maintaining sustainability of these programs are discussed below.

1. Public Sector - Government Budget

Providing electricity to rural populations is a complex task. Though the private sector's role in rural electrification is growing somewhat, governments and the donor community are still very much needed to provide initial start-up financing as well as a continuous engagement in some fashion. Governments provide the framework for rural electrification activities while donors can accelerate the process.

In most cases, in order for the rural electrification programs to be sustainable, the governments need to maintain some form of subsidy to the poorest consumers. The problem is not with the need for a targeted subsidy for a certain period of time until the consumers' affordability can be increased through income generating activities, but rather, often the wrong group is subsidized and the method of subsidy withdrawal is not well thought out in advance.

In some cases, the government acts as the primary implementer of RE programs and projects, although village cooperatives and private sector equipment vendors also play important roles. In other cases the government plays a more passive role such as creating and implementing an enabling environment that would induce NGOs, village level consumer groups, or vendors to undertake provision of rural electricity. An example of a passive role by the government would be to provide a one-time subsidy (e.g. grant, low interest loan, tax credits, etc.) to local energy providers in order to provide the initial incentive needed to start RE service delivery. While the level of government involvement in RE projects may vary, experience indicates that governments can best support programs by focusing on:

- decentralizing the delivery of rural energy services by empowering the local governments at the village level;
- creating an enabling environment to induce private sector, NGOs, consumer groups, and local businesses to take on a more direct role in the delivery of rural energy services;
- developing local and national markets by creating market and competition rules and a transparent regulatory regime to guide the markets; and
- supporting transparent institutional and regulatory frameworks.

The case most often is that the governments do not have enough funds in the budget to support the financing of rural electrification. Yet, most governments and politicians interfere with the state utilities and pressure them into continuing to provide electricity to non-paying rural consumers. A common net result of this policy in most countries is that utilities continue to mount debts and are often not able to provide reliable and high quality electricity to paying consumers. Also, over time, the utility systems degrade for want of adequate maintenance. Nonetheless, governments can play an important role in the commercial rural electrification market, if the design of the relevant governmental programs supports the commercial approach to, and the engagement of, commercial players in rural electrification.

Figure 4 provides a simplified illustration of the traditional approach to RE financing where the government allocates a specific budget to the national utility which is generally far less than the funds needed to both maintain the existing system and invest in new capacity. Under this approach, rural electrification becomes one component of the overall service provided by the national utility. Typically this is the component that has a high cost of service and results in the least collections due to consumer inability or unwillingness to pay.

Many utilities and governments have recognized that rural electrification is a critical need for rural development and it is important for national economic development. The traditional approach has not worked and in fact has weakened national utilities and the power sector to the point that the private sector is reluctant to make any investments in the power sector. Therefore, a relatively new trend that has been adapted by many countries is for the governments to separate rural electrification away from the national utility and treat it as an independent sector, given the complexities and challenges associated with financing rural electrification. A common model is for the governments to establish rural electrification funds capitalized by a combination of government budget allocation and bilateral and multilateral donor funds. Figure 5 illustrates the new approach to financing rural electrification.

Under this approach, a RE Fund is established with seed capital from the government and an aggressive approach is pursued to have other stakeholders buy into the Fund. Typically, bilateral and multilateral donors buy into the Fund. They require a transparent management of the Fund, without political interference, and a full accountability of the Fund. Generally, it is very difficult for the private sector to invest in such a Fund as these Funds often have a public sector character fraught with cumbersome procedures and a lack of commercial management practices.

Figure 4: Traditional Approach of RE Financing

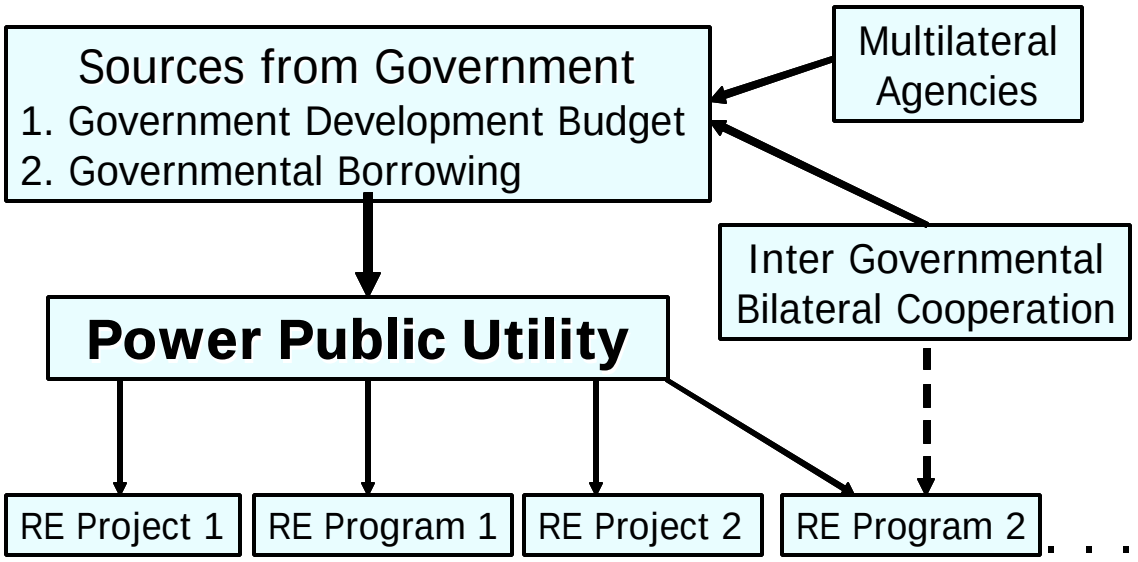
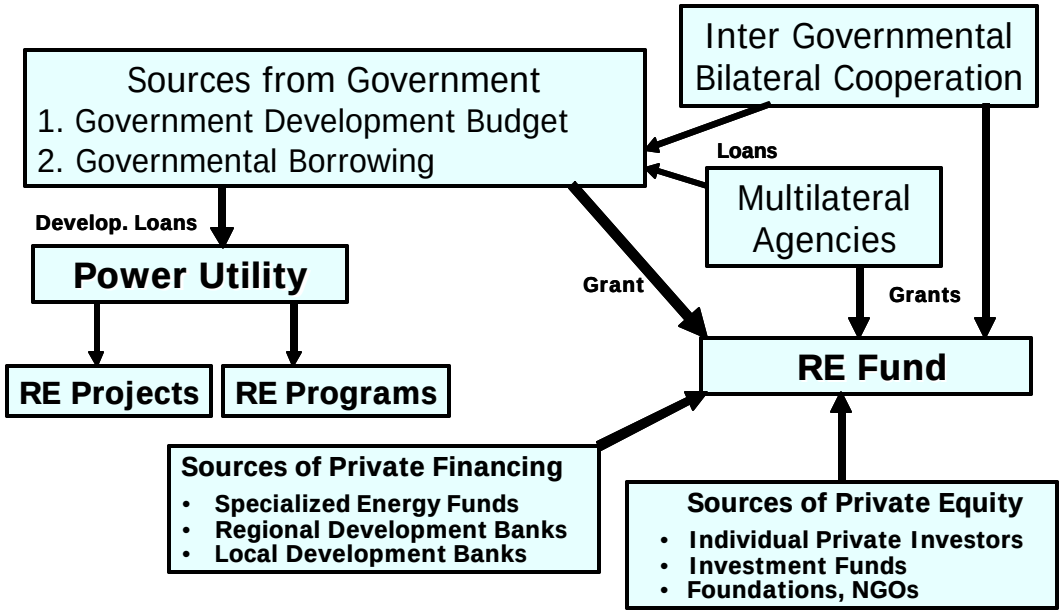


Figure 5: New Pattern of RE Financing



The involvement of private investors and micro-finance institutions in RE is certainly very desirable and it represents a new perspective for financial investors interested in this area, as it enables them to invest in an intermediary which acts in their own field - the financing area. However, the success of public-private Funds has been very limited as the governments have a tendency to control the operation and management of such Funds. Please see Box 7 for details on some best practices for governments.

Box 7: Best Practice for Governments on Off-Grid Systems

- Governments need to assign clear responsibilities for off-grid system development and the development of the necessary 'enabling environment'. Best Practice suggests that this would ideally be part of assigning more general responsibilities for the provision of decentralized energy services to rural organizations and stakeholders.
- Governments need to treat all energy supply options equally ('offer the full menu of options') and to favor what best meets the needs of the consumer in different locations.
- Governments need to ensure fair competition between competing supply options and provide equal access to aid and other concessional funds, subsidies, tax breaks and support.

Source: http://www.itdg.org/html/energy/docs/bestpractsynthe.pdf, adopted, 2002

2. Public Sector - Multilateral and Bilateral Donors

In the case of most national electrification programs in developing countries, national, bilateral, and multilateral financing agreements are established to generate the necessary financing for power sector investments. Institutions providing development finance, particularly international development banks, dedicate a proportion of their funds to financing energy programs. However, the requirements of these institutions are very rigid and the government, typically have a ceiling on their borrowing capacity. Thus, such funds are channeled to those projects with the best prospects for investment recovery. Unfortunately, rural electrification projects take a back seat as they have the most risk. Therefore, the challenge for the development finance institutions is to find creative ways to pressure governments into implementing policy reforms that would encourage private sector investments. Development institutions, more and more, are using grant financing to effectively help create the conditions which will encourage the implementation of sustainable energy options through market forces.

The World Bank and other multilateral lending institutions are also beginning to put more resources toward encouraging governments to recognize that effective RE programs can be established through greater use of renewable energy options. Such projects are sustainable, environmentally friendly and are a great alternative to grid extension. Innovative World Bank/GEF-supported RE programs with this emphasis are presently underway in several countries. The most successful and innovative schemes have involved the private sector and commercial approaches to rural energy delivery. Please see Box 8 for some recommended best practices for donors in financing off-grid systems.

Box 8: Best Practice for Donors in Financing Off-Grid Systems

- Build programs on a thorough understanding of what has already been tried before in the country and elsewhere.
- Adopt funding strategies that enhance (rather than duplicate or destroy) local capabilities including organizations, regulatory frameworks, and technical capacities.
- Maintain the 'full menu' of options, so as to give off-grid systems the same chances for funding as other decentralized energy supply options.
- Ensure funds build markets rather than destroy them - apply the principles of 'smarter and targeted subsidies'.
- Ensure funds are available for all aspects of project development.
- Use soft funds to leverage access to large flows of more conventional loan and equity finance.
- Be transparent to make others aware of what you are doing and try to harmonize activities with other donors, partners, equipment suppliers, contractors, and government programs.

Source: http://www.itdg.org/html/energy/docs/bestpractsynthe.pdf, adopted

Box 9 provides a case study example of a partnership between the Government of India and the IFIs for the development of solar home systems in India. A component for private sector participation also exists within this program.

Box 9: India Government Channels Funds in Financing of Solar Home Systems in India

The Indian Renewable Energy Development Agency (IREDA) is the only financing agency in India developed specifically to promote renewable energy systems, with soft term loans varying at present from 2.5 to 14%. As the financing arm of the Ministry of Non-Conventional Energy Sources, IREDA is the major agency channeling funds into the Indian market. Set up in 1987, the IREDA secured international funding within six years: The World Bank extended a line of credit of US $195M in 1993 - 1994, of which more than 95% has been utilized. The program covers the solar photovoltaic, small hydro, and wind sectors. A line of credit from the Asian Development Bank offered US $120M to cover solar, thermal and wind power projects. The World Bank has offered another line of credit for US $173M to cover smaller hydro and energy-efficiency projects. As a government agency, IREDA started cautiously taking bank guarantees from the beneficiary for releasing credits in any of the modes available with them. By mid 1998, IREDA had sanctioned 963 projects covering over US $300M. The loan recovery rate has been as high as 99%.

SELCO is one of the solar energy services companies marketing small-scale photovoltaic power systems in southern India. The current market for residential systems for rural households not currently serviced by the grid in Karnataka State and the neighboring states of Andhra Pradesh, northern Kerala and Tamil Nadu is estimated to be 290,000 households. SELCO has established marketing, sales, installation, and service operations in three areas of Karnataka to begin to serve the market.

In order to access funds for direct consumer financing, SELCO had to seek a bank guarantee from a not-for-profit company, E&Co. As a result of this guarantee, SELCO negotiated with IREDA to access World Bank Global Environmental Fund dollars for on-lending to end-users. These funds will be guaranteed through an E&Co account in a local Indian Bank.

Source: WEC Website

3. Private Sector

Developing country governments are under severe pressure to explore other options for financing power sector investments as public funds are simply not enough to support the needed levels of investments. With the growing need to look for commercial approaches to financing rural electrification, many governments are creating policies to promote private investments.

The commercial banking systems in most Southern African countries are simply not set up to make long-term loans to scattered customers with no credit history or collateral. There are a number of ways that this problem is being overcome, and some of these approaches will be described later in this desk study. More research into innovative ways to financing programs in Southern Africa needs to be conducted and on a country-by-country basis.

In some countries, small loans are amalgamated into one large loan through an intermediary, with the risk guaranteed by the government (see Box 7). In other cases, the independent energy service providers themselves build credit arrangements into the purchase of their products as in the case of a Global Environment Fund (GEF) PV project in Zimbabwe. Loans for rural electrification at the individual household level made to communities have, in some cases, been linked to income-generating activities (e.g., local industries such as basket weaving, other services) in order to enhance their ability to pay. Naturally, the private sector is reliant upon consumers to purchase equipment such as solar home systems and batteries and pay for the products and services they receive. Therefore, the consumer and other local participants in such programs are seen as playing an ever increasing role in RE projects and such participation has become a necessary part of the implementation of off-grid rural electrification programs world wide. Please see Box 10 for information on best practices for private sector project developers.

Box 10: Best Practice for Off-Grid Project Developers

- Off-grid project developers who have the skill and tenacity to put all the elements of the system together are crucial to the success of programs, and are likely to be the main constraint to program expansion, particularly if their costs cannot be covered by grants.
- Successful off-grid programs will need to be sufficiently large to produce sufficient work for the project developers and to achieve economies of scale in the supply of such services.
- Financial institutions and regulatory agencies need to strike a balance between their need for off-grid project developers they regard as credible -- with formal qualifications in engineering and accountancy -- and their cost.
- Efforts should be made to estimate the realistic size of the market for off-grid systems taking into account costs, alternatives, and the likely availability of financing, so as to determine whether the process of off-grid project development can be put on a more sustainable financial basis (including grants). Additionally the scale of project development capabilities should be increased sufficiently so as to reduce unit costs by capturing the economies of scale.
- Technical assistance services should be separated from credit functions to ensure that sound judgments are made about the financial viability of each project (with or without subsidies) and credit worthiness of project owners.

- Consideration should be given to productive end-uses from the outset, and treat off-grid system investment as a small enterprise (regardless of actual the ownership structure).
- Endeavor to create a business like management structure, even if co-operative or other forms of joint ownership are used.
- Attempt to institute rules for tariff setting and for inflation adjustments that are technical and routine rather than arbitrary and politicized (e.g. link the price of electricity to some other freely traded commodity - such as a staple crop, kerosene, or candles).
- Successful programs include activities that lobby for changes in the 'enabling environment' created by government, financial institutions and donors. These are probably most effective when operating as an 'Energy Forum' combining the interests of all people interested in rural, 'alternative', or decentralized energy options.
- Project development would benefit from technical catalysts who can work in close proximity to villagers at relatively low cost.

Source: http://www.itdg.org/html/energy/docs/bestpractsynthe.pdf, adopted

4. Consumer and Local Participation

Experience shows that true public participation in RE development programs is possible only when the rural poor are able to pool their efforts and resources in pursuit of objectives they set for themselves. An efficient means for achieving this objective are through small, democratic and informal groups. For governments and development agencies, public participation through small groups offers distinct advantages including economies of scale, productivity gains, reduced costs and increased efficiency, value added through the building of grassroots democratic organizations, and sustainability. The following discussion emphasize the benefits from consumer and local participation.

4.1 Economies of Scale

The high cost of providing development services to scattered and isolated small-scale households is a major constraint for RE-oriented programs. However, economies of scale can be achieved when small participatory groups form a grassroots "receiving system" that allows governments and development agencies to reduce the unit delivery or transaction costs of their services, thus broadening their impact.

4.2 Higher Productivity

Once the rural consumers are willing to participate in RE programs, have access to resources that are backed with a guarantee that they will share fully in the benefits of their efforts, they (i) become more receptive to new technologies and

services, (ii) achieve higher levels of production, and (iii) eventually enjoy greater income as a direct outcome of the availability of rural energy. This can contribute to the building of cash surpluses that strengthen the groups' economic base and contribute to rural capital formation.

4.3 Reduced Costs and Increased Efficiency

With the participation of rural grassroots organizations -- often represented by government officials, village leaders, consumer groups, and the private sector -- project planning and implementation costs are often reduced. The participatory groups' knowledge of local conditions can facilitate the diagnosis of environmental, social and institutional constraints that can delay program implementation. Such groups have a tendency to find and implement solutions as well as increase program development efficiencies.

4.4 Building of Democratic Organizations

The limited size and informality of relatively small groups is well suited to the rural organizational experience and the often associated low literacy levels. Moreover, the smaller group environment is ideal for the diffusion of collective decision-making and leadership skills, which can be valuable later in building intra-group federations.

4.5 Sustainability

Participatory development leads to increased self-reliance among the rural people and the establishment of a network of self-sustaining rural organizations. This carries important benefit as the greater efficiency of development services stimulates economic growth in rural areas and broadens domestic markets, thus favoring balanced national development. In addition, participatory approaches provide opportunities for the rural people to contribute constructively to development which has a visible impact on the group members' quality of live. The replication prospect for participatory development springing from RE programs into other sectors such as health and education is great and can play an important role as a starting block to these other sectors where visible impacts are sometimes less apparent.

The pivotal role of people's participation in rural development is now re-emerging in economic and social development thinking. One striking example of this trend comes from the World Bank. In its proposed strategy for sustainable development in Africa, the Bank calls for a "people-centered" approach that will (i) improve access to the poor of productive assets, (ii) allow them to participate in designing and implementing development programs, and (iii) foster their involvement in institutions from the village to the national level. UNICEF has proposed similar measures in its strategy for structural adjustment "with a human

face", stressing peoples' participation in the formulation of development policy, and efforts to make full use of the local potential.

Box 11 provides a list of best practices for greater public participation at the local level in RE program development. It also contains a rule of thumb: "It is easier to make a profitable off-grid system socially beneficial than to make a socially beneficial off-grid system profitable."

Box 11: Best Practice and Profitable End-uses, Local Capacity Building, and Management of Off-Grid Systems

- It is easier to make a profitable off-grid system socially beneficial than to make a socially beneficial off-grid system profitable.
- Profitable end-uses are difficult to develop because of the limited size of the local market and the general difficulty of small and micro enterprise development in remote locations.
- Financial institutions willing to finance off-grid systems should consider funding associated end-use investments in order to build profitable load.
- It may well be that off-grid systems should be promoted for their role in securing livelihoods, or developing small enterprises, rather than as an 'energy program.
- The choice of end-use can affect those who benefit from off-grid systems and will therefore affect the poverty and gender impacts, even if not all the community has direct access to the energy.
- There appears to be no short cuts in developing local capacities. The process takes a long time and is costly, but without such capacities off-grid programs cannot succeed.
- Local capacities to build off-grid systems locally appear to substantially reduce costs.
- Local capacities to manage, operate and maintain off-grid systems are a necessary condition for success and resources will need to be devoted to building this capacity.
- Regardless of ownership structure, the successful management of off-grid systems requires a 'corporate structure' that minimizes political interference (e.g. from municipal authorities or powerful community members) by providing clear delegated authority to a management to achieve clearly stated objectives related to profitability, coverage, and the quality of the service to be provided.

Source: http://www.itdg.org/html/energy/docs/bestpractsynthe.pdf, adopted

5. Rural Electrification and Subsidies

When people are very poor and the provision of electricity is so expensive that rural households cannot afford it, rural electrification subsidies are required. From a development standpoint, this is not hard to justify considering that investment in rural electrification contributes to development, in terms of not only the opportunity to generate more income, but also because of the value added

social benefits in education, health, communications, integration, and so on. Any subsidies, however, should be minimal and well targeted.

Small projects in isolated areas have higher up-front costs. Costs for project design, feasibility studies and analyses, operations training, etc. are higher. However, if the design and implementation schemes are carried out well, there can be measurable cost savings in the implementation stage and greater sustainability can be achieved. These up-front pre-investment costs often require subsidies. For communities that may be prepared to finance a large part of the infrastructure investment costs, subsidies for these up-front costs can make a significant difference.

Reform of the energy sector and reform of subsidies ideally go hand in hand. Structural, ownership, and regulatory reforms aimed at making services more efficient should lead to rethinking of both the level of subsidy and the delivery mechanism.

In addition to up-front capital subsidies, rural electrification programs often require additional subsidies as the revenues do not even cover the basic operation and maintenance costs. This has been a chronic problem for many governments because once one gets into subsidizing the operation and maintenance costs of RE projects, it is very difficult to remove this subsidy without social and political upheaval. A prudent policy for the governments is to avoid any subsidy other than some up-front capital subsidy. In addition, other factors should also guide the determination of the type and size of subsidy for rural electrification. Some of the key factors include the following:

- decentralization of decisions to the regional and community level -- this would make the subsidy more explicit and direct, and therefore easier to eventually remove

- competition between technologies as well as suppliers, thereby reduce the size of the subsidy

- a requirement that all partners in the process (users and private companies as well as the state) contribute to the financing of expansion projects -- this is possible only if all partners have a financial stake in the success of RE projects and the consumer is guaranteed reliable high quality electricity

In principle, subsidies to make service more accessible to users should be one-shot deals, not long-term support covering operational and/or maintenance costs. The key challenge, however, is how to quantify and allocate subsidies. The best and most common criterion for allocating subsidies is by providing a minimum subsidy per user. This promotes both least-cost technologies and maximum

leverage. A ceiling given by the project's economic net present value is advisable.

It is important to find the appropriate mechanism for providing subsidies in a market environment. Clear guidelines on who can benefit, and how, are very important as well. The subsidy mechanism should be open so that anybody can apply – a utility, a customer, a vendor, a community, or a developer.

Best practices, such as the case of RE in Chile, show that RE programs which set up special funds to allocate subsidies can be successful. It is important for the subsidies to be competitively allocated and at best they should be a one-time direct subsidy to private electricity distribution companies agreeing to undertake rural electrification only to cover part of their initial investment costs. Subsidies should not be provided for operating costs. A fundamental rule is "*sustainability of RE programs can be achieved only if operating costs are financed with tariff charges*". In the case of Chile, the central government allocates the subsidy funds to the regions on the basis of two criteria: (i) how much progress a region made in rural electrification in the previous year, and (ii) how many households still lack electricity. Regional governments also allocate their own resources to their RE programs and the subsidy allocations are still based on results. This has proven to be a more successful formula than, for example, the approach used to provide matching funds. Please see Box 12, Rural Electrification in Chile - Best Practice. This program increased the coverage of electricity in rural areas from 53% in 1992 to 76% at the end of 1999, exceeding the target rate of 75% by 2000.

Box 12: Rural Electrification in Chile – Best Practice

In the mid 1990s, Chile launched a new rural electrification program designed to be compatible with the government's overall reform program for the electricity sector. The program was initiated in November 1994, and was designed to reach 75% of the rural population by 2000. It was estimated that the central government would need to provide US $150 million in subsidies to allow for the electrification of about 110,000 dwellings.

The program relies on competition, private investment, and decentralized decision making to achieve its goals. The objective of the program is, with the use of a subsidy, to make rural electrification an attractive business opportunity. To help ensure buy-in, all participants, including the government, private sector, and users, are required to contribute funding into the program.

The government's contribution - through subsidies and the up-front cost of running the program - is delivered through a specific fund set up to competitively allocate a one-time direct subsidy to private electricity distribution companies to cover part of their investment in rural electrification projects. To apply for a subsidy, companies submit their projects to the local community, which then submits them to the regional government. The regional government then

allocates funds to those projects scoring best on several objective criteria, including: (i) cost-benefit analysis, (ii) amount of investment covered by the local distribution companies, and (iii) social impact.

Bids are conducted annually. The central government provides funds to regional governments on the basis of two criteria: (i) how much progress a region has made in rural electrification in the previous year, and (ii) how many households remain without electricity service. Regional governments also allocate their own funds to the program. The designers of the program set out to devise a scheme that would promote private investment, stimulate competition, and take into account the structural reforms in the power sector. The program was built around four principles:

- Decentralized Decision Making. The program was designed to involve regional governments in the identification of needs, choice of solutions, and in decisions about the allocation of funds from the central government. To involve local communities, the program requires that projects be requested by organizations rather than individuals. The role of the central government also is to provide economic resources and technical assistance to help coordinate the institutions involved in the program. It also developed the criteria and tools for evaluating the projects.
- Joint Financing. To ensure sustainability and buy-in, all participants-the central and regional governments, electricity companies and users-contribute to the funding of projects. The central government's subsidy is allocated only to projects with a positive social return and also covers expenditures related to managing the program. Facilities built under the program are owned by the local privately-owned distribution company rather than the government. The goal here was to make rural electrification an attractive opportunity for electric utilities. Companies also are required to invest their own funds in the project and users contribute both at the investment phase of the project and during the operation phase through their monthly bills.
- Competition. To reduce the risk of politicization, minimize project costs, and encourage innovation, competition is used at as many levels as possible among project participants. To ensure a fair process in project selection, the rules for deciding among competing projects are transparent and stable and are established by the central government.
- Appropriate Technologies. For solutions to rural electrification needs, the program considers grid extension and distributed technologies, including photovoltaic systems for isolated rural dwellings; hybrid systems; small hydroelectric power stations; and biomass systems. To ensure sustainability, all costs over the life of the projects are considered in the appraisal, and organizational programs for operating and maintaining the projects also are included.

The program increased the coverage of electricity in rural areas from 53% in 1992 to 76% at the end of 1999, exceeding the target rate of 75% by 2000.

Source: Nexant, 2002

III. INSTITUTIONAL APPROACHES

This section includes several case studies of selected RE systems in various countries in Asia and Africa and provides an assessment of the lessons learned and the factors that influence the design of the most optimum custom-made approaches for RE development in different settings.

A. SELECTED RURAL ELECTRIFICATION CASE STUDIES

1. Bangladesh

One of the most successful private sector led RE projects is a solar project being implemented by Grameen Shakti (GS), a renewable energy company in Bangladesh. The company was established in 1996 as a non-profit and is an affiliated company of the Grameen Bank. The company's objectives are as follows:

- To popularize and deliver renewable energy to rural households.
- To market solar, biogas and wind energy on a commercial basis, focusing on rural areas, particularly the clientele of the Grameen Bank.
- To provide services that alleviate poverty and protect the environment through applied research and the development of renewable energy based technologies.
- To undertake a project to progressively manufacture and market efficient and affordable household-based photovoltaic systems.
- To implement projects to generate electricity from wind in the coastal belts and offshore islands; and operate mini- and micro- hydro plants in the hilly areas.
- To develop and implement special credit, savings and investment programs for generation, storage, and utilization of renewable energy for the benefit of the rural people.
- To test the new and appropriate technologies to provide more cost effective energy services at affordable price to non-electrified areas.
- To provide capital, technology and management services to energy enterprises, including individuals, communities, businesses, non-government organizations (NGOs), private voluntary organizations

(PVOs), which promote, produce and finance enterprises based on renewable energy sources.

The company has the following main programs:

- Solar Program: marketing solar home systems through a network of branch offices with a soft loan program
- Wind Program: distributing electricity through micro-enterprises in cyclone shelters in coastal areas of Bangladesh
- Bio-gas Program: promoting bio digester to produce cooking fuel and fertilizer
- Bio-mass Gasification Program: producing electricity from bio-mass and marketing the power in rural markets
- Training Program: creating employment for rural people and a base of necessary skills
- Research and Development Program: exploring appropriate technologies, marketing and financing mechanisms, and local manufacturing of components
- RICT Program: Introducing Rural Information and Communication Technology
- Solar Powered Computer Education Program: providing computer education in remote places

Solar Program Review: For the solar program, the company offers the following terms to rural consumers:

Option I

- 25 % down payment
- 75 % in 24 installments (with an 8% service charge)

Option II

- 15 % down payment
- 85 % in 36 installments (with a 12% service charge)

One of the keys to the success of the company is its excellent consumer service provided through 43 branch units, located in difficult-to-access areas, consisting of one engineer and one technician based at each of the branch units that not

only market the program but also provide full on-site service and maintenance of all systems. The units perform the following activities:

- Engineers visit the customers each month to collect the installments. During the visits the engineer checks the systems and takes corrective measures if necessary.

- Customers are given orientation training on minor maintenance issues.

- Engineers and technicians train the local technicians who are expected to gradually take over the maintenance of PV systems.

GS has marketed and installed 5,206 Solar PV systems as of July 2001 with a total capacity of 259.4 kWp. GS is installing, on an average, 300 solar systems per month. GS has trained 300 local technicians (young men and women) on installation, operation, and maintenance of PV systems. These trained technicians are expected to take over after the sales service period expires. In addition, it has trained 2,100 customers on minor maintenance of their systems. Gradually all customers will be brought under the training program.

Wind Program Review: GS has installed 6 wind turbines in coastal areas. Four of them are hybrid systems with diesel backup. One system is of 10 kW and the rest are 1.5 kW each. Power is being supplied to cyclone shelters of Grameen Bank and some customers.

Solar Powered Computer Education Program: GS has started four computer education centers.

Future Plan

- GS has planned to install 10,841 solar home systems within the next 5 years

- 18 small battery-charging stations, powered by solar PV, will be installed within the next 2 years

- 16 computer-training centers, powered by solar PV, will be installed within the next 2 years

- 20 multi service centers, powered by solar PV, will be installed within the next 2 years

This program offers a number of best practices. It success is based on its emphasis on customer service and training of customers, combined with a highly trained and motivated sales and maintenance staff.

2. India

In India, steps for formation of Rural Electric Cooperatives for distribution of power in rural areas were taken for the first time only in the later half of the 1960s when the Government of India sponsored an investigation by an expert team from the National Rural Electric Cooperatives Association (NRECA), USA for identifying a few areas with adequate potential for the establishment of Rural Electric Cooperatives. As a result, 5 areas were identified, one each in the States of Andhra Pradesh (Sircilla), Gujarat (Kodinar), Karnataka (Hukeri), Maharashtra (Rahuri & Shrirampur), and Uttar Pradesh (Lucknow). Five pilot rural electric cooperatives were established in 1969. At approximately the same time, the Rural Electrification Corporation (REC) was established and was given the responsibility to fund and promote these pilot societies. Inclusive of these five pilot societies, REC has so far sanctioned 41 RE Cooperatives in the country spread over 12 States. As of now, 33 of them are in operation and 8 cooperative societies (3 in Rajasthan and one each in the States of Bihar, Gujarat, Jammu & Kashmir, Uttar Pradesh and Orissa) have since been taken over by the respective State Electricity Boards (SEBs).

The broad objectives of the rural electric cooperatives are to:

- Extend the electrical network in their areas quickly and economically;
- Provide proper service to the consumers taking into account local conditions;
- Support the wider program of development of the area for increasing agricultural production and stimulating the growth of rural industries, and
- Ensure local participation in the management of rural distribution of electricity.

While a few of the existing RE Cooperatives are doing well, most of them are in very difficult situation and/or organizationally and financially weak. The primary reasons for the failure of these cooperatives are as follows:

- Lack of freedom to set tariffs on commercial basis for different types of consumers in their area of operation.
- Unfavorable load mix that is often forced on them because of the SEBs proximity and influence with the State Governments.
- Constant political interference.

Notwithstanding these challenges, there are a number of independent and small RE programs that are showing great promise. The Rural Energy Program (IREP) is an excellent example of an integrated rural energy program designed by India, which combines both national planning and rural level leadership to enhance program sustainability. The IREP was launched as part of the India's Seventh Five Year Plan (1985 -1990) with the objective of meeting the basic needs of cooking, heating and lighting in the rural sector. The Ministry of Non-conventional Energy Resources (MNES) administers this program. The focus of the program is on utilizing locally available resources to the maximum extent possible.

The program has two components: (i) a Central sector component which provides aid in the form of grants for professionals, and supports staff in the IREP project cells at the State and District/Block, and (ii) a State sector component which funds IREP Block energy projects at the State and District/Block levels. Specific management components of the program include the following:

- 19 State Level Technical Back Up Units (STBU) for technical support to IREP State, District and Block Cells
- 171 District Level Technical Back Up Units (DTBU) for technical support to IREP District and Block Cells
- 6 Regional IREP Training Centers set up (with two centers in Delhi and Lucknow being fully operational)
- 860 Blocks covered

Some examples of the successful RE projects implemented by IREP are briefly discussed below:

2.1 Water Heating and Cooking Project - Solan District, Himachal Pradesh

Project Area:	5 villages
Energy plan focus:	Water heating and cooking
Devices installed:	3 community solar water heaters (750 lpd each) 116 Improved Chulhas (Cooking Stoves) 51 Solar cookers with electric back-up

Local institutions Involved:	Mahila Mandals and Panchayats Local NGOs – DEEP and Development Promoter

2.2 Cooking and Lighting Project - Sultanpur District, Uttar Pradesh

Project Area:	3 villages
Energy plan focus:	Cooking and lighting
Devices installed:	24 Biogas plants (2 cubic meter each) 250 Improved Chulhas 65 Solar lanterns
Local institutions Involved:	Village Panchayats Local technicians

2.3 Solar Photovoltaic Project - Sagardeep Island, West Bengal

- Set up by West Bengal Renewable Energy Development Agency (WBREDA)
- Soft loan by Indian Renewable Energy Development Agency (IREDA)
- Project cost Rs 42.7 million (approximately US $5 million)
- Five power stations of 25 kWp each
- 120 consumers in one or two villages connected to each power station
- 100 W (maximum) to each consumer
- Rs. 1000 (US $115) as deposit by each consumer
- Rs. 120 (US $14) per month paid by each consumer (Rs. 80/US $9 per month was previously spent by each consumer on kerosene for lighting)
- 9 metric tonne subsidized kerosene saved per annum
- Project funded by Ministry of Non-Conventional Energy Sources (MNES) and DOE's National Renewable Energy Laboratory, USA

3. Kenya

The Kenyan photovoltaic industry is an interesting case to study for other developing countries in Africa and elsewhere because it provides a low-cost model for sustainable, private sector-based off-grid rural electrification. Some 120,000 solar photovoltaic systems for household use (lighting, radio, or television) have been sold in Kenya since 1990, and during the 1992 - 1999 timeframe the market grew by more than 20 percent a year.[1] Most buyers are rural, middle-class households that lack confidence that the power grid will be extended, are knowledgeable about photovoltaic system performance, and want to make existing battery systems less maintenance intensive. Local entrepreneurs have played a key role in the process by aggressively moving photovoltaic systems to market and by downsizing the product to the needs of the lower-income market.

This market has developed in an environment where rural grid electrification had been lagging population growth for years, with less than 2 percent of Kenya's 3.7 million rural households having access to grid electricity.

3.1 PV Market Development In Three Stages

The PV market can be said to have truly begun in 1982 and by 1999 the photovoltaic market had grown into a US $6 million a year industry. The development of the market can be described in three stages. In the first stage, upper-middle-class rural innovators - as well as nongovernmental organizations (NGOs) working off-grid - installed complete photovoltaic systems. This created the demand for the technology and the services it provided. In the second stage, large numbers of rural people bought small photovoltaic panels and batteries, primarily to power televisions which expanded the market for PV while demonstrating consumer trust in the technology. In the third stage, "hire-purchase" arrangements and finance agencies began to offer systems, allowing far more rural Kenyans to buy them on credit. Hire-purchase of consumer goods such as sewing machines, televisions, stereos, bicycles, sofas - has been common in Kenya for at least twenty years. Under this arrangement a wage employee signs up with a hire-purchase company that automatically deducts monthly payments from his or her salary.

In the early years, well-engineered, complete systems were common. Typically the systems generated from 40 to 100 peak watts, with one battery powering five to ten lights and a black and white television. Marketing the product was easy. Once a community leader had a photovoltaic lighting system, it did not take long

[1] The case study for Kenya is adapted from "*A case study on private provision of photovoltaic systems in Kenya", by Mark Hankins, 2000.*

for his middle-income neighbors to buy one too ('keeping up with the Jones'). Once the technology was known in a community, it became common for urban-based Kenyans with disposable incomes to purchase photovoltaic systems for their rural homes, thus spreading the knowledge and attractiveness of the systems to additional rural communities.

By the end of 1990, Kenya had more than 0.5 megawatt of installed photovoltaic capacity and at least 5,000 installed solar home systems. Although donors continued to purchase 20 - 40 percent of the photovoltaic equipment each year, donor-subsidized purchases became far less important to the overall market than the household consumer.

Aggressive marketing quickly saturated the market for buyers of large solar home systems. Less than 0.5 percent of rural Kenyans could afford to spend US $1,000 or more for a 60-peak-watt solar home system, and by the early 1990s this market evaporated.

Photovoltaic dealers realized that, as much as electric light was a priority, rural people also wanted television. The rapid mass-market growth of the photovoltaic industry had much to do with the expanded reach of the local television network. By the mid-1990s, 10 percent of local battery production - as many as 60,000 units a year – was being sold in the rural television and photovoltaic system market. Photovoltaic panels are still desirable, however, because they eliminate the need to carry a battery to and from a charging station. Thus, the interest soared in smaller, lower-cost photovoltaic modules once they became widely available. In 1990 only 2,400 12-peak-watt modules were sold, at a retail price of about US$100 each. By 1998 more than 22,000 modules were selling each year, and the retail price had dropped to US$65.

Such small modules do not supply enough electricity to power a family's lighting demand. Still, more and more photovoltaic systems were being purchased a piece at a time, and vital system parts - such as charge regulators, which help protect batteries - were being left out. Many consumers learned to conserve their modules' output by using the television and lights less. In addition, many purchased additional modules later when they could afford them. This modular approach to purchasing proved highly successful, both to the consumer and the supplier. It leveled the ability to pay with the desire to have. When combined with the Kenyan tradition of 'hire-purchase' arrangements, the result was an increase in both economic activity and development.

In the third growth stage of the market, and particularly under the 'hire-purchase' arrangement, interest rates could run at 40 percent a year or more. These interest rates were naturally factored into the price of each system. In 1996, after at least one failure to market photovoltaic products through hire purchase companies, a leading photovoltaic company tried to build sales by subsidizing the hire-purchase arrangement through various agents. The company offered

attractive credit terms to hire-purchase retailers and sought a wide base of agents. In 1998 the company sold more than 1,500 systems (and modules) on credit. Today at least four leading photovoltaic importers supply systems through 'hire-purchase' agents, and 15 percent of the solar home system business passes through a hire-purchase financing scheme.

The World Bank, through the Energy Sector Management Assistance Program (ESMAP), has tried to stimulate financing for photovoltaic systems. One project worked with two rural banks to develop loan lines dedicated to solar home systems. The demand for the loans was far greater than the supply, repayment rates were high, and installation quality was excellent. The project underscored the need to educate financial institutions about the demand for and the value and viability of financed solar home systems.

3.2 Market Prospects

Since 1990 more than 2.5 megawatts of photovoltaic capacity have been sold in Kenya. More than 60 percent of these sales went into solar home systems. By 1999, 3-4 percent of the rural population had acquired a photovoltaic system, and at least 70 percent knew what such a system was. That same year, the total photovoltaic market was about 480 peak kilowatts. Of this, more than 250 peak kilowatts came from modules of 20 peak watts or less. This sustained and growing demand is a clear indication of the value rural people place on modern energy.

3.3 Market Players

Today's photovoltaic industry in Kenya involves an increasing number of players:

- There are ten to twelve photovoltaic equipment importers, many of which have turnovers above US$500,000, and nearly all of which deal in other products related to photovoltaic power. For example, one major photovoltaic importer is a battery manufacturer; another is a television and appliance dealer, and another sells power electronics.

- There are hundreds of retailers - including appliance vendors, automotive parts suppliers, hire purchase agents, and a few dedicated "solar retailers" - selling to customers from urban and small town outlets.

- There is a small but active group of local manufacturers that assemble and sell system components, including 12Vdc (volts of direct current electricity) lights, cables, charge regulators, and batteries.

3.4 Consumer Benefits

Surveys show that about 60 percent of buyers are satisfied with their photovoltaic systems, and 94 percent would recommend them to a friend. A dealer's purchase price for a photovoltaic system can be as little as US$150 for a two-light, 12-peak-watt system with batteries and wires (without a charge regulator).

Photovoltaic systems can save consumers more than US$8 a month over more traditional forms of energy, with 80 percent of the savings coming from lower kerosene and dry cell consumption. Thus a 10- to 15-peak-watt photovoltaic system will pay for itself within 1.5 – 2.0 years. The first solar home system that a Kenyan buys is likely to be lower quality and less economical. Electric light is of a much higher quality than that provided by a kerosene lamp: it provides far more lumens per dollar, it does not smoke, and it can be switched on and off at will.

3.5 Government Policy

The demand for electricity in Kenya is growing by about 6 percent a year. Energy policies are primarily targeted to meet the electric power industry and commercial fuel supplier needs, which have a direct bearing on Kenya's urban infrastructure. Through the 1997 Electric Power Act, Kenya liberalized the power sector and privatized the main power company, Kenya Power and Light – though the government still owns a controlling share. While Kenya Power and Light retains a monopoly on distribution, privatization has forced the utility to carefully scrutinize programs that are not cost-effective, including its rural program. It has limited generation capacity - about 800 MW in 1999 - and urban and industrial consumers are its priority customers.

The government's hands-off approach to the off-grid private sector has helped the photovoltaic industry flourish. Over the past five years the removal of import, price, and foreign exchange controls has opened markets to competition. The Government has reduced duties on photovoltaic modules to 5 percent and removed the value added tax, lowering photovoltaic system prices to consumers by 15 - 20 percent. The Kenyan shilling is freely convertible.

International photovoltaic suppliers have established local bases in Kenya to serve the East African market - modules come to Kenyan vendors from Australia, Croatia, France, India, Japan, Russia, Spain, the United Kingdom, and the United States. The competition has led to more competitive pricing and a wide range of product selection.

Still, a number of policy-related hurdles remain:

- Conventional rural electrification equipment and photovoltaic modules are exempt from duties and value added taxes. But batteries, charge regulators, inverters, and efficient appliances are charged duties and value added taxes in excess of 35 percent of their price. There is a need to level the playing field for electrification options.

- The industry suffers from erratic equipment and installation standards. Dealers undersize or leave out vital components to win contracts, and there is little incentive for proper engineering.

- The industry suffers a lack of trained technicians. Without systematic technician training, installation – and hence system quality - will remain poor.

- Financing for photovoltaic systems is the next frontier in making the technology more widely available and functional. Rural residents cannot afford to buy complete systems all at once. But Kenya has a strong rural credit tradition and hire purchase movement and this is fertile ground for more experimentation.

4. Sri Lanka

The Government of Sri Lanka manages its electricity sector through the authority of Ceylon Electricity Board (CEB), the national utility. CEB suffers from all of the typical problems plaguing most developing countries -- high losses, inefficient systems, lack of investment capital, etc., and a very low access of electricity to rural consumers. The government has taken a number of steps to address the low level of rural electricity access.

It started an Energy Services Delivery Project (ESDP) with a focus on the rural sector. The project was started by a credit provided by the World Bank and Global Environment Facility (GEF). The total initial grant for Phase I was $30 million. Instead of putting the management of this project inside the national utility (CEB) or a government ministry, the Bank/GEF team set up an alternate institutional and administrative structure for the project. The overall responsibility for management and fund disbursement was placed under the Development Finance Credit Corporation (DFCC) in order to give the project a commercial character and to keep it away from institutional inefficiencies in CEB and the government ministries.

The DFCC used a number of 'Participating Credit Institutions' (PCIs) such as the National Development Bank, Hatton National Bank, Sampath Bank, Commercial Bank, and Sarvodaya Economic Enterprises Development Services (SEEDS).

Two major programs were implemented under the ESD project: (i) Solar Home Systems (SHSs), and (ii) Off-Grid Village Hydro Schemes (VHSs).

The SHS component of the program had the following features: (i) typically 30 Wp, 45 Wp, or 50 Wp systems, and over 1,000 such systems were installed by the end of June 2000. By the end of June 2001, this number rose to 4,236 SHS, a remarkable example of market penetration by any standards. To date more than 6,400 have been installed and an additional 1,000 units are being processed. DFCC had a pipeline of an additional 10,000 units to be installed by December 2002.

The GEF grant is co-financing an average of $100 per SHS, the rest comes from the World Bank line of credit to the DFCC.

The DFCC uses four dealers in the industry: Shell Renewables Lanka Ltd., Selco Solar Power Lanka Ltd., Access Int. (Pvt.) Ltd., and Alpha Thermal Systems Ltd., which provide sales and maintenance services. The financing mechanism provides around Rs. 5,000 (US $60) down payment and the rest is on commercial rates. DFCC has a 97% recovery rate.

The second component of the ESD project is the installation of off-Grid village hydro schemes (VHSs). These systems are typically 10 kW in capacity and serve one village. Currently, the following is the status of this program:

- Originally catered as 100 W per household, but now it averages 250 W per household.

- A total of 19 projects were implemented by June 2001, and DFCC had a pipeline of 61 additional projects for December 2002. A total of 600 households in three key villages now receive electricity from these off-grid projects.

The GEF Grant co-finances US $400/kW with a cap of US $20,000 per project. Villagers form a consumer society (Electricity Consumers Society) provide pool equity and local labor for the project, which is an excellent way to involve the consumer and provide local value added through new jobs in the villages. An actual use basis tariff system is applied to recover revenues. This component of the ESD project is also very successful due to both local capacity building and a comprehensive awareness program implemented by the DFCC and participating credit institutions.

After years of mixed reviews on many rural energy projects financed by the international finance institutions (IFIs), the ESD project has emerged as a real showcase project. The success of the project is so overwhelming that DFCC is

currently in discussions with the WB/GEF for a follow on phase of the project, which will almost be twice the size of the initial project.

The main reason attributed to the success of the project is the implementation structure of the project, which utilized banking and finance institutions to manage all disbursements. By assigning the disbursement and management of the project to parties with a vested interest in its success, the WB/GEF team was able to buy a built-in insurance that the project will be implemented successfully. An added benefit of the project was the participation by consumers, which added consumer confidence in, and political acceptance of, such RE schemes. Box 13 provides more details on the project.

Box 13: World Bank/GEF-Assisted Sri Lanka Energy Services Delivery Project

The Sri Lanka Energy Services Delivery Project (ESDP) was designed to support the installation of approximately 30,000 solar home systems over a five-year implementation period. Financing for these installations would be available to private sector and NGO developers through an ESD Credit Line established under the Project. In addition to the PV systems, the ESD Credit Line is expected to support development of approximately 20 village micro-hydro systems and related distribution network; and 20 mini-hydro plants (connected to the central electricity grid). An estimated US $12 million will be requested for the PV subprojects. Half of this funding was from commercial credit, supported by World Bank (IDA) funds. Project developers provide US $3 million in equity on a one-to-one basis with GEF grant co-financing.

The Project was designed to remove the principal obstacles to widespread dissemination of renewable energy technologies. With respect to solar home systems, these obstacles are: (i) a lack of access to term financing; (ii) unfamiliarity of consumers, private sector developers, and the financial community with the technology; and (iii) an underdeveloped sales and distribution infrastructure. The design supported the idea that once the necessary infrastructure was in place, and a competitive market established, solar home system costs would drop, allowing continued sales after the ESD Project was completed. The ESD Credit Line will provide commercial financing through participating credit institutions for sub-projects which meet standard appraisal criteria. NGO's and private sector developers were allowed to utilize an ESD Credit Line to provide term financing to their solar home system customers. During the Project period, developers would receive a GEF grant of US $90 to US $100 for each 30- to 50-W solar home system sold. To be approved, business plans submitted by project developers in support of their ESD credit application had to show financial viability and continued solar home system sales well beyond the Project period. GEF grant funds also supported business development and technical support.

Source: The World Bank, Press Release, adopted

5. Thailand

The power sector in Thailand is managed by the national utility -- Electricity generating Authority of Thailand (EGAT), responsible for generation and transmission functions; the Metropolitan Electricity Authority (MEA), responsible for distribution in metropolitan areas; and the Provincial Electricity Authority (PEA), responsible for rural areas. Over the past 25 years, Thailand has achieved a remarkable success in increasing rural electricity access, now over 90% (only 10% of the country's villages had access to electricity in 1972). The fundamental approach was a strong distribution company and a cross subsidy from urban consumers to rural consumers for a fixed period of time. The decision for this subsidy was made by the government as a matter of its rural development policy. Early on the government realized that rural development was the key to the development of Thai economy. As such, the government made it a priority to ensure the availability of electricity in the rural sector coupled with income generating activities such as rice growing, textiles, leather goods productions, etc. Many of these products from the rural sector are exported, which is an added benefit of the Thai policy as it generates foreign exchange.

Conventional wisdom dictates that cross subsidy should not be provided as it violates social equity and distorts markets. However, the Thai model has demonstrated that targeted subsidies for a fixed period of time even through a cross-subsidy approach can increase rural electrification and rural industrial development. A benefit of this approach is the demonstration of a clear linkage between electricity availability and rural economic and industrial development. The value added of the rural sector to the national GDP has been continuously increasing at rates more than twice that of the national economic growth rate.

There is a wide consensus on the major reason why the Thai rural electrification program has been so successful. The most important reason is minimal political interference in the selection of villages to be electrified. This has made possible the implementation of two important policies (i) the use of objective criteria for village selection, and (ii) a competitive system for "jumping the queue"[2]. This system provided for a mechanism to accelerate a village's selection if that village was willing to make a larger contribution to the construction cost.

Most villages were electrified through grid extension. The remaining 700 villages are considered too remote to electrify with grid extensions. For these villages, the PEA is focusing on the use of stand-alone electricity generation – with a primarily focus on renewable energy systems. The Thai Government's National Energy Policy Office (NEPO) has established a fund for energy conservation and renewable energy. The government capitalizes the fund through a tax on the sale of fossil fuels in the country. The commitment of the Thai Government

[2] Barnes, Douglas, The World Bank

towards the use of the renewables for expanding rural electrification and promoting energy concervation is described in Box 14.

Box 14: Thailand's Commitment Towards Renewables

Thailand has abundant renewable energy resources. It also has a commitment, through its Small Power Purchase Agreement, to support the development of power projects to supply provincial and national electricity authorities from renewable resources. This support takes the form of an obligation to acquire power from renewable energy projects under an agreed Power Purchase Agreement arrangement at agreed tariff rates. However, to further encourage and accelerate the exploitation of renewable resources, the National Energy Policy Office (NEPO) of the Thai government has initiated a new market incentive scheme.

This program, funded by the Thai government's Energy Conservation Fund (EnCon), will provide incentive prices for up to 300MW of new power projects based on renewable energy sources and technologies, to be developed in the period to 2004. These projects were to be selected through competitive bidding

The significant reduction in economic activity after the economic crisis in Asia has removed the pressure for expansion of the power supply. A power surplus is expected through to 2004, with a supply available from Laos to meet any shortfall. Nevertheless, The Government of Thailand has maintained its support for energy conservation and renewable energy through the Energy Conservation Fund (EnCon). There has been considerable success with energy conservation projects, but the promotion of renewables, especially with the involvement of the private sector, has achieved more limited success. NEPO's response to this has been the announcement in 2001 of a two billion Baht fund to support renewable energy projects through a modified Non-Fossil Fuel Obligation (NFFO) style program. The Government of Thailand is promoting the use of renewable energy as a fuel in the electricity supply industry in the form of Small Power Producers (SPPs). Regulations allow generators of no more than 90MW each (SPPs) to sell power to EGAT, the state-owned power utility. However, only a small proportion of the present 1,580 MW capacity is based on renewable energy.

Source: Adopted based on the information in the Web provided by Mr. Khun Vanchai Tanasoontararat, Commercial Officer, British Embassy, Bangkok

6. Vietnam[3]

The following statistics offer the current status of rural electrification in Vietnam. These statistics are for the year 2000:

[3] This section developed based on "Rural Energy and Comprehensive Poverty Reduction Growth Strategy", The World Bank

- People without electricity are 16 –19 million
- Households without electricity are 3.89 million
- Communes without electricity are 1938
- Of 8896 communes

    - 6958 electrified
    - 6000 under local management including 400 remote communes
    - 958 under EVN management

- Asset value of rural power network is 6,726 billion dong ($ 448 million), contributed by:

    - Central budget/power sector -- 20%
    - Local budget/provinces -- 31.5 %
    - People's contribution -- 48.3 %

Vietnam's electrification plans for 2010 provide for: (i) increase the household coverage to 90%, (ii) extend the grid to all the communes that are economically and physically possible, (iii) supply about 400 isolated communes by renewable sources, and rehabilitate existing rural networks. Investments required for rural electrification follow:

Rural Electrification	**Investments 2000-2010** (US $ Million)
Connecting new communes to network	1,218
Rehabilitation of existing communes	1,003
Remote Communes	40
Total Investment Required	**2,261**

Vietnam is facing three classes of issues in RE today: (i) expansion of grid to connect communes that can be economically connected, (ii) providing energy supply for remote areas, and (iii) repair, rehabilitation and expansion of coverage in existing communes.

Issues in local commune grids are related with: (i) high technical losses (20-50%), (ii) non-technical losses, (iii) faulty meters, unbilled consumption, (iv) poor quality and safety, (v) high tariffs, (vi) many poor not served*, (vii)* lack of legal status, (viii) heavy operating subsidies, (ix) no financial controls or incentives for efficiency, and (x) lack of investment for repair, maintenance, and extension.

After evaluating the pros and cons of implementing different institutional options in terms of ownership and operation of rural electrification schemes (e.g., local authority, the national utility, consumers, and private investors), the government developed model which included most of the advantages and fewer of the disadvantages of other models. This model overcomes the important problem of lack of financing needed to invest in operation and maintenance and system

expansion. The government called this model "*Shared ownership" between the national utility EVN, the local authority, the consumers, and investors.* A summary of the key features of this model follows.

Investment

Advantage

- High capacity to mobilize investment capital from different sources
- Possibility to use the technical skill of EVN
- Loans from commercial banks available

Disadvantage

- (difficult to identify)

Operation

Advantage

- Legal status is secured
- Efficient technical and financial controls
- Direct consumer ownership

Disadvantage

- Might not be applied for all communes
- Management complexity

Some Problem Areas

- RE operation should be for profit basis
- Role of EVN to be defined
- Government employees as shareholders of joint stock companies (JSC)
- Ownership of existing low-voltage (LV) network
- Ownership of medium-voltage (MV) and small systems (SS)
- Monopolies or competition
- Pricing
- Subsidies and incentives for efficiency

World Bank Strategy for Vietnam's Rural Energy (2002 – 2005)

- Expanding access to rural areas
    - Rural Energy I ($ 150 million, FY 2000)
    - Rural Energy II ($ 220 million, FY 2004)

- Mobilizing finance for system expansion
    - Partial Risk guarantee ($ 75 million, FY 2002)

- Improving system and energy efficiency
    - System energy improvement, equitization and renewable project ($225 million, FY 2002)
    - GEF for renewables and DSM/energy efficiency (FY 2003)

- Reform and sector restructuring
    - Sector studies and technical assistance
    - Energy structural credit as part of PRSC II (FY 2003)

Based on the new principles for RE to be implemented in all new WB projects, namely: (i) economic investments, (ii) cost effective projects with no operating subsidies, (iii) œost sharing, (iv) technically sound specifications, (v) legal status, and (vi) local participation and management; the World Bank:

- Is willing to provide $ 200-250 million for RE II in FY 2004
- Alternatives for financing
    - EVN on IDA like terms
        - MV /SS/ transformers -- 100 %
        - LV -- to JSC but less than 50 %
    - Government to onlend to:
        - Provinces for commune electric groups (CEG), rural electric cooperatives (REC), or JSC
    - Rural Energy Agency to onlend to:
        - Provinces for CEG or JSC

Box 15 provides an interesting example of a rural electrification project in Vietnam that maximizes the participation of women.

Box 15: Women Use RE Technologies in Vietnam

An interesting project was implemented in Vietnam that demonstrates the importance of including women who are an important element in RE projects as they are the primary users of the RE technology. The Vietnam Women's Union (VWU) is an NGO comprising 11 million women members. With an $ 87,000 grant from the Solar Electric Light Fund (SELF) and Rockefeller Brothers Fund, the VWU established a Revolving Fund. The fund also received a grant of US $35,000 from the Sandia National Laboratories (funded by DOE, USA). The fund was managed by the VWU. A total of 135 solar household PV systems were installed in 5 communities spread over 3 provinces. Each community system was of 225 Wp each, and 2 outdoor lighting systems were of 75 Wp each. The repayment was received over a three-year period in monthly or bi-monthly installments, with a 95 percent on-time repayment rate.

Additional case studies for rural and renewable energy applications and models in Africa can be found in a comprehensive review entitled "Experience with PV Systems in Africa," as referenced in the bibliography to this report.

B. LESSONS LEARNED

It is apparent that there is considerable potential for RE applications throughout the continent. The biggest barrier continues to be a lack of initiatives to finance rural energy programs as part of overall rural development programs. There is a strong need for governments to develop an enabling environment for greater participation in RE programs by the private sector. In the absence of an enabling environment, most RE programs depend upon donor grants and shrinking government budgets; and disappear when such funding diminishes. Analysts have conducted numerous analyses on mechanisms to achieve RE program sustainability. Several of these papers are included as references in Annex I.

Regardless of the final approach or model used for RE development, sustainability of RE programs can be achieved when programs are backed by a strong government commitment for consumer education, participation and political acceptance; have subsidies that are designed to be withdrawn; and involve private sector participation.

1. Social Trust Aspects of Rural Electrification

“Social Trust” can be defined as the quality of the relationship between a company or organization and its stakeholders. Assuming this trust exists, it is usually based on the fact that the needs of the stakeholders are met by the performance of the institution upon which they rely. Once this level of trust is achieved, it is naturally assumed by the satisfied stakeholders that the institution operates in a favorable manner in all areas of its business, especially those areas where there is less public oversight. Conversely, the distrust that results from an institution not living up to the expectations of its stakeholders can lead to overall distrust of the institution across all areas of business. Each of these scenarios has profound effects on the ability of the institution to perform its role in society. Socially responsible organizations make the trusting relationship between parties a high priority with the understanding that, without trust, there cannot be a relationship.

Francis Fukuyama refers to social capital as social trust and applies it to the economic wellbeing of a liberal economic system. He argues that liberal economic systems are unable to function efficiently unless there is a certain level of trust among those who engage each other commercially. This trust is fostered by the existence of strong political and social institutions that make the rules of commerce clear and fair.

For power utilities and energy service providers, it is important to realize that trust can be enhanced, can diminish, or simply be maintained. For obvious reasons, it is much easier to diminish trust in a short period of time than it is to regain that level of trust. The focus here must remain on building and maintaining trust with the power stakeholders in order to create a healthy business climate and foster future development within the sector. Trusting relationships are the key driver to creating an environment where reliable electricity can be supplied, a company can operate efficiently, risks are minimized, and all responsibilities can be fulfilled (social, legal, and economic). The effective application of these policies will inevitably lead to a highly efficient use of resources, which is the ultimate result of all businesses.

The reason that social trust is so important within the sphere of rural electrification is that there are many social, financial, economic, and technical implications to consider. Rural electrification is a complex and time consuming process in most developing countries and requires strong commitments from all participants. Cooperation and trust are seen as the most important intangible aspects of this process. Achieving high levels of trust will allow for all parties to be effectively involved at all stages of the process and lead to schedules being met and budgets being maintained.

The players within a typical rural electrification plan may include diverse parties with different understandings and expectations. For example, there may be local, national, provincial, as well as international involvement in these projects. Within these larger groups, there are likely to be financial organization, donor groups, NGOs (both domestic and international), government agencies, local trade associations, cooperatives, and local representatives from individual villages. Coordination amongst such diverse groups is considered key. As discussed earlier, mistrust amongst these parties can seriously impede the effective implementation of RE projects, and in most situations the initial trust must be derived from the primary power company. Efficiencies, both in cost as well as time management, are due in part, to the fact that parties have clearly defined roles. Thus, as problems emerge, creative solutions can be incorporated.

Trust between stakeholders is amplified when it comes to public participation in the continuing process of post-implementation of RE projects. Since the public are the end-users in the process and generally bear the brunt of payment, their "buy-in" to the process is vital. In this situation the relationship must resemble much more of a partnership as they will be working side by side on a regular basis to address emerging concerns.

In many cases, it is recommended that the government sets about acting more as a broker of RE programs, rather than the actual implementer. In this way the government acts as the entity that brings all other groups together to work towards the program's objective. The government can also help in establishing

an enabling environment. Private sector entities are unlikely to ever undertake the complex process of rural electrification without the confidence that there is a public sector commitment to these programs. Additionally, RE programs must be developed that are based on a participatory dialogue between donors and the government rather than a situation where donor driven programs are simply signed off on.

Guidelines have been developed to help guide the social trust aspect of rural electrification programs. Many are listed in Table 13, with the understanding that all country situations are unique and these should be considered as general principles:

Table 13: Social Trust Guidelines

General	Project Planning Stage	Project Design Stage	Project Implementation Stage	Project O & M Stage
Provide training in technical and interaction skills with stakeholders	Establish transparent site and community selection criteria based on national policies and programs	Design project to maximize local involvement and benefits	Support local development projects and measures	Maximize local involvement in long term maintenance and operation
Encourage/sustain learning activities aimed at on-going lessons for RE through workshops and meetings	With stakeholders, identify development objectives/priorities	Tailor project to regional context and community needs	Develop local capacity through project construction	Timeline should be included for local organization autonomy
Create clear and impartial rules for providing electricity	Encourage local community and stakeholder involvement in setting goals and choosing technology	Address stakeholder concerns and incorporate them into the design	Voluntary participation should be encouraged	Develop "fade out" plan and implement with local community and stakeholder involvement
Provide beneficiaries with adequate information to understand the rules	Involve stakeholders and beneficiaries in assessing needs/priorities, as well as willingness to pay	Keep community and stakeholders informed throughout stage	Use domestic products and local materials for construction	Encourage Cooperative organizations with local residents for O&M of facility
Approach projects with transparency and fairness	Discuss tariff issues with local residents	Seek local involvement to design a sustainable project	Award contracts clearly and transparently	Explain benefits to local residents of saving funds for maintenance and repairs
Establish impartial procedures	Transparency and full disclosure while taking into account cultural and educational backgrounds	Encourage local participation based on local social structures and customs	Inform stakeholders and communities of rules, rights, and obligations of each party	Inform residents of tariff matters upon completion
Promptly identify concerns of those potentially effected	Provide adequate information as early as possible to all groups involved	Explore existing frameworks for public participation	Assure site monitoring and establish contingency plan	Make residents aware of safety matters
Be willing to modify project components to accommodate various local needs	Roles, responsibilities, and obligations of the electricity provider, beneficiaries, and other stakeholders should be considered	Certify that final design is consistent with needs/priorities of community and stakeholders	To encourage sustainability and fairness, allow monitoring by local authorities and experts	Involve stakeholders in technological, maintenance, operations, management, and financial performance
Sensitivity to local customs and existing activities	Project should be open to modification based on mistakes that will be made	Use local engineers in the detailed design	Maintain environmentally sounds construction practices	Provide follow up training for capacity building

Source: Table prepared based on "Social Trust Aspects of Rural Electrification", E7 Working Group, 2nd Edition, October 2000

2. Stakeholder Participation in Rural Energy

This section focuses on an important aspect of designing rural electrification programs, namely, the critical need for stakeholder participation. In this context, it discusses the role of key entities and stakeholders:

- Role of the Government
- Role of Local Institutions and NGOs
- Role of the Private Sector
- Role of the Donor Community
- Stakeholder Participation in RE Monitoring and Evaluation
- Participation in Identifying Constraints and Beneficiary Needs
- Participation in Monitoring
- Participation in Evaluation
- Organization of RE Project Management

2.1 Role of the Government

The role of government is crucial in rural electrification programs. Based on best practices, the ESMP of the World Bank has characterized this role very well in "Best Practice Manual: Promoting Decentralized Electrification Investment" (Please see section IV.B.1 of this report). Governments need to assign clear responsibilities for off-grid system development and develop the necessary 'enabling environment' for RE programs to take root and prosper. Where an enabling environment is created that provides for more responsibilities to be placed in the hands of decentralized energy service providers and rural organizations and stakeholders, the more likely the program will succeed.

In addition, governments need to look at all options, both in approach and in terms of most suitable technology options. Governments can play a role in ensuring a level and fair playing field in terms of competition for suppliers, equal access and ease of entry by new suppliers, and fair competition for grants, concessional funds, subsidies, tax breaks, and so on.

2.2 Role of Local Institutions and NGOs

Local institutions or NGOs can play a major role in providing RE, and every effort should be made to identify competent and experienced organizations in energy, community development, or rural finance. They can serve the needs of local communities by playing several distinct roles, such as (i) identifying demand in rural areas during the project preparation phase, (ii) guaranteeing credit or cash sales for group lending, (iii) acting as an independent operator of a RE system, or monitoring the activities of RE operators and financiers. In addition, active participation by local institutions can ensure that any difficulties in program

implementation are identified early and immediately addressed through corrective measures.

2.3 Role of the Private Sector

Private sector participation in RE program development has many benefits. The private sector can bring business driven approaches that avoid bureaucratic delays and increased efficiencies. Private sector involvement can increase the potential for competition, from equipment suppliers and service providers alike. This has the tendency to bring down costs and facilitate greater efficiencies. However, to participate in RE programs, the private sector participants must be able to demonstrate both an ability and a willingness to (i) establish a distribution network, (ii) provide some degree of financial commitment or investment, and (iii) provide installation and technical service support. For example, some successful RE programs have required private sector participants to make a long term commitment to as high as a 20 year time frame. Terms of other programs have required providers eligible to participate in the market to guarantee services to all potential participants within a given geographic area. Private sector firms interested in participating in RE programs are often required to participate in special funds and may be required to guarantee repayment on concessional loans.

2.4 Role of the Donor Community

Potential support for RE programs from multilateral development organizations such as the World Bank, the United Nations, regional development banks, GEF, bilateral aid and development agencies, and philanthropic organizations should be integrated into broad rural energy and rural development plans. Donor efforts are most effective when coordinated with governments, local organizations, other donors, and private sector stakeholders. The donor community can facilitate RE programs, provide technical assistance, and help fund both pilot and large-scale projects.

The role of the donor community includes:

- *Promoting policy dialogue.* Donors can encourage governments to: (i) adopt policies and practices that will be most beneficial to rural electrification programs, (ii) implement regulatory reforms, (iii) support least-cost planning and effective financial mechanisms, and improve fiscal policies.

- *Providing investment financing.* Donor funds are often essential for the implementation of RE programs due to the frequently high up-front investment costs of these programs and the limited availability of long-term capital in many developing countries. However, local financial

institutions need to participate in projects in order to ensure the commitment of stakeholders.

- *Technology transfer.* Donor agencies can help disseminate information on technological innovation, best practices, training, and demonstration projects. Effective donor support can improve project and program design, evaluation procedures, technical designs, standards and specifications, quality assurance, manufacturing methods, installation practices, and operation and maintenance of new technologies.

Development cooperation agencies can effectively support governments working to improve this enabling environment by adapting general guidelines to fit specific circumstances. Experimenting with innovative organizational, institutional, financial, or regulatory solutions can be as important as testing the applicability of technologies in different settings.

2.5 Stakeholder Participation in RE Monitoring and Evaluation

Monitoring and evaluation (ME) is an essential function of any development program and project. ME helps governments, donors, and implementation agencies to: (i) identify constraints and beneficiary needs, (ii) monitor progress toward objectives, and (iii) evaluate results. Since one of the main aims of RE development is to develop the rural people's own capacity to participate in solving their own development problems, they should be involved in all phases of the ME process.

In RE programs, the monitoring and evaluation process should be designed in such a way as to meet the information needs of all participants and solve concrete problems as they are encountered. The approach towards local stakeholders needs to be viewed as a participatory learning tool that helps groups to strengthen their problem-solving capacity and achieve self-reliance.

2.6 Participation in Identifying Constraints and Beneficiary Needs

The rural population, through their representative institutions, may be engaged in collecting and analyzing information on social and economic conditions, on constraints affecting them and their organizations, and on the community as a whole. This forms the bases for further program and project identification and formulation. During project implementation, ongoing local participatory research aims at solving concrete problems and providing data for field workshops, developing and sustaining a workable participatory monitoring and evaluation system, carrying out case studies for groups of rural participants, and selecting appropriate technologies. Participatory action research can be performed through simple household and village surveys. These surveys can be conducted to establish the economic and social benchmarks, highlight the status of the

beneficiaries in the initial phase of the project, and serve as a tool to evaluate program progress.

2.7 Participation in Monitoring

Participatory monitoring is a process of collecting, processing and sharing data to assist project participants in decision making and learning. The purpose is to provide all concerned with information as to whether group objectives are being achieved. Implementing agencies and donors also require data on progress toward overall project objectives. A workable participatory monitoring system should, therefore, be based on a multi-level approach that harmonizes the different information needs of those involved in the project. The information gathered should indicate shortfalls in program performance and discrepancies between objectives planned and those achieved. This information will be used in modifying project objectives and rectifying program deficiencies. Participatory monitoring should be conceived from the beginning as part of the group learning and action process and be viewed by participants as a tool for increased performance rather than as a grade card.

2.8 Participation in Evaluation

Evaluations allow for the systematic analysis by beneficiaries and program staff to monitored information, with a view to enabling them to adjust or redefine project objectives, policies, institutional arrangements, resources and activities, where necessary. Some tools used in effective evaluation include log-books summarizing group records, diaries containing personal observations on the process and results of beneficiary participation; monthly review and evaluation meetings; quarterly group and inter-group evaluation sessions; newsletters in the local language based on information provided by the groups; evaluation studies and surveys; and field workshops that allow participants, project staff, and concerned outsiders to gather, discuss, and critique the program. The tools selected for evaluation should remain constant throughout the project and should have the primary objective of promoting a two-way flow of information between stakeholders and the RE program staff. Local stakeholders, especially, should be given the opportunity to discuss shortcomings and make suggestions on how improvements can be made. Evaluation done in this open and discussion-based manner stimulates critical awareness and motivation for better self-management and general improvements.

2.9 Organization of RE Project Management

As mentioned previously, some of the most successful RE programs worldwide can credit a large portion of their achievements to the creation of a sustainable management structure which involves capacity building at all levels of the implementation chain. In addition, the use of local skills to the fullest extent has proven to be a noted best practice, especially for the management of isolated

systems. Another best practice includes the involvement of private companies and local entrepreneurs which can create competition, efficiencies, as well as incentives for success.

3. Integration of Rural Electrification with Rural Development

Rural electrification is highly desirable, but by itself, it does not necessarily bring about rural development. Many RE programs are designed to target areas which focus on increasing the production of goods, including through cottage industries. While some may argue that sustainable RE should follow rural development, best practices world wide show that properly designed RE programs can maximize the impact on people's welfare when RE programs are incorporated as an integral part of the overall rural development process. Mechanization through energy use brings about productivity increases, which in turn, increase revenues. Increased standards of living then impact education and health, and can improve social and community life. This last point is a "soft" element of which is difficult to quantify but can have significant impact upon rural integration on overall country economies.

Various rural infrastructure development initiatives such rural roads projects, rural telecommunications programs, rural water, agriculture, and other rural services provision activities, have common elements with rural electrification programs. These development initiatives typically need (i) government and donor financial support (some form of subsidy), (ii) local stakeholder participation and decentralization of decision making and ownership, (iii) to be economically and socially justifiable, and (iv) to have local communities and government 'ownership' and 'buy-in'. Other common aspects of the rural development initiatives are the types of impact they generate. These include (i) economic and social development to the same beneficiaries and (ii) the same market concepts and principles applied in their development.

In addition, telecom, agro industry, rural electrification, and other development initiatives for rural areas are often dependent upon each other. Examples of this interdependency follow:

- Development of rural telecommunications programs is dependent upon electricity resources in one form or another;
- Appropriate and adequate water pumping requires power for agricultural sector expansion and development;
- Cottage and other rural industries and agro-processing under the form of small rural businesses can increase the productivity by using mechanized/electrified technologies; and
- Quality of education and healthcare delivery systems increase proportionally with improvements in RE and other infrastructure investment.

Box 16 shows a sample of South Africa's approach of integrated planning in order to cause the greatest impact on rural development. Box 17 provides details on Gabon's approach to integrating rural electrification with other sector development programs through a multi-utility delivery system.

Box 16: South Africa's Strategies to Integrate Energy and Rural Development into the Local Decision Making Process:

South Africa looks to an energy planning process that incorporates local participation in needs assessments and the prioritization of initiatives.

- It provides for greater access by the community to facilitation services, including IDT field-workers;
- It utilizes the use of an integrated energy planning (IEP) framework by local governments and the coordinating committees that focuses on the requirements of users and makes a range of appropriate fuels available on a least cost basis;
- The IEP integrates energy planning with other rural development initiatives such as land reform, residential development, and capacity building programs;
- It supports a capacity building program at the community and local government level - including energy-users, suppliers and facilitators - to empower people so that energy initiatives become demand driven, and people are able to make rational and informed decisions;
- Allows for improved information, as well as greater amounts of information, on realistic options; and
- It relies heavily on local governments to determine the range of options that can be pursued, within the affordable limits.

Box 17: Gabon - How Multi-Utility Provision Can Improve Rural Service Delivery

For Gabon, multi-utility provision, on a concession basis, appears to have brought several benefits, although they are difficult to quantify precisely and the dynamics are not yet fully understood. Combining water and electricity service allowed cost reductions through the sharing of resources. These cost reductions were especially evident at the administrative centers which shared physical resources and planning and service functions. At the regional level, commercial functions can also be shared, and some technical functions for personnel can be shared if technicians are trained in both water and electricity systems.

The multi-utility provision allowed for the creation of a platform for more integrated investment planning and coordination with key stakeholders (such as ministries and communities). This placed SEEG (Société d'energie et d'eau du Gabon) in a stronger position to negotiate prices in the notoriously uncompetitive local markets for construction services, enabling it to reduce contracting costs by about 30 percent.

Finally, since SEEG is mostly an electricity business, cross-subsidization helped to bring the water sector up to speed with the electricity sector. The water sector, a lower revenue generator, often lags behind in investment and efficiencies. The cross-subsidies allowed customers to benefit from both lower tariffs and greater investment.

Gabon's experience with a multi-utility concession offers two lessons. First, when services are already integrated, the benefits (and costs) of the integration should be closely reviewed, to avoid jumping too quickly to the conclusion that unbundling is preferable. A more detailed cost-benefit analysis could help in understanding the merits of combining utilities. Second, if services are separated at the national level, integrated contracts with small private operators could be signed at the local level to make the most of multi-utility provision in rural areas. Innovative technologies and financing schemes (such as prepayment) and community relations can be used to make rural service provision both more sustainable and more attractive for private operators.

Source: Multi-Utilities and Access, The World Bank, June 2002

IV. COMMON RURAL ELECTRIFICATION ISSUES IN SAPP MEMBER COUNTRIES

This Chapter discusses some of the most common and cross-cutting rural electrification issues in SAPP member countries. The following are among the numerous factors influencing the promotion of rural electrification and its successful implementation in rural areas in SAPP member countries:

- Low per capita income in rural areas;
- Low per capita energy expenditures;
- High consumer connection charges for grid supplied electricity;
- Wide variety of disparate markets with different needs;
- Lack of a rural energy directive or agency within the power sector to support grid expansion or energy service provision;
- Low information level on rural electrification opportunities;
- Limited electrification options;
- Limited practical experience by consumers with renewable and decentralized power in rural areas;
- Legal and regulatory framework which forbids or restricts energy service provision; and
- Inappropriate taxes and custom regimes.

Success stories in rural electrification development have proved that through implementable policy changes, institutional improvements, and encouragement to the private sector, these challenges can be overcome.

A. POLICY ISSUES

1. Policy and Regulatory Requirements -- Creating Energy Systems Which Promote Sustainable Development

Reforming the policy environment in which the decisions are made is key to providing energy services that promote sustainable development. The first step is the creation of an enabling policy framework in which a variety of enterprises are encouraged to provide sustainable energy services to communities and local

communities are involved in the planning, implementation and project management process. However, this environment cannot be created overnight. There are many challenges to the creation of a workable environment. An effective approach contains components for institutional, legislative, policy and regulatory environments, coupled with three other important factors:

1. Provides for capacity building at all levels of the implementation structure including to consumers;

2. Defines the roles and responsibilities of funding and financing organizations, as well as consumers; and

3. Allows for technology choice through competition and consumer feedback.

1.1 Institutional, Legislative, Policy and Regulatory Environments

Almost all Southern Africa governments have as a national objective, to achieve full electrification before the end of the next decade. In this context, all countries need to prepare and update integrated sustainable energy strategies. Based in the prevailing conditions of many Southern Africa countries, energy provision policies need to focus on the use of indigenous renewable energy resources and energy efficient technologies, which should form an essential part of the country strategies.

The main role of policy-makers in the energy sector is to create a framework of laws and standards in which the market is encouraged to thrive. This framework must also reflect the social development and environmental goals of each country. Regulatory bodies need to ensure that access to energy services is extended to the whole population. Regulatory bodies can be set up to prepare guidelines to which all stakeholders can operate and these bodies can play an important role in educating all stakeholders. (In its extensive experience, NRECA has found that informed participation is the most important single success factor in all the developing country solar PV projects that it has analyzed.) Regulations are necessary to guide the private sector and to protect the consumer, and should not be limited to the technical aspects of energy systems.

When developing regulations and standards, consideration should be given to encouraging regional technical standards that may encourage economies of scale through greater regional trading. Regulations and standard enforcement into other sectors of the economy, such as transport, construction, and industrial production, can result in savings through more efficient resource use.

Recognizing the importance of energy to the rural development, governments have generally sought to make it available as cheaply as possible by subsidizing its cost. This well-intentioned policy has not proven to be sustainable. Best practices have shown that even some of the poorest rural populations are willing and able to pay for energy service delivery, even at a higher rate than urban consumers.

Energy technology and equipment that has to be imported is often taxed at very high rates, making the initial capital costs of energy efficient technologies prohibitive. Renewable energy products such as solar PV and water-heating systems, and the materials used to manufacture them locally, are often subject to government import duties and taxes that can increase their market price relative to conventional fuels - by 40 to 50%, such as in the case of Zimbabwe. Removing import duties and taxes on rural energy equipments, as well as related electronic components (cords, adaptors, etc.) can directly result in making RE systems more affordable to a greater number of consumers, as well as increase private sector participation and competition in markets. The same holds true for energy efficient appliances where regulations and standards should be considered in a regional context to support development.

There is a need for energy services pricing and tax reform. Subsidies should focus on the poorest rural areas and enable the environment for private participation in the provision of sustainable energy sources based on the concepts of cost coverage pricing principles and the provision of subsidies for covering partially the capital upfront cost of energy systems and installations. Subsidies can assist in creating a business environment where private entrepreneurs will find it attractive to extend their activities and services into rural and remote areas.

1.2 Capacity Building

Building strong institutions to support rural electrification and development is one of the important pillars for achieving success. Institutions must be staffed with quality professionals and technicians at the appropriate level. Often, creating this capacity requires the formation of combined working teams of local and foreign expertise for a given period of time. Building on existing institutional capacities is often the most effective approach.

In almost all countries of Southern Africa, many efforts have been made, and substantial expertise has been dedicated to, developing the internal capacity of countries to develop and sustain RE programs. Different approaches have been implemented in deploying assistance from multi- and bilateral donors. Based on the results of several countries in the developing world, several best practices stand out for consideration when developing a capacity building program in this sector:

- All principal stakeholders with a vested interest in rural electrification are to be involved and have a voice - beginning with the early stages of the planning process and proceeding through the implementation process;
- Each actor needs to play its own mandated role and be held responsible for it
- Processes need to be open to the people and the decision-making process must be transparent and guided by clear rules and selection criteria
- Legal and regulatory frameworks should reflect the economic and social goals of the country and ensure that the concerns of private sector participants are given full consideration; and
- Rural electrification needs to be considered as an integral part of rural development strategies and programs.

Joint capacity building projects are effective ways to develop in-country rural capacity. Policy-makers, teamed with local policy analysts/trainers, supported by foreign expertise, often jointly develop policy and implementation programs, thereby building both local capacity and confidence.

Institutionalized training in all aspects of business is important for potential entrepreneurs, particularly where the business sector is small or non-existent. It is not only the traditional skills of accounting and sales that are important. Some businesses will be importing equipment, marketing products, need to provide after-sales service and in some cases, and/or train communities to operate and maintain the equipment themselves. There are numerous examples where NGOs spent several years conducting training programs with local technicians and entrepreneurs in order to create a sustainable pool of people who have sufficient knowledge to install and maintain PV systems, for example.

1.3 Specific Common Policy Approaches for Consideration

A number of specific policy approaches and directions to fostering rural electrification include:

- Limit grid system expansion to those areas where current income and expected income growth of the population promises to cover, at a minimum, the operating costs of the system, and eventually the initial capital expenses as well.

- For all other areas, develop off-grid utility systems that are based on the use of renewable technologies using local resources. Where warranted and where concentrated local demand is high enough, small grid systems based on PV, wind, biomass, small hydro or hybrid units may offer cost-effective solutions.

- Develop credit schemes to increase market penetration, including extended leasing arrangements. These credit systems (minus subsidies, if any) must be based on a rigorous assessment of the willingness and ability of the consumer to pay. A complete area coverage of all households may not be an objective of off-grid electrification programs at the initial stages of RE. Initially, the objective should be to capture as many households as possible that are willing and able to pay.

- The required size of the initial down payment, the type and timing of periodic payment, and the credit duration need to be carefully designed based on local conditions.

2. Institutional Requirements for Policy Implementation

2.1 Identifying the Agency Responsible for RE and Defining its Role

It is important to either identify a government agency that will or can be responsible for rural energy or to establish such an agency or organization if one does not exist. Ideally, the agency will have a degree of autonomy from the national utility and/or energy ministry so that it can independently act and promote RE activities without conflicting objectives. The willingness to have such an independent agency will, in part, establish government's commitment to the promotion of RE.

2.2 Development of Rural Markets

Experience teaches that there are several areas that will directly facilitate the development of RE markets. These areas include technology, delivery mechanisms, costs and financing, and reform issues.

Technology Initiatives: The following key technology issues should be addressed as future RE projects are developed:

- Grid connection versus off-grid isolated systems and individual systems. Grid connection is an unlikely option for all rural residents due to the lack of overall investment in rural grid connected electrification, the isolated and dispersed nature of consumers, and the distance to existing power transmission and distribution lines. Isolated systems, either individual or mini-grids, may be a better means to provide electricity in these areas. Moreover, the high connection costs and low per capita consumption of rural consumers is a major problem for justifying financing of grid connections.

- Traditional versus higher quality energy sources. Candles and kerosene meet lighting needs in many poor rural households and diesel generators are favored by wealthier households and communities. Typically, these energy forms are expensive and do not provide as high a quality lighting as alternatives currently available, such as solar lamps. For an equivalent or slightly higher amount of monthly expenditure, higher quality light could be made available, often in conjunction with a mechanism to finance the initial capital costs.

- Technology independence. A variety of technologies could be used to meet the RE needs of rural consumers. Selection of technology should be based upon (i) the most appropriate technological option with (ii) the lowest marginal cost. Technology specific projects should evaluate other alternatives to ensure that the proposed option is the most appropriate and least expensive option.

- Future of diesel power. Diesel power is widely used both in cities and rural areas, due to unreliable power. Although diesel power generators are expensive to operate, their economic efficiency could be increased by creating a hybrid system with solar panels, potentially serving as a mini-grid.

- Micro-hydro. This technology, to date, has been underutilized due to a lack of knowledge and technical expertise. Although its use is limited to highland areas, further work needs to be done to evaluate options to increase its use. In particular, creating local technical expertise to evaluate the potential opportunities, to produce simple micro-hydro turbines from and with local materials, is essential if a viable market is to be created.

- PV systems versus components. Market research often reveals that the typical PV systems may be too large for the vast majority of consumers, many of whom prefer smaller systems or individual PV panels (<20 watts). These alternatives are more affordable, allow consumers to build their own system based on modular upgrades, and better suit their needs.

Initiatives for Enhancing Delivery Mechanisms: The following issues should be addressed as future projects are developed:

- *Raising RE awareness*. There is generally a low degree of up-to-date knowledge regarding the benefits and potential uses for RE. Customer (and potential customer) awareness needs to be raised in order to promote renewable energy technology use.

- *Product sales versus leasing services*. Direct sale of products may be inappropriate and unsuccessful due to many factors including a high unit cost, lack of a tradition of savings by consumers, and limited access to

credit. Marketing energy services through leasing of systems or through energy service arrangement may be more appropriate than direct sales and may lower delivery costs to consumers.

- *Cash sales versus credit sales*. In developed countries, both retailers and consumers buy and sell on a cash basis, most having limited credit experience. In some developing countries, use of credit may be quite complicated and may require mechanisms to administer and guarantee repayment. Use of community organizations, such as cooperatives, is one means of reducing lending complexity and cost through group lending arrangements.

- *Developing a distribution and service system*. A sales and service network is an essential element if RE services are to be made available to the potential consumers. Local businesspeople need to play a role, point-of-sale/service needs to be used, and an aggressive marketing campaign must be introduced to actively develop the market. Once the product is installed, service technicians need to be available to provide any necessary technical assistance and repairs that may be necessary.

Cost of Financing: Key issues relating to the cost of financing include the following:

- *Dealer/distributor risk aversion and credit needs*. Many businesspeople are cautious when entering a new market. Their limited working capital and lack of market/product knowledge makes them increasingly cautious and risk adverse. Secondly, insufficient working capital reduces their ability to inventory, market, and finance RE products. By increasing access to working capital, businesspeople will be able to purchase products on credit and then either sell or lease products to consumers.

- *Consumer credit and payment schemes*. Meeting with local government, nongovernmental, community agencies and banks are a necessary prerequisite to assess the optimal financing and repayment means for any new RE program. Group lending to a community organization is one way of reducing transaction costs and ensuring repayment. Using local community organizations, where the consumer is currently a member, is another way of screening candidates and guaranteeing repayment.

- *Aversion to consumer credit*. Lack of credit experience and an aversion to credit creates a need for alternative sales options such as lease arrangements or prepayment schemes. In many parts of the developing world, consumer credit is a rare phenomenon frowned upon by or unavailable to rural residents. As a result, direct sales of large systems are more difficult, with component sales or leasing a more realistic option.

Reform Issues: Key reform issues that should be addressed include the following:

- *Establishing an electricity law and opening rural energy markets*. Governments need to develop laws which allow the provision of energy services by independent operators in rural areas that do not, and are in the near future likely to receive access to the grid.

- *Defining the role of government*. In the past, governments have often taken an undefined role relative to their commitment to promote either rural electrification or renewable energy. Based on technology improvements, a greater understanding of the importance and link between rural development and energy, and pressures related to the need to increase health and education delivery in rural areas, many governments are making a greater commitment to promoting renewable energy initiatives for the rural electrification of remote and rural areas.

- *Elimination of tax and duty barriers*. High import duties, VAT and other taxes need to be eliminated to level the playing field with traditional energy options and support the introduction of renewable energy technologies. Taxes on both modular equipment systems, as well as their associated electrical components, should be free of duties and taxes as a further means for reducing costs to consumers in rural areas.

3. Creating a Framework for Private Sector Participation in RE

Traditionally, the role of the public sector in energy development and rural electrification was exercised in the form of direct action by the government or by agencies owned and controlled by the government. Today, the role of the public sector has changed to that of the enabler for RE project development by directing market forces to drive its development. Enabling activities for the public sector to engage in include removing barriers that impede the diffusion of effective sustainable energy initiatives; removing subsidies that make alternative energy/alternative fuel use undesirable; designing and supporting schemes to finance mini- and micro- projects; adapting norms and regulations that take account of emerging sustainable energy technologies; adopting a more balanced and productive fiscal system in the energy field; stimulating competition; and contributing to both individual and institutional capacity building.

3.1 Introducing Sustainability into the Market

Market forces are known to optimize the allocation of resources for short- and medium-term objectives. Where markets fall short is in the area of recognizing long-term trends and longer-term opportunities. As stated by The World Bank,

"liberalizing energy markets, however important, may not be the complete answer - private companies have shown little interest in extending electricity supplies to rural areas." Private companies are more interested in providing energy services to industrial and urban areas where the business is more lucrative, has less associated risks, and has less complicated arrangements in terms of their implementation. Governments may correct the nearsightedness of the market by introducing incentives and removing subsidies that distort the market. Removing the legislative, institutional, and information barriers are also necessary to cure market imperfections.

Experience has shown that RE programs are most effective when they make use of market mechanisms (i.e. competitive bidding) and when they actually promote technology improvement (i.e. through planned decreases of subsidies with time). Innovative approaches are possible, and one approach receiving attention at the moment is the "concession approach" to renewable energy resources. This approach applies the same criteria used for oil or gas concessions through the exploration phase, joint venture arrangement, and exploitation phase. The concession approach, coupled with the removal of many regulatory barriers, has successfully enticed otherwise reluctant private sector businesses to participate in the RE market world wide.

3.2 Role of the Market

Energy has always been seen as a strategic sector, crucial to economic and social development, as well as national security. State utilities for electricity, gas, and also coal and oil, are instrumental in implementing energy policy in many Western European countries and the U.S. This concept has been gradually abandoned in many countries, because of the inherent efficiencies which can be achieved through greater private sector participation. However, progress has been slower in many of the developing countries. Financing institutions feel that the development of sustainable energy would greatly benefit from market and competitive forces. The World Bank states that "one of the most powerful ways to improve energy supply is to ensure that the energy market is determined by consumers' choices... that means both that the price of energy should reflect its cost and that regulation of energy industries should encourage competition and choice." (World Bank, 1996)

Most SAPP member countries are seeking to find ways to move away from highly subsidized rural electrification programs to more economically sustainable alternatives. In general, this shift results in a more consumer-oriented, market-based approach to rural energy services for which solar home systems are ideally suited to the conditions of many African countries. While this subject has been discussed before, it is important to stress the need for key policy initiatives that many of the SAPP member countries can expand. To promote sustainable household PV electrification, governments should consider promoting the following:

- *Rationalized import duties and taxes*. Import taxes and duties on PV components and solar home systems should be avoided since they can increase the costs of solar home systems dramatically, limiting the potential market.

- *Equalize fiscal treatment of rural electrification options*. Although market based pricing is the appropriate goal, the poorest households may still require subsidies in order to buy and maintain solar home systems. To reach the poor, PV systems should receive similar financial support as that provided under conventional grid extension or isolated grids in rural areas.

- *Public investment in PV*. Public financial assistance should be provided for PV electrification efforts, just as public sector equity financing and long-term loans have flowed to grid-based rural electrification projects. Even if a government is not involved in procuring solar home systems directly, it can play a key advocacy role in supporting the dissemination of technologies, such as PV systems, by using them in education, health, and other social programs in remote areas.

- *Access to affordable financing*. Financing mechanisms such as credit lines, loan guarantees, and hire-purchase and leasing schemes expanded the PV home systems market in many countries. Governments should support innovative financing mechanisms that allow lenders to offer long-term credit on reasonable terms.

- *Local participation in rural electrification programs*. Local cooperatives, NGOs, and grass-roots organizations are better suited than centralized power utilities to provide PV home systems to dispersed rural populations. Government policies and programs should help enable these groups to participate in PV dissemination by offering them training in business practices, installation and servicing, as well as marketing.

Box 18 provides an excerpt from a report by Energy Alternatives Africa. The conclusion of the report is that there is a true market for PV systems in Africa and that individuals with expendable income exist. The percentage of individuals willing and able to pay for energy services in the rural areas can range from 2 - 25% of the rural population, depending upon the country.

Box 18: Real Markets for PV in Africa

There are real markets for PV in Africa. Over the past few years, Energy Alternatives Africa has been exploring the commercial market potential for Africa, and has conducted market surveys for PV solar home systems in Kenya, Uganda, Tanzania, Ethiopia, Eritrea and Somalia. These surveys demonstrate considerable achievable markets (i.e. those based on rural household spending patterns for energy and consumer goods, rather than the theoretical potential) for solar home systems (SHS) in the region. There are people who will pay for the small amounts of power that PV provides. All over the continent, rural people are purchasing radios, hi-fis, TVs, pressure lamps, car batteries, dry cells and other amenities that demonstrate their desire and willingness to pay for basic lighting and entertainment. However, these consumers are not the rural poor. Just as PV system buyers in the Northern hemisphere are in high income brackets, buyers in the south are also rural upper and middle class - teachers, small business owners, government extension workers, and people with relatives in town or abroad who support them. They are too far from the grid to connect, but they demand small amounts of power. Depending on the relative wealth of the country, Energy Alternatives Africa estimates that they make up between 2-25% of the rural population.

Box 19 provides a summary of the lessons learned from the implementation of a solar home systems project in Kenya. This excerpt is taken from the *Implementation Manual: Financing Mechanisms for Solar Electric Equipment, 2000,* The World Bank.

Box 19: Solar Electric Equipment Business in Kenya -- Lessons Learned

From a Solar Home System Project in Kenya, the following lessons learned were reported by the World Bank.

1. **End-users** appreciated the opportunity to buy into a scheme to finance a SHS; they were able to acquire better-quality and larger systems than if they had been on their own. They are willing to pay interest charges, although the level is limited to what they have access to for other purposes. For example, they find unacceptable the prevailing commercial market interest rates of 25–30 percent per annum.

2. The **credit mechanisms** tested here all deal with groups of individuals, instead of directly with individuals. The bulk purchase of equipment offset most of the cost of financing the loans. It was demonstrated that procurement of equipment for groups of about 30 could lower SHS cost (installed cost, including maintenance contract) by as much as 20 percent, thus offsetting the costs of borrowing money. The experience shows that it is easier to deal with existing credit groups (such as through cooperatives/SACCOs) than with the credit groups created for this purpose. However, concentrating only on cooperatives would severely limit the replicability: not all households are members of such organizations. Using Teacher Associations (etc.) is a variation on the same theme; they would also be relatively easy to use, particularly if they would allow

automatic loan payments through salary deductions. Dealer (or installer) credit schemes took somewhat longer to realize, but once the practices were established, the dealer wanted to launch new operations.

3. The **financial institutions** found it more difficult than expected to implement the financing mechanisms for solar equipment, even though these were based on existing mechanisms that they regularly apply for other purposes.

4. **Technical assistance** proved indispensable, and it should be available over a longer period. It was the "glue" that kept the different actors together and more or less on the agreed track. The TA was helpful in selecting the beneficiaries and holding early discussions with them; in developing standard packages acceptable for the beneficiaries' needs and payment ability; in procuring the equipment on behalf of the credit groups; in training of the local installers; in inspecting the installed SHSs; and in creating a mechanism and capacity to maintain and service the systems.

5. **Maintenance** of SHSs was often a problem; however, it was built into the project and functioned well.

6. The Kenya Rural Enterprise Program (K-REP) **solar business loans** are fully "mainstreamed" now. There appears to be a substantial demand for small loans (US $1,000–10,000) in the energy enterprise business.

7. **Interference** beyond control of the partners can play havoc with the process, and this is a real problem. In addition, interference from anticipated large donor-financed projects also upsets the players. This was the case in Kenya, where a $5 million solar project has been under preparation for more than 5 years.

8. **Private companies** are eager to cooperate with this type of effort. Despite delays and constant communication problems, the companies maintained their interest in the effort and happily sorted out small problems to do with product quality control. They also used the project to monitor and adapt their product to customer needs.

9. **Village-level installers** played a key role. Because wholesale prices were handed over to customers, the installers were able to charge fair installation and maintenance fees and to maintain a steady cash flow over a long period.

Source: ESMAP/WB -- Implementation Manual: Financing Mechanisms for Solar Electric Equipment, 2000, adopted

B. INSTITUTIONAL ISSUES

Incorporating local participatory elements in large scale rural development programs, where rural electrification plays an important role, is key to ensuring sustainability. Decision makers need to realize that decentralization of decision-making authorities, responsibilities, and some budgets will facilitate the effective involvement of all local stakeholders in their own social and economic development. All these can be achieved by implementing an alternative approach to planning, strategizing, designing, implementing and monitoring of the various development issues and programs especially for the rural areas. The

following are key issues that need careful consideration and require wide consensus and awareness before implementation:

- *Policy driver*. Participation of rural people in the designing, planning, implementing, and operations of rural development programs is crucial in order to ensure the sustainability of such programs.

- *Policy issues*. Policy makers and NGO development agencies should be encouraged to prepare and propose policies that favor participatory development. These policies include appropriate legislation for promoting rural organizations, as well as a better reorientation of delivery systems towards the needs of the rural poor. Other policies should promote full integration of women in development, decentralization of decision-making, planning and resource allocation, and expansion of non-agricultural employment.

- *Sustainable rural energy policy.* A sustainable energy policy and implementation strategy would supply the reliable energy services that rural people desire while advancing social development and minimizing the environmental impacts of energy use. Rural electrification should be considered an integral part of every rural development program. Policies must be understood and be widely accepted by the rural population beneficiaries. This is a prerequisite for success and sustainability.

- *Decentralization and empowerment.* Decentralization and empowerment of local governments and communities, as well as community participation in the development process are crucial in the process of economic growth and poverty eradication. The involvement of local leaders of all kinds, and the support of village leaders, is often crucial to a participatory process in all development program life cycles. This support should be obtained through meetings and project initiation workshops aimed at demonstrating to the local traditional and administrative leaders that the project is in their own short- and long-term interest.

- *Influencing development planners and administrators*. Many of the development agencies involved in implementation of large-scale programs and projects may have little or no experience in participatory development. Development planners and implementation agencies can be influenced through meetings and field workshops, periodic informal exchanges of views, briefings on participatory projects, and incorporation of participatory issues in project identification, preparation, appraisal, and evaluation missions.

- *New role of donors and international development agencies*. The support of donors, development agencies and international financial institutions is essential for widespread adoption of the participatory approach. Efforts to

obtain this support should aim, first, at convincing these donors and agencies to expand the support of participatory projects in their assistance areas.

- *Demonstration and best practice dissemination.* It will be crucial to demonstrate and disseminate all best practices and to publicize (i) achievements of participatory projects, (ii) their benefits and cost-effectiveness. This data should be gathered through effective monitoring and evaluation systems and case study research programs.

Governments, local leaders, and consumers have a significant role to play in addressing institutional issues which can impact the success of rural electrification programs. Through institutional development activities, these organizations can assist in the development of a market ideal for the consumer and complete with private sector participation. The following discussion highlights the roles of various parties in institutional development for rural electrification.

1. Role of the Government

The government's first responsibility to any RE projects is political.[4] No electrification project has ever succeeded without the backing of governments and without demonstrated strong political will. Throughout the world, national electricity sectors have been structured exclusively around electrical supply networks. Ministries share with the people they serve this network-based conception of electricity services; power company personnel are trained in the same schools and share a common outlook. This cultural homogeneity has created a strong resistance to the types of innovation that RE projects will need to succeed.

To increase popular access to electricity, the current system must evolve. It is the role of the energy ministry (with government support) to facilitate this evolution in the following ways:

- *Coordinate RE activities once government policy is established.* It is essential that all interventions, both international and national, fall within a same institutional and organizational scope and that they follow similar and compatible rules for a successful RE program. The energy ministry has the responsibility to lead government policy on these matters.

[4] Source: This section is prepared based on "Best Practice Manual: Promoting Decentralized Electrification Investment", ESMAP, WB, 2001

- *Create conditions favorable to the private sector.* This includes electricity laws and accompanying decrees, reduction of taxes and customs duties on RE equipment, and support from the energy ministry to support reforms.

- *Mobilize national and international financing.* This may require the engagement and the guarantee of the country. It is still the role of the government to monitor and ensure the good use of public funds intended for RE, through a mechanism of transparent financing.

- *Make sure RE project staff are technically competent.* The energy ministry needs to provide technical aid to RE projects to ensure that they are implemented with the highest standards.

- *Gather information.* Multiple services, such as administration, customs, communities, health, and education needs, are required to gather and support the introduction of RE programs. It is the responsibility of the Agency (or energy ministry) to make sure that this information is gathered and properly applied.

- *Foster the development of independent regulation.* As the energy sector is liberalized, the introduction of multiple operators, statutes, and a range of services (interconnected networks and providers of electric, co-operative service users of electricity, etc.), may cause conflicts requiring arbitration. Arbitrating such conflicts is generally the role of a regulatory agency independent from the ministry, but vested with legal authority by the government

A separate independent regulator is useful because the same institution cannot effectively both implement and judge a project. For example, the ministry (via, say, a technical assistance office) cannot first help project operators formulate their business plans, then switch roles (via its regulatory office) to evaluate the same plan. In the case where the technical assistance office is on the ground with the RE operators, the regulator acts as a referee. It is the regulator that decides whether or not to allow subsidies for RE projects, notifies the commercial bank and the board (the board of directors for each project) of its decisions, and submits proposals for improving RE delivery service mechanisms.

2. Role of Local Leaders and Consumers

2.1 Decentralization and Community Participation

A full fledged decentralization process is part of all modern government practices in almost all democratic countries. It is a complicated process which requires substantial efforts and a long timeframe to be implemented. Decentralization process means political, fiscal and administrative decentralization. It involves

allocation of power resources to local level. In order to decentralize, deep structural reforms should be implemented.

People, and how they are empowered, are at the center of the entire decentralization process in any country. Involvement of local communities and their elected representatives and local administrations is crucial in achieving an overall sustainable rural development. The community must define the end-uses that are most important for them, decide what they are willing to pay for different levels of service, and, based on a wide range of choices, plan for future needs. Offering communities choices, and educating them about the implications of those choices, will lead to informed decision-making and better use of energy resources.

2.2 Role of Local Leaders in Rural Electrification

Governments and donors are becoming more and more aware that a "one-size-fits-all" approach to rural electrification policy and implementation modeling no longer works. They are becoming aware that in order for the RE policies and implementation programs to be effective, they need to adopt new approaches and target specific new challenges.

Local elected and appointed leaders need to become important players in the process of rural development and rural electrification. In most of the cases it is obvious that they need to build and enhance their management and administrative capabilities. Governments and donors are aware of this and are willing to support them through capacity building programs. Local government authorities need to be assigned responsibilities including fiscal and budget spending authority. Local governments typically play the following roles:

- Bringing the voice and needs of the rural population to the attention of central governments
- Integrate RE in the rural development plans and programs
- Participate in the RE planning and designing process
- Assign and spend some local budgets on capital cost financing and 'smart subsidies', as needed
- Participate in the RE project selection, award, and monitoring process
- Involve the private sector in implementing RE projects and provide local infrastructure services in general under their oversight
- Support awareness programs on the available rural electrification technologies that best match local conditions

Box 20 provides a description of a capacity building program supported by USAID to assist local government officials to build skills to effectively govern in a newly decentralized environment. Many components of the program focused on the official's ability to take responsibility for and assist in improving service delivery systems at the local level.

Box 20: Decentralization Process in Uganda

Before the 1990s, neither officials nor citizens had any experience of participation in decision making in Uganda. Uganda was determined to build a new democratic and decentralized system of governance. Authority and responsibility to plan, budget, and deliver services were given to districts and their sub-units. Implementation of the decentralized system of governance progressed rapidly and the amount of financial resources expended by local governments increased rapidly from an initial figure of Shs. 63 billion (FY 1994/95) to the present figure of Shs. 476 billion (FY 2000/01). The number of districts also grew from 39 at the start of the decentralization process to 56 at present. With these rapid increases in the size of financial transfers to local governments, in the scope of local government functions, and in the number of local governments, glaring gaps in local government functional capacity became evident. The U.S. Agency for International Development (USAID) responded to this need through several capacity building activities.

USAID's support to decentralization in Uganda began with a pilot activity in Gulu and Kamuli Districts focusing on capacity building for the elected and appointed officials and representatives of civil society. The aim was to increase local government capacity to deliver services and to expand civil society involvement in decision making and governmental oversight. USAID's approach in building the capacities of both the demand and supply sides of the service delivery partnership was both unique and strategic. During the pilot program, 524 elected, appointed and civil society representatives were trained in the three thematic areas of local governance and leadership, financial management and budgeting, and gender mainstreaming. The same audience was also the target of a separate but connected mentoring effort designed principally to enhance the understanding and applicability of the training in the trainees' workplaces.

The USAID program brought about significant improvements in the levels of compliance with the Local Government Act of 1997 in the two pilot districts. After only one year, Gulu and Kamuli so improved their capacities in planning, budgeting and financial management that they qualified for the Local Government Development Program (LGDP) Grant. The LGDP is a World Bank funded grant to local governments awarded to districts that are able to demonstrate certain minimum capacities in planning, budgeting and financial management. There was also a significant increase in women's participation in local government processes and increased awareness of and sensitivity to gender concerns. To build upon the success of this pilot effort, the Ministry of Local Government requested assistance from USAID in replicating the program in other districts. Additional districts were selected using a proactive and transparent strategy and training activities have been refined and broadened, based on lessons learned from the pilot phase.

Source: USAID – Uganda, 2002

2.3 Role of Consumer and Local Participation - The Participatory Approach

Peoples' participation requires some form of formal organizing of the community, empowering the organization to contribute in collective actions to achieve the common goals. Therefore, participation is the combination of three key elements -- organization, empowerment, and contribution. The participatory approach in the rural development process and rural electrification empowers the local people in utilizing their knowledge, skills and experiences. Consumers are able to identify and prioritize their problems and needs on energy and resource management better than anyone. The participatory approach ensures these needs are communicated to the service providers. The participatory approach helps to:

- increase farmers and other rural people's skills and knowledge of the energy and 'work productivity' linkage,

- enhance rural people's capabilities in organizing and decision making in rural energy development programs based on local energy resources,

- involve rural people in designing, formulating and implementing plans and programs related to the provision of energy to cover their own needs,

- involve the rural poor in planning and undertaking additional income generating activities based on the use of modern energy

Most energy supply options benefit from economies of scale. This means that joint or "community" decisions are often required to ensure that sufficient numbers of consumers are involved from the outset. Community or locally based approaches in project selection and project management are therefore essential for the success of energy supply options. Community involvement in the RE process is relevant in the following contexts:

- *Choice of energy service.* Decentralization of decision-making to local communities is essential if they are to signal their energy service needs. Poor communities must usually choose between different supply options. Also, they must sometimes choose between different community-based rural infrastructures, such as health centers, schools, water supply and sanitation, and energy supply. Empowering local communities to assume the responsibility of making these choices can also reveal their willingness to pay.

- *Consumer-based ownership and management of RE systems.* Rural Energy Cooperatives (RECs) can provide the delivery of energy services to the rural areas. Consumers own the RECs and are able to operate the rural

utilities in a business-like way, as well as manage to collect adequate revenues. This form of participation increases local employment and reduces costs. With lower tariffs, it is highly possible to further increase access and improve affordability of the energy services.

2.4 Local Institutions and the Need to Interact with Other Level Institutions

Generally institutions in supporting RE are categorized in three levels (i) national, (ii) intermediary, and (iii) local. *The national level* is responsible for the formulation of policy and plans for rural development and the legal and regulatory framework within which the sector will develop. *The intermediate level* provides an integrating link between the national and local levels, ensuring that plans and policies match the needs of consumers, owners and suppliers. Intermediaries may be NGOs, government bodies or private concession holders contracted by government. In most cases, an intermediary can provide considerable help in explaining, facilitating and planning a suitable choice from what are normally not familiar technical options. *The local level* is where village and district rural energy supply programs are implemented. Suitable owners may be community based organizations, electrification co-operatives supported by local NGOs, or branches of national NGOs. In Peru, for example, the micro-hydro schemes are owned by the community but operation and maintenance is contracted to a private service company. In Sri Lanka, the Electricity Consumers Society owns, operates, and manages the entire system.

As is the case with Sri Lanka, all sectors of the population need to be involved in planning from the outset if the community is to own or manage the scheme. As electricity is new to such communities, an intermediary can provide useful help in planning. At the national level, guidelines are developed for a range of options for the scope of the electrification program and the level of tariffs, which are then agreed upon.

An intermediary level institution can assist in the process of RE program development in a number of important ways including the following:

- Provision of appropriate guidance and support for policy formulation,
- Advice on development of a national rural energy strategy
- Development of networks within the sector to guide communities on sources of advice, expertise, equipment, and finance,
- Facilitate financing,
- Perform information brokering,

- Providing simple guidelines for working out energy service needs, and presenting the technical options available with their costs, benefits, advantages and disadvantages,

- Facilitating community planning,

- Identification of training requirements, and running training courses for manufacturers, developers, operators, local government, communities,

- Developing proposals for technical standards and developing standard suppliers' contracts to include technical support and warranties,

- Setting the framework for tariff options, and

- General promotion of rural electrification and electricity use.

3. Encouraging Private Sector Participation

The greatest way to increase private sector participation in RE development is to proactively reduce private sector risks while providing a fair framework for operating. Governments can do both through incentive programs, government guarantees, and properly designed and accepted policies.

Private sector businesses and investors desire governments to support them in a number of ways. Some of these are discussed under Section 1: Role of the Government. Other ways in which the governments can encourage the private sector to participate in rural electrification include the following:

- *Avoid the use of mechanisms and instruments that distort the emerging rural energy markets.* Government policies must consider the importance the market plays in rural electrification development. Building appropriate markets promises sustainability of the service. This does not imply that all subsidies should be banned but it does imply that subsidies should not cover maintenance and service.

- *Let the consumers and energy service providers decide which technology they are going to use* in a case by case mode. The government should provide for a level playing field for all providers of equipment and services that meet the standards developed by the regulations. Giving consumers more choices in the market place results in competition and resultant reduction in costs to the consumer. Consumers should ultimately make the final technology selection based on both quality and cost.

- *Create the right environment for the creation of appropriate RE financing institutions.* It is important to provide for the mobilization of local rural savings and leverage them with public resources in supporting RE projects. Guarantee schemes are an important instrument for attracting private investors.

- *Provide for level playing field* in bidding for concessions, subsidies, projects, etc. Public awareness and transparency are critical to the process.

The private sector can be attracted to participate in rural electrification schemes, even in a poor country, if an appropriate legal framework and risk management options are in place, including the assurance of a level playing field in terms of competition and the ability to charge full cost-recovery tariffs.

C. FINANCING ISSUES

In general, rural electrification is a complex subject and when pursued in isolation, an "unprofitable" business. Furthermore, if the population is poor, the effort's sustainability will always be in doubt as long as there are no clear government policies or imaginative and efficient ways of promoting investment and establishing management structures.

The following recommendations are proposed to make the implementation of rural electrification, particularly by isolated power supply systems, more viable:

Financing: All stakeholders need to coordinate their work and establish common rules and guidelines, especially for funding mechanisms. Credit mechanisms in which owners of power supply systems can negotiate contract terms so that customers assume more responsibility for the use their services. Under these conditions, programs can be successful as long as technical assistance is provided in isolated rural areas. Box 21 provides a listing of best practices in the financing of off-grid systems.

Box 21: Best Practice in Financing Off-Grid Systems

- Best practice suggests that the expansion of off-grid systems will continue to need both 'soft funds' and funds at commercial rates, particularly if they are to meet the needs of people with low money incomes.
- Funding will be needed to cover capital costs, technical assistance and social/organizational 'intermediation'.
- Off-grid system development need to leverage funds from many sources including those for small enterprise development, livelihood development, technical assistance social infrastructure, as well as the more usual energy and environment sources.

- Off-grid systems need to widen the menu of financing options for acquiring both debt and equity, including leasing, novel forms of debt guarantee, and novel forms of collateral.
- Loan conditions should be simplified, and collateral conditions modified to suit local conditions for asset (land, equipment) ownership.
- Some financial institutions are likely to require training to understand the special needs and risks of off-grid system solutions or to build on analogous experience in other forms of rural investment.

Regulations should establish standards to reduce costs without affecting the quality or sustainability of the service. Experience has shown that it is possible to implement small systems that cost 50-60 percent less than those implemented under international standards. Also, from a technological point of view, the sustainability of small manufacturers of equipment and spare parts should be promoted at a national level, both for the implementation process and for subsequent services.

By developing and announcing annual public investment programs, manufacturers and service suppliers would have knowledge of the opportunities available to them as investors or entrepreneurs.

1. Rural Energy Deployment Models[5]

In general, rural energy deployment models are classified in four different categories, notably (i) cash, (ii) credit, (iii) leasing, and (iv) service provision. There are different deployment models within each category.

1.1 Cash Models

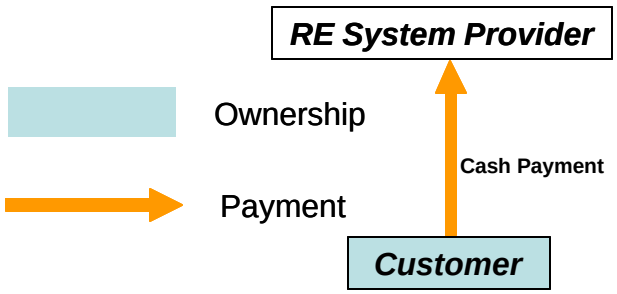
Cash represents the payment of money amounting to the purchase price in exchange for the components or the electricity system. In this case ownership on the system is transferred to the customer on payment.

Models which fall under this category are (i) Cash & Carry, and (ii) Cash Sales. Both cash & carry and cash sales purchases are common in rural electrification markets. As can be derived from the term, cash & carry does not comprise any regulation on who is responsible for installation of the systems, and the customer must arrange for it. In contrast to this, cash sales contracts often require installation of the system by the PV company, generally a dealer or supplier. In this case, the cash payment is often split in two parts - one with the order for installation, the other with the installation itself. Obviously, such an agreement will raise the price of the energy supply system compared to the price in a pure cash & carry contract, but only at the point of purchase.

[5] This section is to some extent based on the Website http://resum.ises.org/

In the Cash & Carry Model (see Figure 6), a system user is responsible for installation and operations and maintenance (O&M), and dealers are generally based in main cities. Short term guarantees on whole systems, excluding electric components (cords, adapters, etc.) equipment, are generally provided.

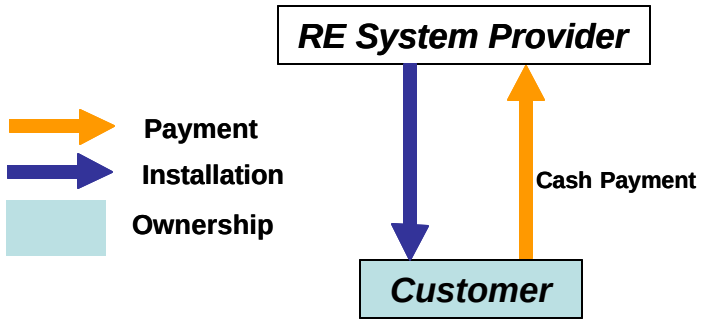
Figure 6: Cash and Carry Model



Example projects which have used this model in the SAPP region are DIY SHS Deployment in Zimbabwe, and Swaziland Solar Home Systems.

In the Cash Sales Model (see Figure 7), the customer pays for the system with cash and the system provider installs the system. Ownership is transferred with payment and the user is responsible for O&M. Typically dealers are based in main cities with network of salesmen. Short term guarantees are generally provided on whole systems, excluding add-on electric components.

Figure 7: Cash Sale Model



A significant number of solar home systems are sold directly to high-income customers who pay the full amount in cash. Direct cash sales of PV units are common in many countries, including Kenya, Sri Lanka, and Swaziland. Private vendors receive their products from wholesalers and regional distribution networks. Cash sales represent the least complicated financial vehicle. Given

the limited disposable income of most rural households, direct cash sales of capital-intensive solar home systems cannot sustain a household PV electrification program directed at a sizable proportion of the rural population.

1.2 Credit Models

Under this model loans are provided in order to enable the customer (borrower) to purchase components or the system. Ownership is transferred to the customer when the contract is signed. A credit or loan is a sum of money lent to a person, for a specified time - the term - at a specified interest rate. With installment credits, the sum is paid back in the form of regular installment payments. These credits are purpose oriented credits, calculated to a specific financing object, and granted to private persons. They are not paid in cash to the customer, but can be used to pay the seller company. The company may act as an intermediary between a financial institution and a customer. The vendor presents the loan application form of the financial institution to the customer and the credit contract is concluded. With it, the customer obtains ownership of the financed object. In return, the financial institution channels the complete credit volume to the company and effectively pays the vendor up-front on behalf of the customer. Typically, a joint commitment of vendor liability is incorporated in the contract.

In the context of rural electrification the most common form of financing equipment is ***dealer or supplier credit*****.** This is especially true in remote areas where there are few, if any, financial institutions. Consequently, PV companies often act as a pseudo financial institution and offer their customers sale-by-installments agreements, which offer a short-term credit over a very short term in order to lower the company's risks. In such contracts the customer obtains ownership of the system when the contract is concluded, but the system is used to secure the loan. In some cases, micro-finance initiatives may provide companies with lines of credit.

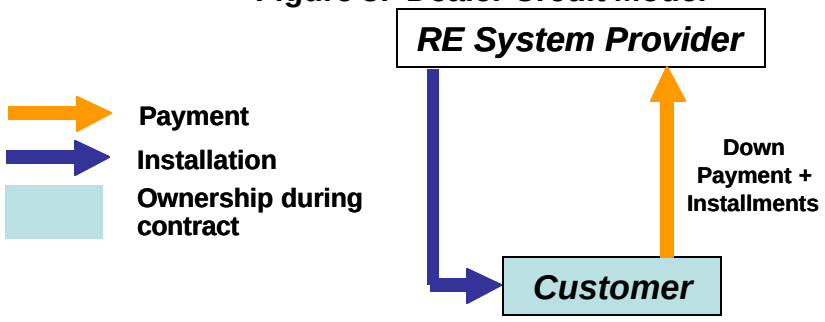
A main difference between contracts in an installment credit arrangement or those in a personal credit can be found in the contract terms as well as in the maintenance agreements. In the case of PV systems, for example, differences include:

- With installment credit arrangements, there is a strong co-operation and often a contract between the PV company and the financial institution. The PV company agrees to offer basic maintenance during the credit period to ensure the functioning of the system and
- The financial institution can lower the interest rates because of an existing collateral.

Models that fall under this category are (i) Dealer Credit, and (ii) Installment Credit.

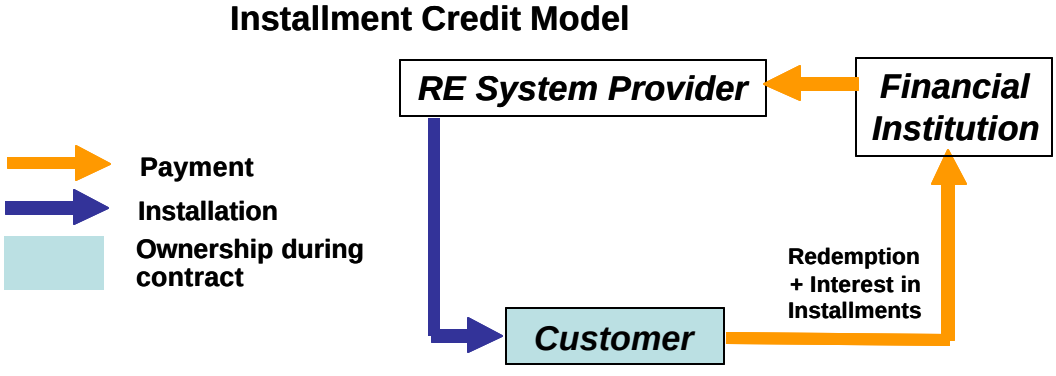
In the Dealer Credit Model, (see Figure 8) the customer pays for the system to the provider on credit directly offered by the system provider (down-payment + installments). The system provider installs the system, and the ownership is transferred with contract conclusion. The user is responsible for O&M supported by the system provider. Typically, dealers have local offices in rural areas.

Figure 8: Dealer Credit Model



In the Installment Credit Model (see Figure 9), the customer pays for the system on credit channeled from a financial institution through a system provider to a customer (installment = redemption + interest). The system provider installs the system, and the ownership is transferred at the time of contract conclusion. The user is responsible for O&M supported by system provider. Typically the dealers and micro-finance institutions are located in rural areas as well.

Figure 9: Installment Credit Model



This model was used in the case study example of Sri Lanka, and involved SELCO Solar Lanka Limited, Sri Lanka.

The primary advantage of commercial financing is that it is firmly rooted in the private sector, which often has the potential to offer more competitive, efficient services than government-sponsored programs. In addition, commercial financing relies entirely on existing institutions (banks, NGOs, and private vendors) and can be self-sustaining if there is sufficient market demand.

1.3 Leasing

Under a leasing or hire-purchase arrangement, the intermediary retains ownership of the energy system or some of its components until the cost is recovered. The system itself is used to secure the lease agreement. In this model the owner of the property - the lessor - allows the client - the lessee - to use the property for a specified time in return for payment. The ownership may be transferred to the user after the leasing period under certain arrangements. In the context of rural energy supply, leasing is an arrangement which can be situated between the credit and the service model. The owner of property - the lessor - allows the client - the lessee - to use the property for a specified time, in return for an agreed upon payment.

Legally, leasing agreements comprise the following components:

- Regulation of basic leasing period, in which the lessee cannot terminate the agreement
- Arrangement on extension of the agreement or purchase options after the basic leasing period
- Level of leasing installments
- Arrangement on the investment risk taken by the lessor or lessee
- Arrangement on service and maintenance of the leasing object

Leasing realized in the context of off-grid power supply is an equipment-leasing/product-leasing. The following special contracts are relevant:

- Operate leasing agreements comprise the regulation that the contract can be terminated subject to a defined term. In this case, the lessor takes over the whole investment risk.
- Finance leasing agreements - or more common hire-purchase agreements - regulate that the lessee cannot terminate the contract during a defined basic leasing period. After this period, the lessee can decide to:

    1. purchase the leasing object by the payment of the remaining price;
    2. extend the hire-purchase contract for a defined time, after which the ownership title of the leasing object is transferred to the lessee; and
    3. terminate the contract and return the leasing object to the lessor.

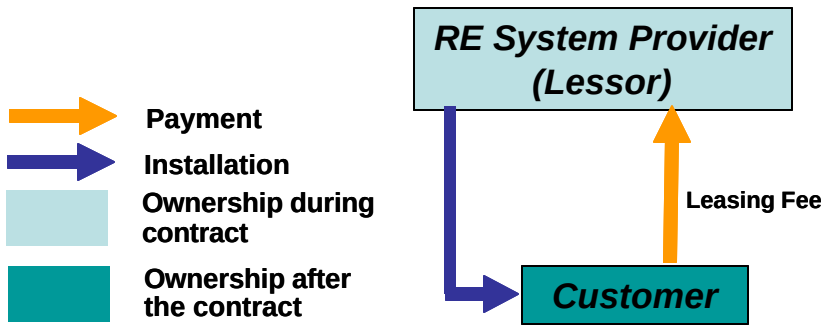
Leasing schemes realized for rural energy supply systems are however mostly not realized according to leasing legislation, as leasing is not that common in developing countries and leasing agreements are not standardized. Nevertheless, some special aspects can be summarized:

- In the context of rural energy supply, leasing schemes are realized for individual power supply systems, especially for SHS. Such leasing agreements do in general only comprise the main components but not appliances like lights, radios and TVs.
- For individual power supply systems, hire-purchase agreements with an agreed purchase of the leased object have most commonly been realized in the past. This is due to the fact that the leasing model has often been included in projects realized in governmental and aid programs. These often foresee the establishment of a revolving fund. An initial grant is transferred to an intermediary, an initial amount of single household supply systems is bought and leased to the households. The leasing installments, the turnover in the project, are used to invest in new single household supply systems.
- Local co-operatives, NGOs and ESCOs are the typical intermediaries the leasing schemes. Thus, leasing for renewable energy systems is a combination of direct and indirect leasing - an intermediary acts between the producer and the customer, but is not a leasing society. Also, leasing in form of hire-purchase contracts is offered by dealers, whereby a third party, a financial institution, is generally involved.

Models which fall under this category are (i) Finance Leasing, and (ii) Maintenance or Fee-for-Service.

In the Finance Leasing / Hire-Purchase (see Figure 10) model the customer leases the system for payment of regular leasing fee. The system provider is the owner of the system during the basic leasing period. Ownership title is transferred with payment of the remaining amount. The system provider installs the system and the user is responsible for O&M. Typically the dealer provides for the lease.

Figure 10: Leasing Model

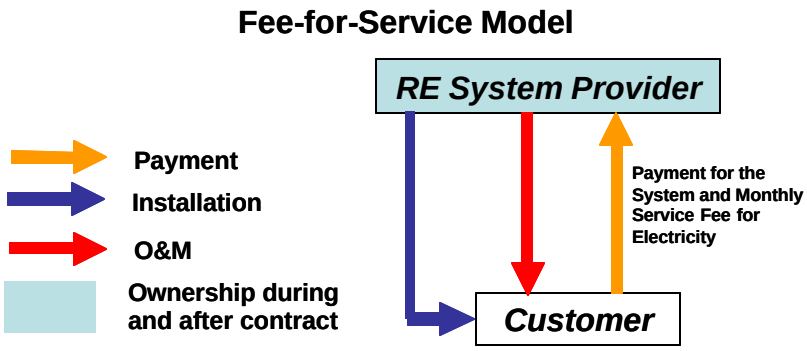


Most leasing programs for renewables technologies to date have been set up with grants or low- or zero-interest loans from donors and governments and have used NGOs as intermediaries. For example, in Sri Lanka these grants have been used to establish a revolving fund to buy PV systems. The intermediary serves as the manager and guarantor of the funds if loans need to be repaid, registers qualified participants, makes bulk purchases, provides installation and maintenance services, stocks spares parts, trains consumers, collects fees, and performs other administrative tasks. The Solanka/Sun Societies and Sarvodaya in Sri Lanka use lease arrangements under which customers make monthly payments to the NGO/intermediary responsible for servicing the debt to the donor agency or government. Once a loan is paid off, ownership transfers to the customer.

ESCOs: The principal differences between ESCOs and leasing arrangements are that ESCOs retain ownership of the major solar home system components, while in lease or hire-purchase arrangements, fees are essentially loan repayments. Services such as maintenance must be paid for separately. As an institutional model, lease or hire-purchase arrangements share many of the potential advantages of the ESCO scheme but are often constrained by the scarcity of grant financing to set up revolving funds.

In the Fee-for-Service Model (see Figure 11) the customer pays regular service fees for electric service. The service provider is the owner of system and is responsible for installation and O&M. Typically, the dealer or the service company (e.g., utility) provides the service.

Figure 11: Fee-for-Service Model



Financing Modalities include fixed rate fee-for-service and consumption dependent fee-for-service as described below:

Fixed rate fee-for-service. There is a payment of a one-time connection fee plus payment of regular service fee, either time dependent (e.g. $/month) or dependent on service offered (e.g. $/Wmax).

Consumption dependent fee-for-service. There is a payment of a one-time connection fee plus payment of regular service fee according to consumption (e.g. $/Wh). The *Clearing method* is pre-payment or metering (invoice).

Service: In this model, the service provider supplies electricity to the user. The service supplier retains ownership on the system. In the context of rural electrification, service delivery models are very close to leasing, with the difference that the customer will never own the service system. A service provider offers a defined service for which the customer pays a regular service fee.

In the context of rural electrification, service agreements concluded for the provision of a public need like water, gas, electricity, transport, telecommunication etc. need to be considered. Service entities - public and private ones - provide a certain service to the end customer, who pays a regular service fee. Prices of these services may be subsidized by the government.

Obviously, the models used in the area of public services are highly relevant in the context of rural electrification, as basic services are provided in both. In these models, the operator - typically an Electric Service Company (ESCO) - owns the off-grid power supply system and charges monthly fees to the household for the right of use. During the contract period, the ESCO is responsible for operation and maintenance of the system. According to this, the guarantee is issued for the whole contract term. Service delivery models are often realized on a concessionaire base.

Rural electrification service models are differentiated according to the service guaranteed:

- in the fee-for-service model, the company offers the electric service to enable the customer to run electric appliances. Thus, the ESCO guarantees the functioning of the system excluding the electric appliances.
- in the energy service model, the company offers the energy service, typically lighting, radio, television and operation of small appliances. Thus, the ESCO guarantees the functioning of the whole system including the appliances and guarantee is issued up to the bulb.

Also for rural electrification, fixed service models and consumption dependent service models have been realized, which defines the clearing method. With fixed service models, the customer needs to pay a regular service fee. In

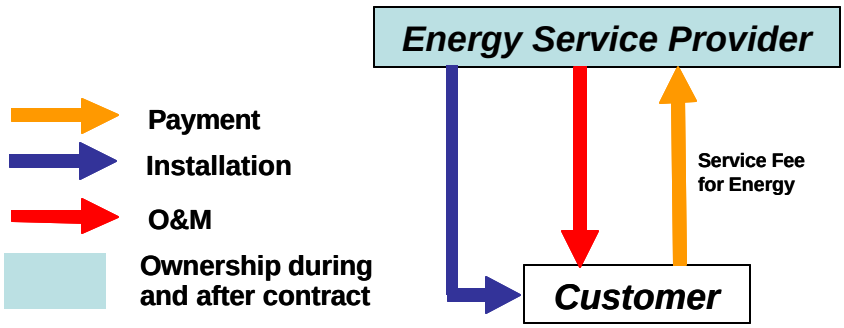
consumption dependent service models, clearing is either realized with pre-payment systems or by metering, whereby metering is seldom used as distance to the customer is higher, thus control more difficult.

The models which fall under this category are (i) Fee-for-Service, and (ii) Energy Service.

For the *Fee-for-Service Model* (see above Figure 11).

In the Energy Service Model (see Figure 12), the customer pays regular service fees for services like light, communications, cooling etc., and the service provider is the owner of system, and is responsible for installation and O&M costs. Typically this service is provided by ESCOs.

Figure 12: Energy Service Model



Financing Modalities: This includes two modalities as follows:

Fixed rate energy service. There is a payment of a one-time connection fee plus payment of regular service fee, either time dependent (e.g. $/month) or dependent on service offered (e.g. $/Wmax). The *Clearing method* is pre-payment or payment of regular fee (often monthly payment cycles, but adaptation to income cycles might be possible).

Consumption dependent energy service. There is a payment of a one-time connection fee plus payment of regular service fee according to consumption (e.g. $/Wh). The *Clearing method* is pre-payment or metering (invoice).

Table 14 summarizes all major characteristics of rural energy supply models.

Table 14: Summary of Rural Energy Supply Models Characteristics

	Cash		Credit		Leasing		Service
	Cash & Carry	**Cash Sale**	**Dealer Credit**	**Installment Credit**	**Finance Leasing**	**Fee-for-Service**	**Energy Service**
Ownership	Customer	Customer	Customer	Customer	During leasing period ownership title with energy system provider. Ownership title transferred to customer after basic leasing period and payment of remaining amount or extension of contract to maximum leasing period	Ownership title with service provider	Ownership title with service provider
Financing Modalities	Cash payment	Cash payment	Down-payment plus regular installment payments. High interest rates, as provider has often only access to expensive capital.	Down-payment plus regular installment payments.	Regular payment of leasing fees. After basic leasing period payment of a remaining amount in form of one payment or extension of leasing contract to maximum leasing period, often at lower leasing rates.	1. Fixed rate fee-for-service 2. Consume dependent fee-for-service	1. Fixed rate energy service 2. Consume dependent energy service
Collateral	No need	No need	Power system itself during the credit period	Power system itself during the credit period	Not necessary as system belongs to the provider and may be removed in case of repeated payment default as fixed in the contract	Not necessary as system belongs to provider and may be removed in case of repeated payment default as fixed in the contract	Not necessary as system belongs to provider and may be removed in case of repeated payment default as fixed in the contract

	Cash		Credit		Leasing		Service
	Cash & Carry	**Cash Sale**	**Dealer Credit**	**Installment Credit**	**Finance Leasing**	**Fee-for-Service**	**Energy Service**
Installation	Customer	Seller	Provider responsible for installation	Provider responsible for installation	System provider responsible for installation	Service provider responsible for installation. Service provider may commission subcontractor, who has to follow regulations determined by service provider	Service provider responsible for installation. Service provider may commission subcontractor, who has to follow regulations determined by service provider
O&M	Customer	Customer	Customer. Provider often offers basic service during credit period to ensure system functioning and decrease risk of non-payment	Customer	Lessee responsible for O&M. Lessor may offer basic service during basic leasing period to ensure system functioning and decrease risk of non-payment	Service provider responsible for O&M. Service provider must guarantee O&M service	Service provider responsible for O&M. Service provider must guarantee O&M service. User not allowed to buy/install new/other electric appliances.
Guarantees	Short term guarantees on whole system	Short term guarantees on whole system	Guarantee on whole system excluding electric appliances during credit period	Guarantee on whole system excluding electric appliances during credit period	During leasing period for all components which are object of contract	Guarantee of electric service for whole contract period	Guarantee of energy service for whole contract period. Service provider must guarantee O&M service within a defined time frame

2. Role of Rural Electrification Funds

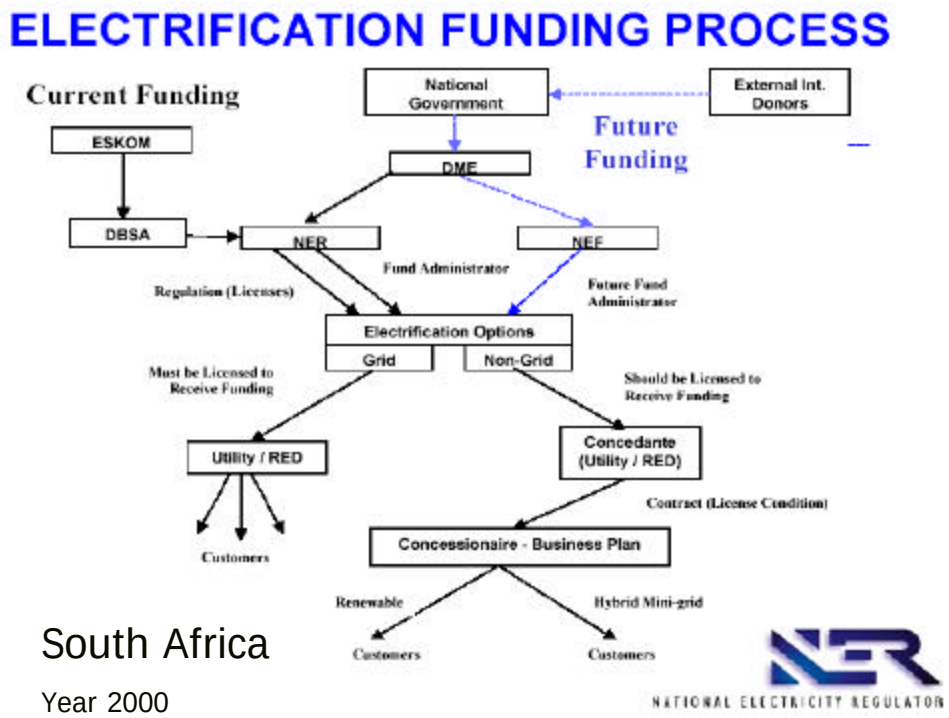
Almost all RE programs are associated with rural electrification funds (REFs) in a form or another. They are the basic instruments that governments use in implementing their RE plans and programs. Today it is clear that governments alone can not provide all the funds required to achieve their objectives for RE, and so other resources need to be harnessed and mobilized. The potential sources of RE financing may be summarized as follows:

- National funds for economic development
- National funds for rural development
- Government budget
- Local development banks
- International development institutions
- Bilateral cooperation
- Levies charged on consumers that use electricity
- Foundations and private business donations
- Private sector investors
- Consumers
- Through special tax funds

Given the fact that almost every REF needs to be financed with fund that come from resources other than government budget, it is important to understand and implement an adequate and widely acceptable approach in designing and establishing an REF.

South Africa is moving to widely establish new patterns of RE financing. As shown in Figure 13, the government intends to mobilize substantial financing from international donors. The plan is to channel this fund to the National Electrification Fund which would be administered under a new structure.

Figure 13: New Electrification Funding Process in South Africa



3. Private Sector Financing

Under right conditions the private sector can be mobilized to participate in rural electrification. This is not an easy task and requires the governments and the industry to work closely together to create an environment that would both benefit the rural consumer on one hand and protect the financial interests of the private investor on the other.

3.1 Role of RE Development Programs in Facilitating Savings and Access to Credit

In promoting RE it is important to develop a set of financial strategies designed to improve rural access to financial services and promote their financial self-reliance. Directed programs should introduce, first on a pilot basis, new financial mechanisms and incentives that modify the existing rural financial environment. The focus should be on (i) reducing the cost to the banks of delivering savings and credit services; and (ii) lowering the cost to project participants of gaining access to financial services.

Financial approaches will vary according to local conditions, but all of them share the following basic elements:

- *Savings first*. Rural groups need to be encouraged to initiate group-based savings schemes prior to applying for bank loans. Progress in mobilizing group savings provides a measure of members' commitment to the group enterprise and their loan repayment capacity.

- *Group savings and credit.* Delivery of financial services to participatory groups, rather than individuals, carries cost advantages for both banks and the poor. Group savings offer similar reductions in deposit account maintenance costs. Transaction costs are also lower for the group members: they need to prepare only one loan application and make a single trip to their local bank branch.

- *Credit Guarantee Fund.* To encourage an interested institution to lend to participatory groups, RE programs or funds need to provide a special Credit Guarantee Fund (CGF) to cover losses resulting from loan defaults. The fund, held in an interest-bearing account at the institution, is governed by a written agreement that sets out conditions under which loans are to be granted from the bank's own capital, as well as procedures to be followed in the case of non-repayment of loans.

- *Loans based on social collateral.* Generally banks do not use social collateral in their lending practices. However, cooperating banks should be encouraged to relax requirements for physical collateral and use "social collateral" in its place. In this approach, members of borrowing groups are held jointly responsible for the repayment of their group loan. Should one member of the group fail to repay his or her portion of the loan, the entire group loan is considered delinquent and all group members are barred from obtaining credit until it has been repaid. This type of loan may be more appropriate when the bank finances income producing group oriented RE systems.

- *Group training in financial self-reliance.* The training of group members and leaders is an essential element in achieving financial self-reliance. Groups should be encouraged to exercise discipline in the use of savings and credit in order to maximize the income-generating potential of their activities, to accumulate wealth and to build credit-worthiness. The group promoter will play an important role in this education process and serves as a link between the group and the cooperating bank.

Much of the discussions above is relevant to national and local development banks, credit unions, and cooperative banks similar to those that traditionally finance farming.

3.2 How Commercial Banks Can Deal with the RE Financing

Commercial banks operating strictly along commercial lines rarely finance the purchase of consumer durables in rural areas of developing countries. Where bank financing is available, interest rates are high and terms are short to medium. The limited ability of rural people to offer acceptable collateral also restricts commercial bank financing to high income-consumers, those with fixed assets or co-guarantors, or to salaried borrowers.

Commercial bank financing can help implement RE programs and projects if:

- *Electricity provision systems (renewables, etc.) are considered eligible for bank financing.* Loans for income producing investments that use the income stream as partial loan security are one option for supporting income oriented RE projects. Otherwise, banks need to be encouraged to examine the potential effects of renewable systems on household income.

- *Bank staff are familiar with RE systems*. For example, the Sri Lankan and Indian experience shows that even if banks are willing to lend money for solar home systems, an awareness program targeted at loan officers is necessary.

- *Borrowers have convenient access to banks*. Ideally, the bank (or a branch) should be located close to borrowers. Proximity is particularly important if more than one visit is needed to secure the loan and if payments must be made in person. Grameen Shatki bank in Bangladesh is a good example of how banks can reach the rural people. Since banks are open only on weekdays, dealers may have to assist customers in arranging financing or, as happens in some rural credit schemes, may need to offer outreach services for rural customers.

- *Loan application procedures are streamlined*. Loan forms should be simple to complete and the number of visits required to approve the loans kept to a minimum. Again, it is helpful to have suppliers assist buyers in preparing loan applications and negotiating with banks.

- *Collateral barrier is addressed***.** Where rural households lack the necessary collateral to secure a loan, the bank may treat the RE system as a collateral. The system suppliers may participate in the collateral scheme by collecting payments or repossessing the module in cases of default.

- *Repayment schedules are flexible and complement borrowers' income flow.* Many rural households have income streams that depend on harvests, sales of animals or seasonal employment. Flexible schemes would, for

example, allow farmers to pay after crops are sold rather than on a monthly basis.

Box 22 provides a case study on the results of a RE project in Mozambique that provided financial support to household consumers for wiring and connections.

Box 22: Mozambique: Private Participation in Isolated Electrical Grids

Following the passage of the Electricity Law in 1997 which de-monopolized EDM, the national utility, and allowed private sector participation in the industry, the Urban Household Energy Project funded a pilot isolated grid electrification project in two coastal towns in Mozambique, low-cost electricity services were extended to the two isolated areas after an enabling framework had been created for private sector participation.

Impact on the ground

- Cost recovery tariffs were introduced. The tariffs were set to generate revenues to cover all costs including the management fee, depreciation, and a return to the government of about 8 percent on its capital investment.
- More than 60 new jobs were created during construction.
- About 400 households/industries now enjoy 24-hour electricity supply. The demand growth exceeded the projection by 50 percent, with a monthly growth of over 10 percent.
- Obsolete low-voltage overhead lines and some poles were replaced and new transformers and other facilities were placed. The grids were extended to the Vilankulo airport which has become a main hub to bring in an increasing number of tourists.
- Noise pollution from the gas generators was contained by placing them in sound- proof power houses with the high boundary walls.
- A number of streetlights have been built along the main roads and around the public places. The estimated electricity consumption for street lighting is about 5 percent of electricity generated, which is paid for by the electricity users.
- Better lighting improved health clinic services and extended their operating time.
- The power sector reforms that permitted the creation of independent grids with cost-based tariffs were rated as a "significant achievement" by the Bank's internal independent review (OED).

Lessons learned

- It is possible to significantly reduce electrification costs via lower-cost options, i.e., independent grids rather than costly transmission extensions and use of ready boards.
- It is difficult to estimate the suppressed demand and willingness and ability to pay. The average electricity tariff for consumers is estimated at MT 1,558 (US cents 12.6)/kWh, which is significantly higher than the current average national tariff at US cents 7.5. After the systems were commissioned, demand grew much faster than anticipated at the time of the feasibility study.

- The electricity law restructured the power sector, which set the legal framework for private participation in the program and sustainable sector operation. However, full reform implementation is not a prerequisite for private participation in distribution.
- The private sector can be attracted to participate in rural electrification schemes, even in a poor country, if the appropriate legal framework and risk management options are in place, including the assurance of a level playing field in terms of competition and the ability to charge full cost-recovery tariffs.
- Financial support for house-wiring/connections and for the purchase of appliances helps increase coverage and build load.
- Consumers are able and willing to pay higher tariffs in return for improved services and theft can be avoided. Non-technical distribution losses are very low (around 5 percent) and collection exceeds 98 percent.
- The availability of electricity stimulates the development of small and micro enterprises and led to increase in new private investments.

This article was written by Yuriko Sakairi, Senior Economist, The World Bank.

D. GLOBAL VILLAGE ENERGY PARTNERSHIP (GVEP) AND SAPP MEMBER COUNTRIES

A new global energy initiative has been launched to assist developing countries through the provision of grants and financing with the target beneficiaries being the least economically and most needy populations. This new program is called the Global Village Energy Partnership (GVEP) and USAID is a co-sponsor of the program. The following includes background information on the program as well as information about how SAPP member countries can apply for membership.

1. Background

1.1 A Truly Global Partnership

The Global Village Energy Partnership[6] (GVEP) brings together developing and industrialized country governments, public and private organizations, multilateral institutions, consumers and others in an effort to ensure access to modern energy services by the poor. This Partnership of partnerships aims to help reduce poverty and enhance economic and social development for millions around the world. Its work will be carried out under a 10-year "implementation based" program. The Partnership's objectives are to:

- *Catalyze* country commitments to village energy programs and guide policies and investment in this area.

[6] Source: Adopted from http://www.gvep.org/about/index.html

- *Bridge* the gap between investors, entrepreneurs and energy users in the design, installation and operation of replicable energy-poverty projects.

- *Facilitate* policy and market regulatory frameworks to scale up the availability of energy services.

- Serve as *marketplace* for information and best practices on the effective development and implementation of energy-poverty projects/programs.

- *Create* and maintain an effective coordination mechanism for addressing energy-poverty needs.

The Global Village Energy Partnership builds on existing experience and adds value to the work of its individual partners. It reaches out to non-energy organizations in the health, education, agriculture, transport and enterprise sectors, and offers a range of technology solutions to meet their needs. This covers renewable energy, energy efficiency, modern biomass, liquefied petroleum gas (LPG) and cleaner fossil fuels. The Partnership will help achieve the internationally recognized Millennium Development Goals. The partnership will also address gender issues in order to reduce health and environmental hazards and increase social and economic welfare; it will build on the knowledge and capacity of each member of the community in energy service delivery and use.

1.2 Services

The Global Village Energy Partnership will offer a number of innovative services.

- *Action Plans* will provide the 'implementation vehicle' for energy related activities set forth in national and/or local poverty reduction strategies and development plans.

- *Knowledge Management and Transaction* is a service that will enable the sharing of information on innovative approaches, lessons learned and best practices for improved energy service delivery, while providing a forum for networking among partners.

- *Capacity Development* will enhance policy frameworks, entrepreneurial development, consumer organization, and credit systems aimed at expanding the number and the capabilities of enterprises operating in rural markets. It will also increase access to energy services.

- *Funding Facilitation* will work with a broad range of local, bilateral and multilateral financiers, expanding existing programs and financial instruments to better suit the needs of investors and energy consumers.

- *Results and Impact Monitoring and Evaluation* will track energy services and their impact on poverty reduction and sustainable development, while enhancing partner accountability for tangible results.

1.3 Who will Benefit

The Global Village Energy Partnership will yield benefits to various groups.

- *Local communities* will have more effective social services (health, education), linkages to markets (telecommunications), and enhanced opportunities for attracting enterprises and investments.

- *Households* will have higher incomes, more jobs, and a better quality of life from improved lighting, power, heating, and social services.

- *Community and civil society organizations, non-governmental organizations and entrepreneurs* will benefit from training and inclusion in a network of service providers, technicians and project managers, and from increased business opportunities.

- *National governments* will see reduced poverty in the population; increased economic growth; improved fiscal balances; better environmental conditions and enhanced energy security.

- *Domestic and international financial institutions* will be able to expand their investment portfolios.

- *Multilateral and bilateral aid donors* will benefit from improved access to critical information, lessons learned and enhanced effectiveness of their respective programs in all sectors.

- *Private sector companies* will benefit from access to information, improved public sector partnerships, and expansion into new business areas (energy products, services, appliances).

1.4 Desired Outcomes

With an increased volume in investments and availability of modern energy services, the GVEP will help attain the Millennium Development Goals. Although specific indicators will be developed as part of the Results Monitoring Service, it is also expected that the following will be achieved:

- A significant number of countries with nation-wide energy-poverty-reduction programs based on modern energy services.

- At least 400 million people previously unserved will have access to modern energy services.

- At least 50,000 new communities served (schools, hospitals, clinics).

- A cadre of trained entrepreneurs and institutions capable of developing and implementing village power projects and programs.

- Increases in productivity, income, environment, equity and quality of life, including gender equality.

2. GVEP Partners– SAPP Member Countries May Join GVEP

The GVEP was launched on August 31, 2002 at the World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa.[7] The Partnership's Technical Secretariat reached approximately 450 people over the course of WSSD through a wide variety of Global Village Energy Partnership-related events. The launch was attended by over 150 people. Speakers included Mark Malloch Brown from UNDP, Peter Woicke from the World Bank and IFC as well as Ministers from Germany, Guatemala, the Netherlands, South Africa and Uganda, who pledged their commitment to the Partnership. Representatives speaking on behalf of Shell, BP, Rural Area Power Solution of South Africa (RAPS), Kumasi Institute of Technology and Environment of Ghana (KITE), Munasinghe Institute for Development (MIND) and USAID also outlined energy-access related projects and pledged their support. The Minister of Environment from Pakistan along with a host of representatives from NGOs, small and large businesses, multilateral and bilateral lending agencies, the media and other civil society groups were in attendance as well, and many of them participated during the question and answer session.

During the Sept 2, 2002 Implementation Meeting, attended by over 40 people, there was general consensus that 1) the Partnership's Technical Secretariat, responsible for day-to-day management, should remain with ESMAP for the immediate future; 2) a Consultative Executive Board Group would be formed to develop the Partnership governance, establishing it by the end of 2002; 3) participants are eager to contribute to and build on Partnership activities in the field.

The Partnership currently boasts 70 Partners from the Philippines Department of Energy to IT Power, U.S., Inc. Partners have suggested collaborating on a wide range of activities, including actively contributing to the development of each of the Partnership's five service areas.

[7] GVEP Newsletter, October 2002

Since WSSD, the Technical Secretariat (TS) has held and attended meetings with another 50 potential Partners. As requested in Johannesburg, the Secretariat is completing a Partnership database, which will list areas and location of Partners' Global Village Energy Partnership-related activity as well as contact information. The TS encourages all existing Partners and any prospective Partners to send plans for working with the Partnership to info@gvep.org and or/fax us at 1-202-522-3018.

Those interested in joining the Partnership may also view the Statement of Principles at http://www.gvep.org/about/StatementOfPrinciples.html and submit the Partnership membership form electronically through http://www.gvep.org/cfapps/inforequest/index.cfm. Hard copies of this form are also available and may be obtained from the Technical Secretariat or any existing Partners.

Part II: RURAL ELECTRIFICATION PLANNING IN LESOTHO

RURAL ELECTRIFICATION PLANNING IN LESOTHO

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ACKNOWLEDGEMENTS

This report entitled "Issues and Options for Rural Electrification in SAPP Member Countries and Rural Electrification Planning in Lesotho" has been prepared by CORE International, Inc. under its Energy and Environment Training Project - Indefinite Quantity Contract (EETP-IQC) with the U.S. Agency for International Development (USAID). The Office of Energy & Information Technology within the Bureau of Economic Growth, Agriculture, & Trade (EGAT) and the USAID Mission in Gaborone, Botswana provided guidance during the design and preparation of the report.

The preparation of Part II of this desk study required extensive desk research. As such, the report is prepared as a guidance document for the Government of Lesotho to address rural electrification. Considerable field work and research is needed to design the rural electrification strategy that is specific to the socioeconomic conditions in Lesotho. The elements of rural electrification discussed in the report, and the examples of best practices in other countries, provide the setting that should be helpful to the Government as it embarks upon the task of rural electrification. This desk study is designed as a reference document to facilitate discussions among participants from the Government and the stakeholder community in a Workshop on Rural Electrification Planning to be held in Lesotho in April 2003. CORE's experts worked closely with officials from the Lesotho Government ministries and agencies, in addition to various NGOs and private sector energy service providers in Lesotho. The officials from these entities, and many others, provided valuable insights that significantly added to the quality and substance of this report. CORE International would like to make a special mention of the following officials from Lesotho who supported the preparation of this report:

Mr. Batalatsang Kanetsi	Department of Energy, Ministry of Natural Resources, Lesotho	Director
Mr. Simon L. Mhaville	Lesotho Electricity Corporation	Managing Director
Mr. Batchi Baldeh	Department of Energy, Ministry of Natural Resources, Lesotho	Advisor to LEC Board
Mr. Sarel Esterhuizen	Lesotho Electricity Corporation	Deputy Managing Director
Mr. I. Seitlheko	Department of Energy, Ministry of Natural Resources, Lesotho	Advisor
Mr. H.M. Ntlamelle	Power Affairs Division, Department of Energy, Ministry of Natural Resources, Lesotho	Principal Technical Officer
Mr. T. Phuroe	GEF/UNDP Renewable Energy Project, Department of Energy, Ministry of Natural Resources, Lesotho	Project Coordinator
Dr. Tom Jardine	LEC Sales Advisory Group, KPMG Consulting Project, Lesotho	Project Manager
Mr. R.S. Sefali	Power Section, Department of Energy, Ministry of Natural Resources, Lesotho	Specialist
Ms. Lucy Khalema Redeby	Khalema Redeby & Associates (Pty) Ltd, Lesotho	Director
Mr. Billy Gibson	Solar Matla, Lesotho	Manager
Mr. Napo Maluke	Solasat, Lesotho	Manager

CORE International would like to specifically acknowledge the technical guidance provided by Dr. Kevin Warr, Program Analyst, and Mr. Erik Streed, both at the USAID/EGAT/EIT; Washington, D.C., Mr. Lovemore Bingandadi, Infrastructure Advisor, USAID Regional Center for Southern Africa. We appreciate the support provided by the American Embassy in Lesotho, specifically the help given that Ms. Moroesi Akhiombare offered to our team during the field mission.

EXECUTIVE SUMMARY

Reducing poverty especially among the Basotho people that live in the rural areas is a primary objective of the Government of Lesotho (GOL). The provision of modern energy services, especially electricity, is considered key to increasing rural productivity and improving living conditions in rural areas. The GOL, in its policy for the energy sector, has made it clear that the reform, restructuring, and the eventual privatization of Lesotho Electricity Corporation (LEC) will be carried out in a manner that increases rural energy services to the poor. The Government is committed to opening the sector and enabling an environment that attracts private investment. The Government realizes that rural electrification is a key driver to poverty alleviation and it needs to be designed and developed in the overall context of rural development. It realizes as well that, in order to achieve its goals for rural electrification and development, there is a need to build new institutions with clear functions and responsibilities which will operate along with market principles. The overriding philosophy is now clear to everyone -- no sustainable rural electrification progress can be achieved without the full participation of all stakeholders including rural consumer organizations and governments, the private sector, and NGOs. This participation and partnership in development has to be extended throughout the whole process of rural electrification and development – from planning, designing, implementation, impact monitoring and evaluation, and operations.

Part II of this Desk Study is dedicated to Lesotho rural electrification (RE) planning issues and options. It has been designed as a reference document to facilitate discussions during the Workshop on Rural Electrification Planning in Lesotho scheduled for April 2003. It represents the status of the RE in the country and describes the challenges and approaches to various critical issues related to the planning process of RE within the framework of the sustainable rural development for poverty alleviation. A variety of related best practices from all over the world are brought to bear in this report in order to provide the Lesotho authorities with proven successful examples that may be helpful to the Lesotho Government as it embarks upon an ambitious rural electrification program.

In the case of Lesotho, a number of challenges and constraints need to be addressed through designing a targeted and effective RE model based on lessons learned elsewhere. Preliminary assessments by the Government and several donors indicate that Lesotho faces most of the major barriers to increasing rural energy access. These include financial, to some extent tariffs, institutional, transaction costs, commercial, education, training and technology awareness. There is a need for a more in-depth identification of barriers and development of approaches to addressing these barriers through a comprehensive rural electrification strategy.

Given the situation and the actual needs of Lesotho, a special focus in this report relates to issues of the institutional arrangements for RE policy implementation. Therefore the Rural Electrification Master Plan and the National Rural Electrification Fund (NREF) are given an ample window for discussion during the workshop in April 2003. The objective of this exercise has been to provide a document for discussion based on the following key principles commonly found in the rural electrification planning process:

1. The Rural Electrification Master Plan needs to be integrated with the Government's Rural Development Plan. The two plans should be developed and approved under the umbrella of the *"Country Growth and Poverty Alleviation Framework"* in Lesotho.

2. The National RE Fund has to operate along commercial lines and be fully transparent and accountable in accordance with internationally accepted best practices. The Fund should be open and provide opportunity for participation by both domestic and foreign sources of funds including service providers, donor agencies, NGOs, and other private investors.

Participation of local stakeholders in the RE process is considered critical to achieving sustainability of rural electrification development. Therefore, this Desk Study goes into substantial detail in discussing the role of various stakeholders. Where it is considered important, the report tries to synthesize key policy issues and options regarding the role expected to be played in the RE planning and implementation process by the Government, consumers, local private entities, donor organizations, the regulator, the financial sector, RE planning and implementing institutions, and others.

Experience around the word dictates that it is the time to think about a multi-modal approach to delivering rural energy in Lesotho. The utility model that seeks to provide both rural and urban customers with similar levels of service is used for most energy planning issues in Lesotho. In urban areas, this model has worked well. In rural areas, however, it is often unworkable because most utility-based rural electrification programs center on grid extension, which is only one option among many that is needed if the Government intends to meet its rural electrification goals. The rural electrification process should allow delivery of energy services through a range of institutions, both public and private, as well as local cooperatives and NGOs. In regions or markets where the private sector or local organizations can take the lead in project planning and implementation, the Government should adopt a facilitating and oversight role.

The lessons learned in other countries offer key insights that may be helpful for Lesotho to design its own RE planning and implementation process. Leadership for formulating an appropriate rural electrification model will need to start with the Government. The following questions are pertinent to the formulation of a RE model:

- What is the Government's long-term rural development policy and how does the Government view the role of rural electrification in facilitating rural economic development?

- What is the place of rural development within the Growth and Poverty Reduction Framework and what are the expected fund allocations for RE development?

- What are the key energy demand characteristics and demographic patterns in Lesotho that need to be explicitly incorporated in RE planning?

- What is the desired set of energy service delivery models which fit with in the country conditions?

- What principles will guide the process of institutional set up for RE policy, planning, programming, designing, and implementation and monitoring?

- What are the key elements of an enabling environment that the Government needs to put in place to encourage market participation in the RE program?

- What should be the role of the donors and what coordination framework needs to be established for working with them?

- How should the participation of the various RE stakeholders be maximized in order to boost rural electrification?

- What is the role of the regulator to protect the consumer on the one hand and to facilitate investor viability on the other?

These are just a few of the planning challenges that the Government of Lesotho needs to face. The Part II of the Desk Study provides a review of the different RE planning issues considered in other countries and outlines a process that should be considered by the Government of Lesotho as it embarks upon the development of a Rural Electrification Master Plan and the establishment of the RE Fund.

I. THE LESOTHO ECONOMY

A. BACKGROUND

Lesotho is a small, mountainous, landlocked country, entirely surrounded by South Africa with few substantial natural resources. Lesotho's major natural resource is water, often referred to as 'white gold' by the Basotho people. The economy of Lesotho is based on subsistence farming and animal husbandry, as well as small-scale industries that include clothing, footwear, textiles, food processing and construction. The small manufacturing base depends largely on farm products to support the milling, canning, leather and jute industries. The great majority of households gain their livelihood from subsistence farming and migrant labor, with a large portion of the adult male workforce employed in South African mines. However, the employment levels in these mines have steadily declined over the last several years which has resulted in adverse unemployment impacts.

More than 85% of the population of 2.2 million lives in rural areas and is engaged mainly in agriculture and informal activities. Agriculture contributes to about 14% of the GDP but has remained a supplementary source of income since approximately half of the rural household income come from those family members working in South Africa. Although declining, these repatriated earnings still constitute about 30% of Lesotho's GNP. About 35% of the labor force is unemployed or under-employed. Figure 1 provides a map of Lesotho.

Figure 1: Map of Lesotho

Lesotho is a democratic, sovereign and independent country. Formerly a British protectorate until it gained its independence in 1966; the Kingdom of Lesotho is one of three remaining monarchies in Africa. It has a land area of approximately 30, 355 km², roughly the size of Belgium or Taiwan. Lesotho functioned as a multi-party democracy from independence until 1986, when a military regime took power. The country was under military leadership from 1986 to 1993 when democracy was restored following the election of a new Government led by the Basotho Congress Party (BCP). The BCP split in 1997 and the majority of MPs followed the then Prime Minister into a new party, the Lesotho Congress for Democracy (LCD). The LCD, led by Pakalitha Mosisili, won all but one of the seats contested in the parliamentary election held in May 1998, which precipitated civil unrest and the establishment of the Interim Political Authority. The LCD subsequently won the Parliamentary elections that took place in May 2002.

Lesotho joined the World Bank and the International Development Association (IDA) in 1968 and the International Finance Corporation (IFC) in 1972. It was a founding member of the Multilateral Investment Guarantee Agency (MIGA) in 1988. The World Bank and other donors provide support to the Government's strategy to reduce poverty and to improve the country's competitiveness through greater integration of the country's economy into the sub-regional economy. To date, the World Bank has assisted Lesotho with projects in agriculture, infrastructure, roads, health, population, nutrition, education, water, community development, land management and conservation, and utilities. The World Bank has also provided technical assistance support for economic and sector analyses in agriculture, education, health and sanitation, public expenditure and finance.

The United Nations Development Program (UNDP) is responsible for all donor coordination in Lesotho and organizes periodic Round Table Conferences. Over fifteen donor entities are active in the country including the World Bank Group, the Africa Development Bank, and the European Union. In recent years, most project support and development activities in Lesotho have involved multiple donors that leverage their resources in areas of their respective interest and expertise.

B. LESOTHO'S RECENT ECONOMIC PERFORMANCE

The sale of water to South Africa has generated a significant amount of revenue for the Government of Lesotho. The country has also benefited from its membership in a common customs union with South Africa. Lesotho's GDP in 2001 was approximately US $0.8 billion, a 2.6% increase over the year 2000. The real GDP growth rates for the years 2001 and 2002 are 3.2 % and 2.9% respectively, representing an economic decline in 2002. Per capita GDP in 2001 was around US $400. Table 1 summarizes selected economic indicators for Lesotho.

Table 1: Selected Economic Indicators for Lesotho

	2000	2001*	2002+
1. Output Growth(Percent)			
1.1 Gross Domestic Product – GDP	1.4	3.4	4.3
1.2 Gross Domestic Product Excluding LHWP	0.4	3.9	3.4
1.3 Gross National Product – GNP	-3.1	-1.7	2.8
1.4 Per capita –GNP	-4.9	-3.8	0.2
2. Sectoral Growth Rates			
2.1 Agriculture	2.9	2.9	-1.4
2.2 Manufacturing	4.4	7.9	10.0
2.3 Construction	9.7	0.8	9.5
2.4 Services	-0.6	2.3	2.9
3. External Sector – Percent of GNP Excluding LHWP			
3.1 Imports of Goods	71.7	76.1	88.6
3.2 Current Account	-8.7	-2.8	-2.6
3.3 Official Reserves (Months of Imports)	8.0	10.5	6.4
4. Government Budget Balance (Percent of GNP)	-4.9	-1.0	-2.2

*Preliminary Estimates
+ Projections
Source: HDR 2002

Privatization of national industries has become a priority for the Government, and this is an ongoing process which includes extensive involvement by the IMF. IMF involvement has also helped to control the macroeconomic forces at play within the country and has had a stabilizing influence, while working to affect poverty reduction.

Factors affecting Lesotho economically include (i) a fairly large gap in wealth between the rich and poor, and (ii) considerable underemployment and unemployment, both of which continue to affect long-term prospects for the economy. The agriculture and manufacturing sectors remain fairly small and most products from these sectors are exported to South Africa. One promising area of growth in the country is the apparel assembly industry which, while still quite small, is expanding rapidly.

Continued exports of water to South Africa and attention to the growing manufacturing sector are imperative for Lesotho's growth levels to reach those achieved in the mid-1990's (10% per year). Foreign involvement has been beneficial in addressing many issues affecting the country, especially in regard to institutional reform, macroeconomic planning, and poverty alleviation.

C. KEY DEVELOPMENT POLICIES

Lesotho Government policies are geared to the ultimate goals of sustaining rapid economic growth, boosting employment opportunities, and reducing poverty through the development of the private sector. GOL aims to improve the environment for private

economic activity by limiting the role of the public sector and making it more efficient. In addition, the Government is placing considerable emphasis on improving public sector governance and the judicial system and maintaining financial stability. The GOL is committed to adhering to tight overall expenditure targets, while increasing spending in priority areas such as health and education. Over the medium-term, the share of recurrent public sector spending in GDP is expected to fall in order to promote private sector development and employment creation. The Government is developing a longer-term plan to strengthen public sector management with assistance from The World Bank.

In order to attain its macroeconomic objectives, the Government of Lesotho is continuing to place a high priority on parastatal privatization and private sector development, with this strategy forming the primary source of growth and employment creation. Any institutional and regulatory constraints that impede growth are being addressed with The World Bank's assistance. Lesotho faces the dual challenge of securing macro-economic growth and stability while ensuring that sustainable improvements are made in the livelihood of the poor. Greater inclusion of the poorest communities by speeding up the decentralization process and strengthening local government structures is considered a priority policy by the GOL.

In order to stabilize and revitalize the economy, the Government is pursuing policies to liberalize and restructure key economic sectors through financial sector reform and privatization of publicly owned utilities. Keeping the budget deficit in check, maintaining low levels of inflation, and stemming the growing external imbalances are seen as key factors in restoring macroeconomic stability and injecting confidence into the economy. Since January 2001, the Government's medium-term policies have been guided by an interim Poverty Reduction Strategy Plan (PRSP) supported by a loan agreement under the Poverty Reduction and Growth Facility of the International Monetary Fund (IMF).

The Seventh National Development Plan and its predecessor place the highest priority on poverty reduction. A guiding document, the "Interim Poverty Reduction Strategy Paper (2000)" perceives poverty

> *"As a multi-dimensional phenomenon, poverty is defined and measured in a number of ways. Income unequivocally plays a highly significant part in achieving well-being for individuals. But since material wealth does not form the total sum of well-being, lack of income does not form the total sum of poverty. Other factors that reflect the extent to which individuals are deprived of access to basic human needs, such as food, shelter, schooling and health services, should constitute an integral part of any description of well being and poverty."*

Lesotho has started to successfully implement an economic development program that addresses the poverty-related issues articulated above. GDP growth has picked up somewhat, inflation is stable, and exports are expanding. These achievements have

been complemented by a strengthening of the Government's fiscal situation resulting from tighter spending limits and better tax administration.

II. THE ENERGY SECTOR

A. OVERVIEW OF THE ENERGY RESOURCES

Lesotho is essentially self-sufficient in hydropower, with hydropower accounting for 92% of the electricity generation. The key challenge for the Government in the energy sector is to increase access to electricity for both urban consumers and a large number of rural and isolated consumers throughout the country. The demand for electricity is estimated to grow threefold within the next 10 years. The Ministry of Natural Resources, through its Department of Energy (DOE), is the Government's principal entity charged with national energy planning and policy development. The Government has stated that increasing access to electricity in urban and rural areas, and the provision of all forms of energy to promote economic development, are two of its key development priorities.

Lesotho does not have fossil fuel resources, and, therefore, it relies entirely on imports for fossil fuels, especially from South Africa. The economy has met most of its electricity demand since 1998 when the 72 MW hydropower station at Muela became operational. However, electricity imports from South Africa supplement the local supply when necessary (especially during the winter season). Prior to 1998, nearly all of Lesotho's electricity was imported from South Africa.

Due to its geography and landscape, Lesotho is rich in hydro resources, which are generally located in the highland areas. Apart form the concentrated hydropower resources around Muela, substantial resources exist for generating hydropower energy by small distributed generation schemes in remote areas. In addition to large-scale hydropower projects such as the Muela Project, a number of small-scale hydropower facilities can be developed throughout the country to meet localized demand. The DOE has conducted studies that indicate that as many as 20 new sites could potentially be developed. So far, four sites have been developed and have an installed capacity of 3.5 MW.

In addition to hydropower resources, there is great potential for the utilization of renewable energy resources such as solar, wind, and to a lesser extent, biomass. Lesotho relies greatly on unsustainable biomass resources. The use of biomass for fuel purposes is not sustainable as the rate of consumption exceeds that of resource replenishment, particularly as it pertains to fuelwood. However, it remains an important element of the country's energy balance as more than 70% of the country's energy consumption for cooking and lighting in rural areas is covered by "free" biomass.

Detailed wind measurements have been carried out over a period of more than a year at three locations in Lesotho: Quthing, Letšeng-la-Terae and Sani Top (*Source: Our Environment, 3rd Issue, June 2002, Lesotho)*. The survey shows that there is a considerable wind resource in Lesotho, particularly in the highlands between Oxbow and Mokhotlong. The economic viability of wind energy projects has not been fully studied. However, it is likely that wind power may not be financially viable at the

present time when compared to the price of imported electricity. When conditions change, however, the wind resources could be exploited to provide electricity in large quantities by installing grid-connected wind turbines.

Solar resource utilization may be considered as a means for decreasing dependence on imported power while being a great resource for servicing rural and remote populations.

B. OVERVIEW OF STATUS OF RURAL ELECTRIFICATION

At present, only about 5% of households in Lesotho have access to electricity. The situation is much worse in the rural sector where only 1% of the households have access to reliable electricity. The majority of households in Lesotho rely on fuels such as coal, gas, and paraffin for cooking, heating, and lighting. In the rural areas, wood, shrubs and cow dung are the main sources of fuel. Energy resources in the rural areas are scarce, mainly because of the limited number of trees but also because fuel supply outlets are few and far apart. Many rural people have to travel long distances to get fuels such as gas and paraffin often at very high prices. Because of the lack of trees in Lesotho, people in the rural areas often walk 5-10 kilometers a day to get firewood.

The market for electricity in Lesotho is characterized by the country's geography and in particular the small, largely rural, and sparsely distributed population of about 2.2 million. Of the estimated 400,000 households only about 20,000 are connected to a formal electricity supply. Exhibit 1 shows the percentage of Lesotho's population that has access to electricity in urban and rural areas as compared to a number of other countries in the region.

Exhibit I: Access to Electricity in a Number of SAPP Countries (Urban vs. Rural Population)

Country	Percentage of Households Electrified	
	Urban	Rural
Malawi	11.00%	0.32%
Tanzania	13.00%	1.00%
Lesotho	**14.00%**	**4.00%**
Mozambique	17.05%	0.66%
Zambia	17.85%	1.39%
Namibia	26.00%	5.00%
Botswana	26.48%	2.09%
Swaziland	42.00%	2.00%
Zimbabwe	64.72%	0.60%
South Africa	74.6%	27.2%

Source ESMAP, The World Bank 2000 (modified)

1. National Power Sector Goals

Lack of access to affordable and reliable electricity supply for the people of Lesotho is a material impediment to the social and economic welfare of the country. Increasing the

speed at which new customers are connected to the main grid, or connected to an isolated supply, is a major objective of the reforms for the electricity sector in Lesotho.

The primary responsibility for supplying electricity in the country is placed with the Lesotho Electricity Corporation (LEC), a state utility, established in 1969. Given the low level of electrification in the country, the Government has embarked on a restructuring of the electricity supply industry which includes the privatization of LEC. The process of privatization of LEC is underway. However, in the interim, LEC continues to be responsible for the rural electrification objectives of the country. It has a two-pronged strategy for accomplishing the Government's objectives: (i) extension of LEC's customer base, and (ii) rural electrification through a universal access development fund -- the National Rural Electrification Fund (NREF), promoting electrification in areas not serviceable through grid connection.

The Government of Lesotho's vision and overall objective is to make energy available to people at an affordable price within the limitations of environmental sustainability and integrated management by all sectors. Based on this vision the following major policy goals have been formulated:

1.1 Poverty Alleviation and Economic Growth

The energy sector is expected to substantially contribute towards poverty alleviation and economic growth in Lesotho. This can be achieved through facilitating the provision of affordable technologies and services, and through the creation of income generating opportunities.

1.2 Access to Basic Energy Technologies and Services

A choice of reliable, affordable, accessible, and quality technologies and services needs to be made available to all Lesotho citizens. The technologies and services are likely to be sourced from within Lesotho as well as the Southern Africa region.

1.3 Security of Supply

The Government of Lesotho aims to ensure security of energy supply to meet the national requirements from diversified sources that are primarily locally based and can ensure the economic viability of their proposed programs.

2. Existing Plans and Programs

To achieve the Government's objectives of electrification the LEC must connect more customers. To achieve this, three alternative strategies are being considered by a LEC Service Advisory Group:

2.1 Expanded Geographical Area

The Service Territory concept seems to offer an effective means of furthering electrification. Defining a Service Territory significantly larger in geographical scope than the presently electrified area with an obligation to supply would give LEC an obligation to connect anyone prepared to pay the connection fee. The obligation to supply in a large geographical area could result in a steep rise in tariffs as a result of a large number of new subsidized connections.

2.2 Obligation to Invest

Along with privatization, LEC could be under obligation to the Government to invest fixed amounts in the electricity network each year for a number of years. While this would ensure additional connections, such investments may not be efficient. Experience with privatization of utilities elsewhere has shown that obligatory commitments imposed on utilities undergoing privatization to invest in expanding services are difficult to monitor and, therefore, difficult to enforce.

2.3 Obligation to Expand the Number of Connections

Under this strategy there would be an obligation on LEC to connect a fixed number of customers each year for a number of years. This obligation is tied in directly to the Government's national development objectives. The obligation would be relatively easy to monitor as part of the utility operations. It has the advantage that the commitment being made is easily understood by the population and by potential customers.

The LEC Service Advisory Group has recommended that the Government adopt the third strategy, requiring the privatized LEC to commit to a number of connections over a period of years. The service territory of LEC would include the entire existing network which will initially be within 50 meters the existing distribution grid. The service area would be expanded annually or biannually as LEC extends the grid and connects additional customers. LEC will be given a monopoly to supply services within the granted areas. In return, LEC will have an obligation to connect anyone within Lesotho who will pay the full incremental costs of connection including the connection to other local networks.

The Government has launched a Connection Fee Policy initiative in order to enable LEC to adhere to this connection policy. This policy is proving to be quite successful. Domestic consumers within 50 meters of an existing line are allowed to connect at a fixed cost. In addition, they can defray a large part of that cost and pay it on a deferred basis through a tariff surcharge. Thus far, most of the newly connected domestic customers have opted for these credit terms. The pricing of new connections under this policy is currently cross-subsidized in order to encourage consumers to participate in the program.

2.4 Access to Electricity in Areas Not Served by LEC

To achieve 100% electrification, the Government's stated policy objective, it will be necessary to connect approximately 500,000 new customers in Lesotho. This may not be possible to accomplish through just the LEC program as many of locations are far away from the grid. In fact, the Government will need to launch a separate program to provide electricity to the remote and isolated rural population. Therefore, a National Rural Electrification Fund (NREF) will be established in order to be a driver for increasing access outside of the LEC service area. The Lesotho Electricity Authority (LEA) is expected to play a key role in implementing electrification policy and administering the NREF.

LEC Service Advisory Group anticipates an increase of some 33% in tariffs in order for the utility to approach financial viability. LEC tariffs have not changed, even in nominal terms, since 1994. Also, over the next five years, the plans are to increase tariffs to only bring them to par with inflation. Thereafter, the tariffs would be adjusted by the Regulator - the Lesotho Electricity Authority (LEA) - in order to reflect LEC's actual total costs of service. Given these plans, there is even a greater pressure on the Government to address rural electrification as LEC will simply not be able to meet that demand.

2.5 The Energy Management Project

In 1999, the Energy Management Project was initiated in the DOE. The project, funded by the Danish Government, concentrated on assisting the DOE to develop a plan for the future energy sector in the country. (*Source: Our Environment, 3rd Issue, June 2002, Lesotho).* This project focuses on 4 areas:

- *Energy Supply.* Improving the security of energy supply through (i) expanding electrification, (ii) securing the availability of wood fuel and petroleum, (iii) electricity trade, and (iv) exploring the potential for energy sources such as solar energy, wind energy and hydropower.

- *Regulation and Organization.* Ensuring reasonable energy prices as well as reforming the power sector, thereby also protecting social energy obligations. This will be accomplished through appropriate energy subsidies and ensuring safety in the handling and trading of petroleum products.

- *Energy Efficiency*. Promoting sustainable building practices; implementing energy audits in industry, commercial and government buildings; and promoting investments in energy efficient appliances and equipment.

- *Cross-cutting Issues.* This component of the project covers issues such as capacity building and inter-ministerial collaboration on energy issues as well as gender, climate change, SADC coordination, and research activities. An important element of the project is the dissemination of information, which promotes safe management of energy resources in households through insulation measures,

energy savings, and clean energy sources. As part of the program, the DOE plans to establish an Energy Information Center in Maseru.

3. Institutional Arrangements

A number of entities within the GOL are involved in the energy sector. The Ministry of Natural Resources, through its Department of Energy (DOE), is the Government's principle entity charged with national energy planning and policy development. The Government has stated that increasing access of electricity to peri-urban and rural areas, and the provision of all forms of energy to promote economic development, are two of its key priorities. The right and obligation to supply electricity in Lesotho has been the sole responsibility of the Lesotho Electricity Corporation (LEC) since its creation in 1969. The Lesotho Electricity Authority (LEA) is Lesotho's regulator and is expected to play an important role in implementing electrification policy and administering the NREF. In addition to these entities, The Ministry of Local Governments (MLG) is leading the efforts to prepare for the process of decentralization of public functions and responsibilities. MLG's role will be in both policy development and long-term planning. The MLG has incorporated rural electrification as an integral component in its rural development strategy. There is also an on-going discussion on the need for establishing a National Rural Electrification Advisory Board (NREAB) as part of the Utilities Reform Project jointly funded by the World Bank and the African Development Bank. The NREAB's primary responsibilities would be the design and implementation of pilot RE projects at designated sites and to advise communities on financing options. It would provide services based on alternative payment plans in accordance with the needs of individual communities.

4. Rural Electrification Financing Plans

The NREF is expected to drive the access to electricity program for those customers outside of the LEC's privatized service area. Funds for the establishment of NREF are to come initially from two principal sources: (i) all connection fees collected by the Interim Management Task Force (IMTF) where The World Bank/African Development Bank finances the costs of connection (100% direct transfer); and (ii) through an increased tariff (tax) on electricity sold in Lesotho.

C. OVERVIEW OF LESOTHO'S POWER SECTOR REFORM

The Government's first Energy Sector Policy Statement was approved in 1988 and is incorporated in the Lesotho Energy Master Plan (LEMP). The driver of this policy is the provision of energy to all sectors of the economy with minimum economic cost. A number of strategies were planned to implement this policy. These included the increased utilization of locally available solar energy resources and minimizing the utilization of imported energy resources without decreasing availability or increasing price. (*Source: Remarks of H.E. Minister Moleleki, 21-22 May 2001, Maseru*).

1. Energy Sector Policies

Lesotho's energy policy objectives include:

- Poverty reduction by facilitating the provision of affordable technologies and services and through the creation of income generating opportunities
- Protection of the environment as well as environmental sustainability
- Contribution towards economic growth and investment through initiatives which are based on energy sector management, job creation, and private sector participation
- Access to basic energy technologies and services, mainly those available through local and regional sources

2. Power Sector Reform

Lesotho's electricity policy objectives include many components for power sector reform. These include the following:

- Ensure that the power sector is operated along commercial lines and conforming with the codes of practice stipulated in the prevailing regulatory framework
- Increase access to affordable and reliable electricity services without putting financial burdens on the utilities
- Implement an affordable marginal cost based, voltage and capacity-related connection service charge
- Implement cost-recovery electricity tariffs and an affordable pricing system for meeting basic household energy demand
- Implement institutional reforms and create an enabling environment for private sector participation in order to increase efficiency in the sector
- Mobilize full participation of local communities and stakeholders in the design, planning, and implementation of electrification programs.

3. Steps toward Implementation

In implementing all of the above policy objectives, the Government of Lesotho (GOL) has set out the steps by which it aims to reform the power sector. These include the establishment of a regulatory body to be independent in the performance of its functions and duties. To this end, the Government passed the 2002 Lesotho Electricity Authority Act which provides for the reestablishment of the Lesotho Electricity Authority (LEA) to regulate and supervise activities in the electricity sector and makes provision for the restructuring and the development of the electricity sector. The 2002 LEA Act

establishes that the LEA will oversee electrification policy and may administer the NREF.

The GOL has engaged an Interim Management Task Force (IMTF) to introduce efficiency into all aspects of the day-to-day activities of LEC with the aim of preparing it for its eventual privatization. The IMTF has been operational at LEC since February 2001. Furthermore, a Sales and Advisory Group (SAG) is charged with drafting and proposing terms and conditions for a potential strategic partner for LEC.

The 2000 Policy Statement and the 2002 LEA Act establish the policy for tariff setting. Tariffs will be set by the LEA by using the methodology established and published in the LEA Regulations. The tariffs will be fully reflective of the costs of an efficient operator including an appropriate return on investment.

The proposed LEC privatization scheme recommends the sale of 80% of LEC to a strategic investor for a fixed fee to be set in advance. The investor will commit to a set number of new connections over a 10 year period. It is anticipated that this strategy should facilitate the connection of at least 100,000 customers to the interconnected network by 2012.

Lesotho's power sector reform agenda includes descriptions of its (a) key elements and objectives, (b) planned institutional structure as well as industry structure, (c) approach to introducing competition, (d) policy on subsidies; and (e) a timetable for reform.

Box 1 summarizes key elements of the Government's power sector reform agenda and the efforts to address many issues such as institutional development, subsidies, competition, etc.

Box 1: Lesotho's Power Sector Reform Agenda

a. Key Elements

- General Objectives
  Expand rapidly electrification throughout the country
  Modernize the service
  Support country economic and social development

- Short to Medium Term Objectives
  Divest government interest in the sector – Privatize LEC
  Develop transparent regulatory framework – Establish the Regulatory Authority
  Attract donor support and private investment
  Develop and enhance indigenous capacity in electric power sector

- Long Term Objectives
  Universal access
  Meet targets for rural electrification
  Ensure minimum adverse environmental impact

Ensure subsidies are properly targeted to the poor

b. Key Ministries and Industry Structure

- Ministry of Natural Resources
  Policy, Monitoring and Liaison with Legislature and International agencies
  Rural Electrification and Off grid

- Lesotho Electricity Authority
  Regulate the privatized power sector
  Licensing, tariff and overall regulation

- Transco
  Initially state owned or concessioned to LEC, but will provide for open access

- Gencos
  Initially state owned, but run commercially

- Disco (initially LEC only) On Grid distribution and sales. Off Grid distribution based primarily on renewables.

- Possibility in the future for Grid Connected Auto Generators

- New Institutions
  Lesotho Electricity Regulatory Authority (ERA)
  REF – Rural Electrification Fund

c. Competition

- Regulation provides for:
  Competition among Genco plus new IPPs in the future
  Bilateral Contracts between Genco and Disco

- Discos and Gencos to initiate capacity expansions

- Transco responsible for projections and capacity requirements

- Lesotho LEA to:
  Approve capacity expansion plans
  Review Business plans for expansion and oversight tenders

- Transco to manage
  Open Access
  Transmission System Operations
  Market Settlement (will neither buy nor sell electricity)
  Network Expansion and Planning

- Disco/LEC will:
  Manage distribution network lines
  Not be allowed to build or own generating plants in excess of a given amount of MWs

Not own shares in Transco

- Ownership and Cross Ownership
  LEC and Gencos will not own shares in Transco
  LEC/Discos and Gencos will not cross own shares
  Not applicable to Off-grid systems

Box 2 provides a description of the recently approved Utilities Sector Reform Project for Lesotho. The project is designed to assist Lesotho in meeting its reform program objectives of improving the business environment and strengthening local capacity.

Box 2: The World Bank/IDA Loan - Utilities Sector Reform Project for Lesotho

The World Bank approved on March 29, 2003, a US$28.6 million credit to assist the Government of Lesotho improve the business infrastructure, in particular electricity and telecommunications services. A cornerstone of the Government's overall economic growth and employment generation strategy is to attract private foreign and domestic capital and expertise. The ***Utilities Sector Reform Project*** will help address this through the following activities:

Lesotho Electric Company (LEC) Divestiture and Electricity Expansion: Focuses focus on upgrading the electricity sector through the inflow of private capital, new technology and management necessary to increase access, and improve the affordability and reliability of electricity services provided in the country;

Regulatory Reform: The role of the regulators will be to enforce the appropriate regulations in the utilities sectors, ensure fair and transparent treatment of sectoral operators, and encourage new entrants, private investment and the transfer of technologies;

Future of Energy Sector in Lesotho: This component will consist of a comprehensive study on the future options related to hydroelectric power in Lesotho. It will also identify and develop alternative methods for sustainable electricity service delivery to areas outside the service territory of LEC;

Private Sector Development: This will involve the establishment of an Investment Fund/Unit Trust and technical assistance will be financed to identify and support activities that will encourage regional integration efforts and identify Lesotho's areas of comparative advantage;

Advisory Services and Capacity Building: Under this component, resources will be provided for advisory services and training of staff at the Ministries of Natural Resources, Communications and Finance;

The Utilities Sector Reform Project will be financed by a US $28.6 million credit from the International Development Association, the World Bank's lending arm for the poorest countries. The IDA credit is on standard terms of 40 years maturity, including 10 years grace.

Source: The World Bank Press Release, March 29, 2001

Lesotho's reformed and modernized energy sector should contribute towards environmental sustainability. Economic growth can be achieved through the implementation of initiatives that emphasize efficiency in energy sector management, job creation, and focus on initiatives that position Lesotho as a competitive player in the Southern Africa region. In achieving this latter goal, the Government places an emphasis on the creation of conditions that encourage private sector investment.

D. ELECTRICITY SECTOR REFORM AND IMPLICATIONS FOR RURAL ELECTRIFICATION

Providing electricity to rural populations is a complex task. Though the private sector's role in rural electrification is growing, governments must provide the framework for rural electrification activities and donors can accelerate the process. The goal should be to increase the share of households with an electricity connection by a certain date. An output-based scheme needs to incorporate measurable indicators, for example, a requirement that a certain number of connections be made during a given period of time.

Reforms in other countries indicate the following:

- Short term impacts have tended to entail price increases to cover costs. The increase of electricity prices may make distributed generation technologies more competitive in the electrification market

- In the long term, it is likely that prices will drop if competition is introduced into the industry

Reform requires a reworking of subsidy schemes:

- As the electricity industry moves towards cost-reflective tariffs subsidy reform is inevitable

- The impact that this reform has on poverty alleviation depends on the Government's policies and the political will to implement reform policies

Many countries maintain energy subsidies for the poor. As reforms move the sector to operate under commercial principles, it may affect RE programs that are designed to increase both off-grid an on-grid access to electricity. Some lessons learned through the experience of other countries that have gone through the reform process include the following:

- Electrification programs may be placed on the backburner until mainstream sector reform issues are addressed

- Generally, private companies are less inclined to invest in electrification programs

- With appropriate incentive, however, private companies can offer new sources of funds for grid and off-grid electrification

- There is often a bias towards grid-electrification and away from off-grid electrification

Based on the above lessons, it is recommended that (i) power sector reforms take access issues into account right from the start, (ii) competition and good regulation precede privatization initiatives, (iii) a study on the impact of reforms be conducted before mistakes are made, and (iv) a comprehensive regulatory framework is established as one of the first reform steps.

Developing business models for private companies that provide infrastructure services to rural customers in developing countries is a crucial and very important task. It is also important to assess the factors driving the performance of private companies in a variety of rural contexts and under diverse legal and regulatory arrangements.

Other areas of consideration include the following:

- Encouraging the participation of local investors in the reform process where the private sector is targeted. Involvement of local partners in the reform process can be a catalyst for providing a sense of ownership and a reduction in the resistance to change. There should also be a distinct effort to build local technical capacity in the service industry. The areas of distribution, supply and revenue collection are less capital intensive in terms of initial outlay cost than generation and transmission. Local entrepreneurs should, therefore, be encouraged to target these unbundled areas for investment.

- Restructuring may leave prospects for renewables on the same standing as when the utility was vertically integrated. If retail tariffs accurately reflect generation, transmission, and distribution costs, customers will have stronger incentives to install distributed generators than if they cannot avoid these costs by doing so. At worst, no single player in an unbundled system may be able to fully benefit from avoiding new generation, transmission, or distribution construction by installing distributed resources.

- Careful consideration must be given to renewable technologies for providing services to niche markets.

1. Expected Setoral Structural Changes

As a consequence of the reform process, the power sector industry structure will change conceptually and in terms of its institutional composition.

Planners should take into consideration the following best practices:

- Commercialization of state-owned vertically integrated utility for eventual divestiture to the private sector
- Establishment of the independent regulatory authority
- Introduction of legislation to accommodate private sector involvement in the restructured sector
- Introduction of IPPs as other sources of electricity supply
- Considering electricity provision and its accompanying services as a vehicle for poverty alleviation
- Encouraging micro-credit and other financial intermediaries in the rural areas to increase income generating activities which could eventually lead to increasing load and thereby justify electricity service provision.

2. Policy Considerations

When developing policies, planners should take the following best practices into consideration:

- Sector reform should target increasing access as well as efficiency
- Competitive private sector participation can improve access and affordability given an effective legal and regulatory framework
- The urban poor are more likely to benefit from electricity reforms in terms of affordability and access. Sizeable investment will be needed to integrate rural customers into the reform process
- In the case of rural areas, alternative energy sources may be necessary to meet the needs of the rural communities in an affordable manner, especially those communities far removed from the existing transmission and distribution network
- Micro credit schemes should be introduced with relaxed pay-back periods to increase load and thereby raise the economic viability of the projects

- Remote rural communities have a right to education, health-care and a better quality of life. This calls for new thinking and strategies and, most importantly, financial and political commitment to the realization of the programs aimed at providing greater access to electricity nationwide

- Funding from the traditional multi- and bilateral institutions is not readily available to support all RE needs

- Institutional structures for the proper implementation, monitoring and evaluation of RE design, planning, and implementation processes are instrumental to the success of RE programs

III. CHALLENGES AND APPROACHES

The rural population in Lesotho generally does not participate in the mainstream formal economy. Subsistence agriculture is the main economic activity open to this population. Therefore, the village population does not have access to the broad array of economic opportunities generally available to urban dwellers. One reason for this disparity in economic opportunities is the lack of reliable and affordable energy. Conventional modern systems based on technologies producing high quality and lower cost electricity are prohibitively "costly" in rural settings.

Geographical layout and the degree of dispersion and isolation are obstacles that prevent rural people from gaining access to electricity. The more isolated an area, the greater the difficulties, since investment costs increase and organization and management skills are limited due to lack of education and access to information. In addition, there is a low migration rate among rural people and conditions are unfavorable for trading with other parts of the country. Given their proximity to the grid, many peri-urban and rural areas are generally in a better position to acquire access through grid expansion in the future. In fact, the country electrification coefficient may increase from 5% at present to 37% by the 2017, only through the planned LEC grid expansion.

However, the only way the vast majority of the highland population can gain access to electricity is by taking advantage of local energy resources in isolated power supply systems, such as hydroelectric power on a small scale, solar energy, biomass and individual diesel gensets.

Generally, in rural areas, there are few mechanisms for the development and growth of the enterprise sector and industry. Therefore, the energy needs in the rural sector are basically social energy needs such as lighting, cooking, water heating and pumping. Small-scale applications of solar technology for such applications as crop drying in the farm sector have proven unsuccessful, as the farmers are unable to pay for such systems.

In addition to the technology barrier, a number of other barriers limit the application of RE systems. These have their roots in the institutional capacity of village level management institutions. The local leaders need to be committed to a sustained development of the enterprise sector, creating new jobs, and proceeding towards a more equitable income distribution. Only such commitment to development will open ways for more widespread application of rural energy systems.

A. CHALLENGES

1. Worldwide Electricity Sector Challenges

Worldwide electricity sector challenges are sometimes summarized as the "Triple AAA" syndrome:

- *Availability*
- *Accessibility*
- *Acceptability*

Availability is the long-term continuity of energy supply as well as the quality of service. *Accessibility* means that energy must be available at prices which are both affordable (low enough for the poorest people) and sustainable (prices which reflect real cost of service). *Acceptability* deals with the consideration of social and environmental aspects.

These challenges need to be faced in collaboration with governments and other stakeholders.

2. Planning and Implementation Needs

In the case of Lesotho, a number of challenges and constraints need to be addressed through designing a targeted and effective RE model based on lessons learned elsewhere. Preliminary assessments by the Government and several donors indicate that Lesotho faces most of the major barriers to increasing rural energy access. These include (i) financial, (ii) tariffs (to some extent), (iii) institutional deficiencies, (iv) costs to the service and technology providers and to the consumers, (v) skills level and capacity, and (vi) awareness and acceptance of renewable energy technologies. There is a need to better define these barriers and to develop approaches to addressing these barriers through a comprehensive RE master plan and strategy.

2.1 Need for an Integrated Electrification Master Plan and Strategy

Several policy actions have been initiated by the Government and several studies have been conducted for RE development in Lesotho. Through speeches, Government policy documents and papers, and other outreach mechanisms, the Government of Lesotho has established the momentum within the country to launch the development of a master plan and strategy for RE development.

The promotion of appropriate energy sector policies and initiatives for sustainable development should be based on an integrated energy strategy that defines directions and appropriate actions for implementation. It is imperative for Lesotho to elaborate its integrated energy strategy as a guiding instrument for a clear electrification perspective with regard to the objectives and goals of sustainable development.
An integrated sustainable energy strategy includes several key components such as sound energy policies, security of supply, energy efficiency, well diversified fuel mix, use

of alternative sources of energy, environmental management, and an optimum mix of public and private sector roles including extensive stakeholder participation and consumer satisfaction. The need for private sector participation and stakeholder participation is particularly relevant and critically needed as part of any strategy for rural electrification.

2.2 Need for National and District Level Energy Information, Surveys, and Energy Planning

A viable integrated energy strategy can only be elaborated on the basis of reliable energy data and statistics. National surveys on the production, supply, and use of all available sources of energy constitute, therefore, one of the building blocks in the development of an adequate energy strategy. Surveys of national and district level energy resources are also required for energy planning purposes. They are essential for the collection of data on resources - the quantities available, their location, and pre-assessments of the costs based on this data. In addition, statistics on end-use energy consumption by consumer type and energy consumption pattern are very necessary in order to plan energy supply and to price energy.

With respect to rural electrification in Lesotho, particularly in remote and low density rural areas, one also needs better information on the geographical distribution of renewable energy sources. Therefore, there is a need to establish a structure based on successful RE models elsewhere in the world. Also, given the population distribution in Lesotho, there is a need for developing creative mechanisms to widely disseminate information on the benefits of renewable energy technologies -- particularly with respect to rural development -- including increased business opportunities, job creation and income distribution. Institutional mechanisms need to be put in place to actively involve the rural and remote consumers in the RE planning and delivery process.

2.3 Lack of a Structure to Foster and Leverage Public-Private Financing of Rural Electrification Schemes

As traditional banking institutions are still reluctant to provide credit for small energy service businesses, Lesotho needs to consider policies that would create an "enabling environment" that would induce the development of creative private sector financing mechanisms needed to promote both grid-based and off-grid rural electrification schemes throughout the country.

A conservative estimate indicates that financing of up to US $200 million may be needed to fully electrify the country, a policy goal set by the Government. Given the public sector budget constraints, much of this investment will have to come from the private sector sources and grants from bilateral donors. Some financing will be available from the World Bank. However, the amount of that financing is dependent upon the Government's borrowing capacity and its overall fiscal health. Thus, in the foreseeable future, the country will need to depend upon the private sector and other

creative public-private financing structures for wide-scale financing of rural electrification particularly to the remote and isolated population.

However, availability of attractive private sector financing continues to be a major constraint. Apart from the lack of public-private funds, there is a lack of a structure that could efficiently channel funds needed for such large investment needs. The development of the planned National Rural Electrification Fund is a good start but the Government should begin thinking now on ways to transition from a 'fund based' subsidized program to a public-private investment structure operating along commercial lines that would serve as the vehicle to generate and disburse investments needed for the electrification of the whole country. Under such an arrangement, private investors, international donors and lenders, and the multilateral donors may feel more assured of getting a return on their investments.

2.4 Need for Institutional Capacity Building

Another area requiring special attention is the need for an efficient institutional infrastructure to guide the rural electrification programs. The Government will need to address the need to strengthen all key institutions involved in the energy sector. This includes enhancing capacity within the DOE and the local government institutions. More importantly, as the Government moves forward with the establishment of the National Rural Electrification Fund, the management of the Fund will need to be designed to maximize its credibility and capability. Since the local consumer groups, electric cooperatives, franchisees, and NGOs will very likely play an important role in rural electricity delivery to isolated populations they will also need to be strengthened.

2.5 Need for Promotion of Best Technologies and Practices

There is also a need to promote best practices in the use of energy saving technologies. For RE systems that will be designed as stand-alone or modular renewable energy systems, enhancing understanding and promoting consumer acceptance are important components to ensuring sustainable development. There are many examples of successful rural electrification practices and technologies from around the world that offer useful lessons and are helpful in designing consumer education and acceptance programs. These best practices and models for technology promotion need to be studied and appropriately adapted to fit with economic and socio-cultural conditions in Lesotho.

2.6 High Cost of Renewable Energy Technologies (RET)

Misconceptions about RETs and rural electrification programs include the belief held by both consumers and private providers that there is really not a big market for such technologies and the rural poor simply do not have the ability to pay for electricity using costly technologies. There is also the belief that the technologies are costly to maintain

and repair. These misconceptions are being proven wrong by numerous applications around the world. The costs of PV systems, for example, have decreased tremendously in the last 10 years. At the same time, their reliability has increased and maintenance and repair costs have decreased. Analysts and private energy providers in many countries are discovering that the consumers' willingness to pay is high if the quality and reliability of the electricity supply is acceptable. Indeed, the consumer is willing to pay if the continuity of energy supply can be assured. As a result, a number of technology vendor based delivery rural electricity systems are becoming popular.

B. POTENTIAL APPROACHES

1. Integration of Rural Electrification with Rural Development Policy and Programs

1.1 Integrated Approach of Rural Electrification

It has become clear that electricity does not contribute much to the development of target communities in isolated areas if it is delivered without any linkage to income generating activities. It is important to promote and encourage productive uses of electricity while the distribution systems are being implemented. Furthermore, it is important to keep in mind that electricity is only one of the many important factors in rural development and that it will contribute effectively to rural development only if its delivery is coupled with that of other infrastructure services.

The main policy issues that need to be considered include the following:

- Socioeconomic indicators need to be incorporated into the methodology when selecting sites for rural electrification

- A detailed database with socioeconomic data, GIS information, and other data relevant for market assessment needs to be developed within the agency responsible for promoting rural electrification

- Policies should recognize that public or private delivery of rural electrification can work provided that (i) financing is available, (ii) the consumers' willingness to pay is taken into account in project and tariff design, (iii) O&M is carried out by appropriately trained personnel, (iv) and politicians do not interfere in business decisions.

- An awareness campaign on isolated power supply systems and outreach programs for representatives of distribution companies, consumers and other stakeholders, needs to be developed and implemented

- Rural development programs should be designed to include rural energy delivery as an explicit component and the delivery mechanisms should be decentralized to maximize the role of local governments and local energy providers

1.2 Economic and Social Infrastructure

Economic infrastructure produces services that directly facilitate, and are basic to, the carrying out of a wide variety of economic activities. Rural infrastructure, therefore, includes investments that directly and indirectly affect productivity in agriculture and other rural non-farm activities. Categories of economic infrastructural activity are investments in rural electrification, rural credit institutions, irrigation and drainage, rural roads, markets for inputs and outputs, etc. While some infrastructure, such as irrigation and credit, enable the adoption of new technology, some others, such as transport, provide intermediate services to facilitate interaction between productive activities. Social infrastructure plays an important role in rural electrification as consumer acceptance of rural energy services is closely linked to the social and cultural patterns of the rural population.

1.3 Planning and Development Policy Objectives

In most developing countries, the main objective of planning and development policy is growth with equity. Investment in rural infrastructure constitutes an important component of national planning and thereby serves the various national policy objectives. The multinational agencies such the World Bank, United Nations Development Program, and African Development Bank have also adopted growth, sustainability, and poverty reduction as the main pillars around which their development projects are designed and funded.

The following are the most common objectives of rural infrastructure development in most countries:

Growth with Equity -- Growth with equity has become the overriding objective of rural development and planning in most developing countries. The basic aim of infrastructure development is to promote growth. To the extent the infrastructure is located in rural areas, which generally have higher incidence of poverty, any gains in productivity resulting from increased investment in infrastructure will also benefit the poor.

Increasing Productivity -- Developing countries are characterized by low levels of productivity of land, labor and capital in almost all sectors of the economy, in particular, in agriculture and allied sectors in rural areas. Infrastructure development does not directly raise productivity, but provides the necessary preconditions for increasing it. Given an appropriate institutional set-up, infrastructure investments help to pave the way for development through other investments. Infrastructure interventions such as investments in rural electrification, transport, irrigation, rural credit, roads and communications, regulated markets, agricultural research and extension, land reforms, education and health, and investment in common property resources are universally

acknowledged as the most important sources of increasing the productivity of resources in both farm and non-farm sectors in rural areas.

Access of Women to Infrastructure -- In spite of the existence of physical and social infrastructure, certain disadvantaged groups, such as poor children and some women, are unable to make use of infrastructure services such as education and health care. For poor children, education does not become available because they have to work for a living. For women, social prejudices preclude them from making use of these services. They spend substantial time in gathering fuel wood and other energy resources. The result of their inability to access the social services is increased morbidity, lower education, and continued ill health.

Environmental Sustainability -- Sustainable development is the development that lasts and is friendly to the environment. Keeping in mind that sometimes growth can be oblivious to environmental considerations and that environmental degradation makes the future generations worse off by degrading the earth's resources and polluting the earth's environment, the objective of sustainable development has now been universally accepted. It is also increasingly appreciated that the cost of maintaining the sustainability of the environment ought to be borne by the present generation.

Provision of Minimum Needs -- Investment in social infrastructure aimed at providing basic minimum needs indirectly leads to poverty eradication by providing a better working and living environment, physical health, and human capital formation amongst the poor. In most cases, poverty itself is manifest in inadequate social infrastructure services like safe drinking water, sanitation, housing, health, family welfare, rural electrification, rural schooling and training institutions. Human capital formation through formal education and training is considered to be the most potent weapon against poverty.

Self-Reliance -- Another important objective of investment in infrastructure aimed at poverty reduction is to make the poor self-reliant and capable of meeting their basic needs out of their own resources. The goal of self-reliance can be accomplished by improving the productivity of the existing asset base of the rural poor. This requires, apart from supplementary policies, helping the poor to overcome the impediments of low returns from assets and increasing the productivity of their land by adopting modern energy and technology.

The asset-creating and employment generation programs should be accompanied by the development of credit infrastructure especially catering to the needs of the rural poor for supplying them with adequate and subsidized credit. The creation of specialized financial institutions assumes significance in this regard because supply of credit to the poor involves high risk and carries exorbitant interest rates. The task of the special financial institutions would be to identify impediments to enhancing the productivity of existing assets and to find ways and means to overcome these. Simultaneously, they need to promote viable economic activities for the rural poor. The Grameen Bank of Bangladesh, which provides credit at reasonable rates to the poor for solar home

systems, has helped make the rural poor self-reliant. There is direct evidence of new productive and income generating activities of the rural poor.

Empowerment of Local Government and Community Participation -- Decentralization of power and the empowerment of local government and communities are important components of democratic functioning and extension of democracy to the grassroots level. Community participation in the development process at the local level directs the bias of development towards local problems and the local poor. There are two aspects of empowerment. One is political power delegated to local bodies through appropriate legislation. The other equally important aspect of empowerment is the devolution of financial resources to these bodies through the budgeting process. In many of the reforming states in India, for example, rural development functions (including rural electrification) are being decentralized from the state rural development ministries and state electricity boards to local village levels -- *Gram Panchayat level* with the corresponding transfer of financial resources from the state budgets. After more than three decades of a centrally controlled model of development, starting in 2000, Indonesia has embarked on a massive decentralization program aimed at transferring authority and resources to the regional and local levels. This also includes rural electrification. As a result, municipalities and villages in the various provinces of Indonesia are becoming increasingly active in rural development and rural electrification.

1.4 Integrating Rural Development Investment with National Planning

Rural development investment constitutes the hard core of national planning and a large proportion of planning resources are generally devoted to its development. Since local and rural development projects operate at different layers of government and in different agro-climatic regions there is need for a careful selection of programs and projects and their proper integration with the national plan. In other words, rural development strategies should be consistent with the broad objectives set out in the national plan. The detailed disaggregated schemes should be formulated in the light of variations in agro-climatic conditions, occupational composition of the population, varying economic opportunities, availability and requirements of infrastructure and other constraints.

A local planning strategy should proceed in three stages. The first stage is to take an inventory of physical endowments of the area and to identify the potentials and constraints vis a vis optimum utilization of existing physical and human resources. In the second stage, viable activities relating to agriculture and allied sectors should be identified. The main objective should be to undertake those projects which lead to the welfare of the local people, in general, and the disadvantaged and the poor, in particular, keeping in view the availability of resources. Other important aspects such as long-term viability, flow of benefits to the targeted population, and environmental impact also need to be given due consideration in local area plan formulation during the third phase. In any multi-level planning exercise, projects at the local level have to be integrated with the plans at the district and national levels.

1.5 Growth-Equity Trade-off

In all developing countries, there are competing demands on limited resources. In the process of planning also, resources have to be allocated to various programs including those designed for different types of infrastructure and direct anti-poverty programs. This invariably leads to a trade-off between growth and equity objectives that most planners must balance. The choice between various competing projects becomes quite difficult. For policy makers, what is needed is a decision rule that enables the selection of optimum programs from among a whole set of programs that range between direct anti-poverty programs, growth programs and indirect growth programs. There is also a need to develop criteria for making a choice among numerous programs and projects that serve the given objectives. Thus, growth-equity trade-off becomes a crucial policy issue. This issue is very present in decisions on rural electrification which often competes with basic services such as education, health care, nutrition, etc.

1.6 The Impact of Infrastructure Intervention on Poverty Reduction

The impact of infrastructure intervention on poverty reduction takes place both directly and indirectly. The indirect impact is through its contribution to the growth of the economy. The three most important infrastructure investments that go a long way towards alleviating rural poverty are energy, transport, and irrigation. Rural infrastructure development, like electrification, irrigation, credit, roads, and communication are essential prerequisites for modernization and growth of agriculture in developing countries. The growth of agriculture, in turn, results not only in increasing the productivity and income of all categories of farmers, but also in providing greater employment to the rural laborer.

The direct effect of infrastructure investment can manifest in various ways. First, during the construction phase of infrastructure projects the poor are provided employment and income-earning opportunities. Other impacts are related to rural health and education. The availability of health infrastructure tends to reduce infant and child mortality as well as fertility rates and leads to eradication of certain diseases. The availability of education infrastructure provides for social growth. And, all these infrastructure schemes need to use modern energy resources.

The process through which infrastructure investment reduces poverty is quite complex, has numerous dynamic links, and operates through different income groups with different effects. Consequently, tracing the pattern of distribution of benefits of different types of investment projects across various income groups and geographical regions generally poses serious difficulties.

The first impact is indirect through its contribution to economic growth. The impact of growth on the rural poor would depend on several factors like the type of infrastructure, the nature of services, and the location of the project. It also depends on the operating environment, such as market structures, the degree of imperfections and government regulations.

For example, a pumped irrigation project is likely to increase the productivity and incomes not only of the rich but also of poor, small, and marginal farmers. Thus, it has an indirect impact on poverty through growth in agricultural production. It also affects the landless labor by providing more employment in agriculture and later in the allied manufacturing and services sectors.

2. Public-Private Partnership

Public-private partnerships are public and private entity associations formed with a view to meet a collective objective. In a demanding context, they permit improvements in the management of publicly financed projects through management contracts to the private sector. Also, in some cases, the private sector can also be a partial investor in a public sector project. Essentially, these arrangements operate on the basis of sharing responsibilities, risks, costs, and profits. The responsibility of public authorities is then to guarantee the general interest of the private sector by concentrating on the provision of incentives and directions and controlling the concerned activities. At the same time, the public sector has the obligation to protect and preserve the interests of the population. This is usually achieved through sound policies and a transparent regulatory regime. The basic objective should be to guarantee successful implementation of the partnerships in a manner that will allow them to be economically, socially, and ecologically efficient.

Public-private partnerships offer the opportunity to optimize the use of public resources and to add them to private resources, which are difficult to attract without a partnership. It also brings innovative management abilities and methods to investment projects. In the most favorable cases, it allows the production of assets and fundamental services at a cost that makes them accessible to a larger segment of the population including the rural population.

The involvement of local partners in such partnerships is often one of the factors that establishes confidence between the parties and, therefore, the success of the investment projects.

Such partnership schemes can be very important for expanding rural electrification, which, in the absence of any Government involvement, is difficult and slow. Market based rural electrification options constitute a prerequisite for successful and sustained public-private initiatives in delivering grid and off-grid electricity to poor rural areas in support of a broader poverty reduction program. This means that a Government policy to promote a market-based approach to rural electrification should be developed as a prerequisite to attract private investors. In general, private sector-led provision of off-grid electricity service is feasible where local resources exist and where there is a substantial growing demand for electricity. Estimates need to be conducted through

market surveys on the local socio-economic and resource conditions and the feasibility of implementing off-grid service.

Rural electricity markets are difficult to operate because there are numerous uncertainties such as consumer behavior, demand characteristics, revenue recovery, etc. This is particularly true for rural areas remote from the grid, where market size, terrain, and low incomes usually deter private companies from considering business investments. One solution to the lack of private sector participation in rural electrification projects is the promotion of public-private partnerships in which the private company, the Government, and the customers all share the investment risks, allowing financially sustainable operation. However, even for the public-private partnerships to be feasible for off-grid projects, the market needs to be carefully defined. A country analysis might need to be conducted in order to provide policy guidance and recommendations on the following issues related to the creation of the right environment for public-private partnerships in RE:

- Modes and conditions for public intervention in support of rural electrification
- Inter-institutional coordination with the regulator and other stakeholders to ensure maximum efficiency and sustainability in regulation and tariffs when awarding new off-grid concessions, and to support the use of least-cost technologies for off-grid sites.
- Approach to addressing workable solutions for the electricity companies' stranded off-grid assets.
- Output-based aid which could be directly applied in the case of solar home systems (SHS) service or sales by private operators.
- Subsidies -- amount, target group, method of subsidy allocation, etc.

Box 3 includes an example of public-private partnership for a rural electrification project in Morocco that was implemented with financing from the French Fund for Global Environment (FFEM). This project illustrates the benefits from creative public-private partnerships in an energy/water nexus project.

Box 3: Decentralized PPP Rural Electrification Project Involving PV Energy in Morocco with the French Fund for Global Environment (FFEM)

Morocco is characterized by a significant rural population relatively spread out. The country has 39 000 "douars" (housing regrouping), most of which have less than 50 homes. In spite of a significant effort for the expansion of electricity and water services, close to 20 000 douars and 500 000 homes will not benefit from conventional solutions in the mid-term, these being spread out and representing a very limited demand.

The project proposed by a French-Moroccan consortium aims at linking public and private funding, according to a new legal arrangement in Morocco, with a view to extend village electrification and supply of drinking water by using photovoltaic equipment.

The rationale of the project lies in the joint financing of investments by public (The National Bureau for Electricity - ONE) and private (the Consortium) partners, the latter being responsible for the management of installations. A local company is responsible for carrying out and managing the operations (studies, supply of equipment, installation, operation and renewal of systems over 10 years). 16 000 homes spread over 400 villages in the provinces of Khemisset, Khouribga, Khenifra and Settat are involved. Furthermore, about one hundred solar pumps will be installed in the villages where this technology is relevant, thus conciliating the management of electricity with that of water services. The costs, investments and operating charges assessed over 5 years amount to euros 19,4 Million. Their funding is shared between the ONE (euros 7,2 M), the Consortium (euros 3,0 M), the Local Authorities (euros 2,4 M), the Consumers (initial contributions + payment for service, for euros 5,2 M). The FFEM is involved for euros 1,6 M.

The project, first of this magnitude in Africa, is distinguished by two innovations: the public/private co-investment and the co-management of these decentralized installations; the integration of the two components electricity and water within the framework of decentralized management in a rural environment.

Source: AGENCE FRANÇAISE DE DÉVELOPPEMENT GROUP, 2002

Box 4 provides one of the most successful illustrations of a well designed rural electrification program that has been successful for over 30 years in the U.S. The rural electric cooperatives (RECs), designed with the assistance of the U.S. Government, now form the most efficient agents for providing rural electrification in the U.S.

Box 4: Government and REC Partnership Programs in the United States

The public understands that helping business can be good business, whether it is to stimulate the economy, to promote economic development, to new technologies, to assist struggling industries or to help supply goods and services to consumers when private markets fail to do the job. Business leaders often refer with pride to public-private partnerships that accomplish goals that neither the private sector nor the public sector can do as effectively alone.

Given the pervasive nature of government assistance to business, it is hard to understand why electric co-operatives are so often attacked for having participated in government programs designed to promote the public good. In particular, some investor-owned utilities (IOUs) have advanced the argument that co-ops should not be allowed to compete with other electric utilities because they have received government subsidies.

Leaving rural areas behind
Early efforts to electrify rural America met with little success. I0Us charged as much as $2,000 to $3,000 to hookup rural customers in the 1920s, and 1930s.

Few rural customers could afford the hookup fees, let alone the higher electric rates that were often charged to rural customers. Early federal efforts focused on providing incentives to private power companies to extend electric service to rural areas. Most I0Us, however, were satisfied to serve the much more lucrative urban areas, leaving the rural areas behind.

With the formation of the Rural Electrification Administration (REA) and the passage of the Rural Electrification Act, the federal government provided low-interest loans to promote rural electrification and provide technical assistance to form nonprofit electric cooperatives to serve rural areas ignored by the investor-owned utilities. These I0Us, however, were also eligible for low-interest loans, provided the funds were used to extend their service to rural areas not receiving central station electric service. Only a few private power companies took advantage of REA loans, including one North Dakota IOU.

Some I0Us now argue, however, that providing government assistance to electric cooperatives to serve rural areas gives the co-ops an unfair competitive advantage. Moreover, they claim that since some co-ops receive this assistance, they should be ineligible to serve any more densely populated areas. In short, they claim that once the co-ops accepted government assistance, they should have become ineligible to compete with "private enterprise." If this principle were applied to all businesses that ever received government assistance, there would be few businesses left to compete, including the I0Us themselves, which have received billions of dollars in benefits from investment tax credits and accelerated depreciation.

Here to serve

Let's look at the competitive playing field in the electric utility arena. Today, electric cooperatives continue to serve the most sparsely populated areas of the state. On average, electric cooperatives in North Dakota serve less than two customers per mile of power line. Even the most urban co-op serves only about five customers per mile of line.

By contrast, the I0Us serve about 24 customers per mile of line. Because it is so much more economical to spread infrastructure costs among 24 customers per mile than it is for two customers per mile, there continues to be a need to offer assistance to utilities that are willing to serve rural areas. The laws have not been willing to do this. Thus, the federal government provides loans and loan guarantees to co-ops to help build and maintain the capital-intensive electric infrastructure necessary to serve rural areas. These are not grants. They are loans paid back in full, often with interest at current market rates. Nevertheless, without such assistance it would be much more difficult to economically provide electricity to remote and sparsely populated rural areas.

Electric cooperatives do not apologize for accessing government programs that have helped bring affordable electricity to consumers in North Dakota and other rural states. Without such programs the task would have been much more difficult. *Because of a successful public-private partnership tens of thousands of North Dakotans have enjoyed a better quality of life, and our state is much stronger than it otherwise would be without affordable electric service for everyone*.

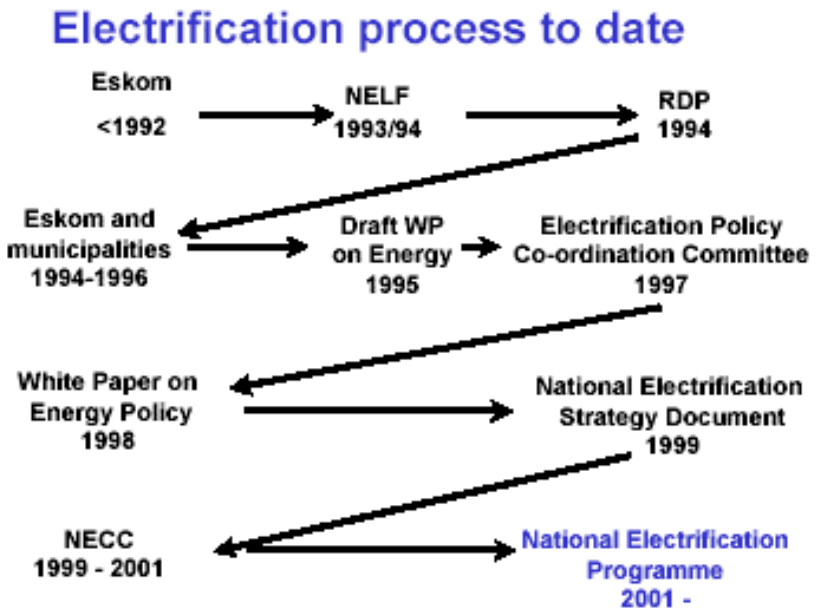
Source: North Dakota Association of Rural Electric Cooperatives, U.S.A.

3. Rural Electrification Master Plan

Motivations to proceed with rural electrification include the fact that electricity is considered a right of every citizen. Rural electrification is presented as a process by which energy is supplied to the rural population that is otherwise left out or behind the main economic stream. The inability of energy storage and the fluctuations in consumption during the day constitute two big restrictions that affect rural electrification. This necessitates the energy facilities to be designed with sufficient flexibility and capacity to meet the maximum demand for electricity. Furthermore, the wide range of consumption during the day time results in increased cost for operation and maintenance.

Given the mix successes of stand-alone rural electrification programs and the obvious relationship between rural energy supply and rural development, planning for rural electrification should be undertaken as a strategic process involving not only energy considerations but overall rural development issues. Income generating activities, farming, and local business development are all dependent upon the availability of reliable and affordable energy. Figure 2 illustrates the steps in the electrification process for the rural electrification program in South Africa. These steps led to the development of the National Electrification Program in South Africa in 2001.

Figure 2: The Road Towards a Comprehensive Electrification Program in South Africa



Source: National Electricity Regulator, South Africa

As part of the rural electrification master plan development process, planners need to consider a number of issues such as the overall objectives of rural electrification, role of the government, Approach for developing a Rural Electrification Program, rural electrification management and property issues, and financing rural electrification. A brief description of these issues is provided below.

3.1 Overall Objectives of Rural Electrification

The overall objective of all energy policies is to satisfy the significant energy requirements of a given country in an environmentally sound manner. There are four fundamental pillars that should define the basis for designing rural electrification policies and programs.

1. Promote and facilitate the investments
2. Promote competition in open energy markets
3. Protect the environment
4. Ensure social equity and justice

Of these four pillars, social equity and justice is most pronounced in the case of rural electrification. Availability of reliable and affordable energy to the rural population contributes to rural development in a number of ways including (i) increase in employment, productivity, and income generation, (ii) conservation of natural resources by introducing more efficient technologies, (iii) improvement in the quality of life by enabling essential services such as drinkable water, illumination and conservation of foods, (iv) health improvement, and (v) conservation of biodiversity.

Box 5 provides an example of a policy framework in Peru where there is no separate rural electrification strategy. Rural electrification, until recently, has been addressed as part of the overall electricity sector planning. However, as the energy sector in the country goes through privatization, the Government is planning for a separate rural electrification strategy. This is similar to the situation in Lesotho where the GOL is also proceeding toward the privatization of LEC.

Box 5: The Legal Framework and National Rural Electrification Strategies in Peru

The legal framework currently in force makes no distinction between rural electrification and the electricity business in urban areas. At the present time, the electricity business is divided into power generation, power transmission, and power distribution (this does not apply to ural electrification, unless the grid is

extended). The Electricity Concessions Law states that a concession is required to generate more than 10 MW, a permit is needed to generate between 0.5 and 10 MW, and that simply notifying the government is all that is required to generate less than 0.5 MW.

There is no law that specifically promotes rural electrification in Peru. During the 1970s when electricity companies were nationalized and ELECTROPERU was created, a rural electrification fund was established based on electricity taxes. This fund no longer exists. Since the 1990s, DEP, which operates as a special project within the Ministry of Energy and Mines (MEM), has been responsible for all energy projects, including rural electrification.

The development of a national strategy for rural electrification is considered necessary in an environment dominated by the privatization of the energy sector. The development of this strategy was beyond the scope of this ESMAP project and is instead being carried out by MEM/DEP under a Population and Human Resources Development (PHRD) grant. It should suffice here to note that an agency should be in charge of gathering and providing basic information on rural energy markets to potential investors, of overseeing the implementation of rural electrification projects, and of disseminating the experience of lessons learned through successful and unsuccessful approaches.

Source: ESMAP -- Report 238/01, February 2001

3.2 Role of the Government

Due to the relationship between major development policy objectives and rural electrification, it is an imperative to incorporate all key rural development issues in the design of a master plan for rural electrification. The Government clearly needs to take a lead in this process. However, extensive involvement of the broad stakeholder community and the consumer needs to be assured from the very beginning. The rural electrification program needs to be framed inside the National Program for Poverty Alleviation and its central objective should be to provide electric service to 100% of the rural population by a certain date.

3.3 Approach to Designing Rural Electrification Programs (REPs)

A new approach to developing REPs needs to be considered in order to cope with the problems observed and encountered in many developing countries included Lesotho. This new approach needs to focus on rural energy, not only rural electrification, and it should be based on local level plans with emphasis on productive activities. Teaming up with local entities as well as inducing private sector participation are crucial elements in this process. The new approach needs to be based on a rural energy strategy whose objective is to (i) guarantee the supply of energy for the rural population in a sustainable manner, (ii) help improve people's quality of life, and (iii) foster district economic development. The new approach should aim at changing the paradigm of rural electrification form *delivering electricity to the rural consumers* to *increasing the access of the rural poor to electricity-based services*.

The main elements of the rural energy strategy and master plan development should include (i) a strong focus on sustainability, (ii) local community participation in project development and implementation, (iii) the use of local resources, inter-agency coordination, follow up and evaluation activities, and (iv) the ultimate goal of creating a culture for energy. In order to implement such a strategy, several critical factors need to be taken into consideration, including cultural, social, political, economic, environmental and technological.

Stemming from this strategy, a plan of action with four stages needs to be considered. In the first stage a diagnostic assessment needs to be made to address key background requirements including (i) opportunities for productive activities and for application of renewable energies, (ii) evaluation of local resources, (iii) planning for future activities, (iv) selection of pilot projects, (v) identification of barriers to projects, and (vi) assuring financing for the next stages. The second stage includes the implementation of a number of pilot or demonstration projects. The third stage should include wide-scale replication of pilot projects including modifications to project designs and implementation approaches based on experience with initial projects. In the fourth and final stage the program should be consolidated and expanded to the whole country.

Designing rural electrification systems, even under the best of circumstances, is a complex task fraught with risks and uncertainties. Therefore, careful monitoring and evaluation is necessary to ensure that the REP is achieving the desired objectives. Also, the Government should develop certain results parameters to assess the success of the program. The following criteria could be useful:

- Consumer Satisfaction: The REP should incorporate socio-economic and socio-cultural characteristics of the consumer and the localities in the choice of technologies, selection of demonstration projects, and the development of implementation models.

- Effective Administration: The capacity of the Government institutions charged with the responsibility for the administration of the REP should be continuously enhanced.

- Consumer Protection: The Government should develop policies with respect to managing technology providers not through control of the market but by creating sufficient competition in order to provide the consumer both choice and protection.

- Promotion of Income generating Activities: In collaboration with the national Ministry of Rural Development and local development entities, the Government should explicitly support rural energy projects that promote income generating activities. This would improve the socioeconomic levels of consumers and generate more energy demand.

As an example, Box 6 discusses key elements of the innovative approaches to increasing rural electricity access developed in Guatemala. In 1998, Guatemala went through privatization of distribution with a mandatory requirement for increasing rural electricity access. The Government established a Trust Fund for facilitating rural electrification. This is similar to the planning being undertaken by the Government of Lesotho. The Trust Fund has been capitalized through a combination of funds including privatization receipts (US $107 million) and treasury bonds (US $51 million) with the balance being sought from other investors and donors including the Inter American Development Bank. The Government has established a Committee with membership from the Ministry of Energy, INDE, and Union Fenosa companies. This Committee approves the annual electrification plan and certifies the completion of all work.

Box 6: Innovative Approaches to RE Service Expansion: The Guatemala REP

Overview of Scheme

- 1998 – rural distribution privatized as 2 companies (DEOCSA and DEORSA), bought by Union Fenosa
- Privatization bundled with obligation to implement Rural Electrification Program (REP), covering distribution and transmission
- Distribution: Goal -- increase coverage from 64% ('99) to 90% ('04) i.e. additional 280,000 connections from '99-'04
- Fixed payment of $650 per new residential connection outside 200m-franchise zone.

Scheme Mechanics - Funding

- Trust Fund established to retain funds for the REP
- Fund constituted with privatization receipts ($107mn), treasury bonds ($51 mln), balance being sought (including from IDB)
- Technical Committee constituted of Ministry, INDE, Union Fenosa companies approves annual plan and certifies completion of works
- Funds held in Bank of New York

Scheme Implementation

- REP originally established detailed plan for connections – amendments required as list out of date
- UF/Government suggest substitute communities – informal process
- DEOCSA/DEORSA get 20% of cost up-front
- Independent Supervisors, hired by Fund, certify completion, eligibility of connections
- DEOCSA/DEORSA receive remaining 80% following acceptance by CT of Independent Supervisor reports

Results

- Distribution: 105,000 connections certified by Independent Supervisors by end '01 (75% target)
- Transmission: slower implementation with delays in obtaining right of way
- Disbursements from Fund (end Jan '02): $102 mln of which $62 mln distribution
- Total new residential connections end '01: 220,000 (some are for PER funding awaiting certification)

Assessment of PER

- Potential for political interference in plan but no sign of this having influence in practice
- Simplicity of approach and criteria have lead to relatively rapid implementation
- Actual costs of connection not clear: UF claims to make 7% profit
- Poor not explicitly targeted but most new connections seem to be low consumption (40-50 kWh/m)
- Govt. does not appear to have right to penalize UF for non-fulfillment of the connection targets – possible lacuna in contract

Design Issues

- Competition for funds
- Management of funds
- Targeting/selection of connections
- Structure of connection payment
- User contributions
- Interaction with tariffs for supply
- Interaction with more general obligations to supply

Conclusions

- Guatemala-type scheme can be useful tool in fast network rollout
- Design schemes with simple objectives, clear targeting/eligibility criteria: in particular, objective likely to be primarily network rollout rather than connecting the poor per se
- Delegate selection of connections within criteria to companies responsible for implementation
- Develop transparent monitoring and verification system, dedicated funding system and "apolitical" management.

Source: Clive Harris, PSAPP, June 2002

3.4 Rural Electrification Management and Property Issues

Organization is a key factor in the sustainability of rural electrification that typically involves a large number of isolated delivery systems. Existing management models fail to meet quality and efficiency standards. Although all aspects such as the legal framework, finance, and technology are minimum prerequisites for a sound REP, the choice of an appropriate management model to ensure program success proves to be

critical. Many models have been applied in different settings and the lesson learned is that no one model can be transported from one situation to another. In the case of Lesotho as well, a tailor-made management model will be necessary. The following three models contain elements that could, in some combination, be useful for designing a management model in Lesotho.

1. The first model focuses on a partial solution for rural electrification through privatization. Under this model, companies purchasing the power distribution utilities are required to commit to earmarking a part of the expenses for grid extension for the electrification of poor consumers in peri-urban and rural areas that are in close proximity to the grid. Typically, the privatized utility is provided some subsidy to undertake this mandatory requirement. This model, in the absence of any other schemes, addresses only grid-based expansion, and remote areas with dispersed load are left behind.

2. The second model is the creation of rural electric utilities in which all beneficiaries participate as shareholders. Typically, such utilities include extensive consumer participation through membership on the board. Such a model has been successfully implemented in Bangladesh (The REB/PBSs model) as a grid expansion electrification program.

3. The third model involves a privatization process, whereby the private companies are awarded concessions and are responsible for the operation and management of the distribution system under a scheme of subsidies for indefinite periods. This is the system currently used in Peru and other Latin American countries.

The other two elements of rural electrification -- distributed generation and mini grids and isolated individual systems -- require entirely different approaches for increasing rural electricity access.

3.5 Financing of Rural Electrification Program

There exist generally two types of rural areas without electricity (i) those within close proximity to the grid that can be reached through a grid extension program, and (ii) those that are far away from the grid in isolated remote areas and have a dispersed demand pattern. In these latter areas individual rural electricity delivery schemes need to be designed and implemented. Both the unit costs and the financing needs for these two types of consumers vary significantly.

Preliminary studies should identify the overall amount of financing needed to achieve the level of rural electrification desired by the Government. As part of the privatization study, Lesotho has already identified the number of consumers in the two categories -- those that can be reached through grid extension and those where individual systems will be needed. In addition, the Government has developed estimates for the total financing requirement to achieve 100 percent electrification in the country.

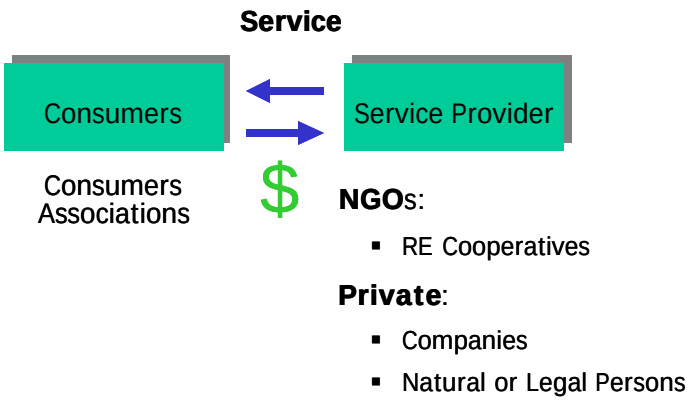
The financing of rural electrification, particularly the portion that will not be addressed by LEC as part of any mandatory requirements of privatization, will fall under the responsibility of the Government. As such, the Government is planning to establish a Rural Electrification Fund.

There are many examples of schemes for financing rural electrification around the world. All of them share one thing in common -- some form of subsidy. The need for subsidy in itself is not as undesirable as a misallocated subsidy maintained over a long time.

Regardless of the characteristics of a rural electrification fund and the type and nature of subsidy, the success of any fund depends on how it is administered. One specific element of this is the criteria and process that is used for identifying and selecting projects for financing and implementation. Any proposed rural electrification project needs to undergo a technical and economic evaluation before approval. This mandates the need for establishing a transparent approach to the selection of projects that not only meet the overall Government policy objectives but also ensures the success of the projects in terms of consumer satisfaction and rural development. In other words, the social benefits of the projects should also be estimated in addition to the economic benefits.

A typical simple approach to the administration, operation, and maintenance of rural electrification systems is illustrated in Figure 3. This approach is only illustrative and the Government of Lesotho will need to develop its own approach based on the unique rural electrification requirements in the country.

Figure 3: Administration of RE Projects after Implementation



4. National Rural Electrification Plan (NREP) for Lesotho

Given Lesotho's topography and many isolated rural areas, a geographical information system needs to be considered in order to support planning activities at the district level. As is the case with such systems, information on local energy resources, renewable energy technology, cost of and markets for renewable energy equipment, local infrastructure, local energy needs, etc. will also be required for comprehensive planning. Due to the low level of demand and the high dispersion of the rural population, rural electrification projects are often not profitable for the urban power distribution companies. This is also the case in Lesotho. Therefore, the Government needs to actively participate in the financing of rural electrification. Also, in order to achieve sustainability, the Government should invite private companies and consumer groups to be involved as partners in this process.

In order for this to succeed, however, there needs to be a national commitment to rural development and the role of rural electrification as an engine to that development process. Specifically, rural electrification should be considered an integral part of country development plans and strategies. The policy for rural electrification needs to ensure the following:

- Maintain the decision-making process as decentralized as possible in order to involve the community and the consumer in decisions. This will lead to greater consumer acceptance of Government plans.

- Widen the technological alternatives of the rural electrification, considering the local conditions and resources. This will provide the consumer the choice to make the best decision.

- Strengthen co-financing mechanisms that would results in investments that include contributions from the Government, the electric service companies and the consumers.

The following discussion focuses on certain basic principles that should guide the development and further elaboration of the National Rural Electrification Plan (NREP) in Lesotho. With the inclusion of these principles, the Government can have greater confidence in the success of the Plan.

1. Design rural energy supply schemes that provide the service required by the consumers based on their ability and willingness to pay.

2. Government contribution should go to finance a part (not all) of capital investments in electrification systems and the associated costs of administering of the REP. In addition, as integral elements of the REP, the Government should finance the costs associated with consumer awareness and outreach programs, institutional capacity building, and pilot demonstration projects. Ideally, private financing institutions, service providers, consumer groups, and

technology vendors should finance the bulk of capital costs of rural energy delivery projects.

3. The REP should not, in principal, provide for covering operation and maintenance costs. These should be covered by the users of the systems by means of paying the rate for electricity used.

4. To the extent possible, the Government should initiate a culture whereby the service providers and consumers become the owners and managers of rural schemes whereas the Government should develop and administer overall policy and the regulator should ensure sufficient competition and protect consumer interests.

5. Another important role for the Government is to favor the creation of conditions aimed at strengthening community organizations that can take on active responsibilities in energy service delivery.

6. A friendly environment should be established to encourage small IPPs and private investors to become involved in small generation and servicing companies.

In the case of off-grid rural energy schemes, the bulk of the likely needs in Lesotho, specific priorities need to be addressed without compromising the approach of least cost solutions. Specifically, the Government may wish to consider the following guidelines:

- Consider hybrid systems to reduce the local dependency on fossil fuels not available locally in order to diminish the cost of operation of the projects
- Promote PV systems for the isolated rural houses located far from the grid or off-grid systems as they require low maintenance and have longer lives
- Promote mini- and micro-hydro projects as they have proven to be reliable and economical and have resulted in greater consumer acceptance
- Maximize the use of local energy resources such as biomass in an environmentally sound manner

The geographical and cultural diversity that characterizes the rural areas in Lesotho, coupled with the Government's decentralization approach, may require the consideration of a strong REP organizational system at the local level. Such an approach will empower local communities thereby increasing the acceptance of the Government-sponsored rural electrification programs.

5. Rural Electrification Funds (REFs)

There is no single model for establishing and managing a rural electrification fund. However, in all countries with successful RE experience, the entity responsible for implementing the fund had a high degree of operating autonomy and accountability. The establishment of such a fund needs to consider new trends and successful patterns of RE financing. The following are some of the key considerations that should guide the establishment and operation of such a fund:

- Funds should be free of political interference and should be used only for the specific purpose for which they are established and no other purpose. This can be achieved through establishing full transparency and accountability by the fund managers to a board composed of public and private representatives. Alternatively, some form of a banking structure such as a local bank, a development bank or an international bank could be used.

- Governments should capitalize the fund adequately. Sources of funds for doing this are (i) privatization proceeds from the sale of shares of national power utilities, (ii) government bonds and budgets, (iii) multi- and bilateral donor financing, and (iv) commercial and private sector financing.

- It is generally advisable to keep the operational management of the fund outside of public administration. This is also necessary to ensure that commercial approaches are instituted in fund operations.

Other key factors that should be explicitly addressed include the following:

- *Use Competition for Funds:* Competition for subsidies can help minimize RE program costs and promote good customer service. This may be achieved by increasing the number of organizations that could access the fund.

- *Target subsidies:* Where resources are limited, selective targeting of subsidies is always preferable. By and large the people who do not have electricity connections are the poor and indigenous communities. The subsidy, based on the average cost of connections, may allow for an apparent average profit on each connection. Targeting subsidies to specific groups or locations, however, may complicate administration and planning. Initially, the Government may try to target subsidies, attaching to the RE plans a list of communities and the expected number of connections in each community. Linking payment of the subsidy to a measure of service or throughput would reduce the risk of poor service. It would also greatly increase the complexity and burden of monitoring.

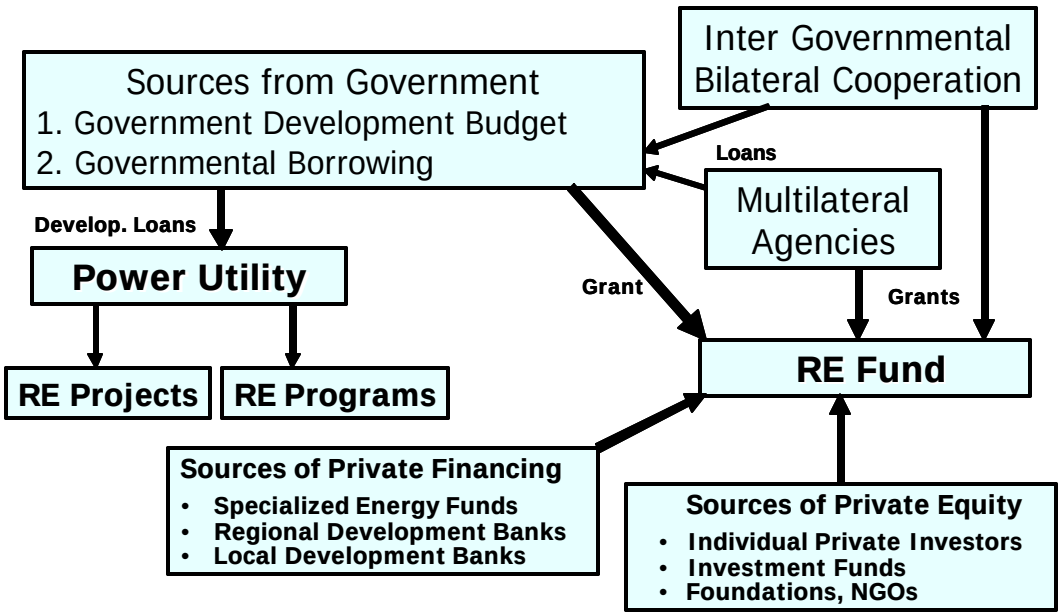
While connections are not a perfect measure, they do have the benefit of being easily verifiable and therefore useful.

- *Provide Incentives to the Private Sector:* Any incentives available to the private energy providers should be clearly articulated and well publicized. In addition, penalties for failing to complete the program should be included in all contracts awarded from the fund. For example, larger and more attractive subsidies may be provided to those providers that agree to connecting more distant communities and in especially poor sections of the rural population.

- *Covering the Cost of Service:* The regulator should ensure adequate level of competition for financing through the fund. Also, in the absence of a real market, the regulator should set prices that the consumers can be charged.

Figure 4 shows an illustration of how rural electrification financing is being organized in some countries. It also shows the relationship of the rural electrification fund to the government, donors, utility, and the private sector.

Figure 4: New trend and patterns of RE financing



The ownership structure of an RE Fund needs to be carefully designed in order to maximize the utility of the fund. While complete government ownership of such funds formally provides access to a variety of sources of finance, in practice most official sources of funds hesitate to support full government ownership of the RE Fund. Participation of private parties in the Fund's ownership enhances the credibility and attractiveness of the fund. Joint financing between public budgets and private sector

entities is becoming popular because of the flexibility it provides for sharing risks and mobilizing soft debts and equity finance. In identifying the sources of finance, the Government should focus on the following:

- Assume a flexible RE Fund ownership structure and integrate the interest of all major stakeholders in the RE Fund
- Assess the receptivity of multilateral agencies and regional and local development banks to the structure and purpose of the fund
- Approach bilateral donors as well as countries that can supply equipment and technical assistance to maximize fund capitalization and its broader appeal
- Check with equipment suppliers for their ability to provide soft trade or export financing
- Review the availability of specialized energy funds and explore the potential for capitalizing on these funds

In structuring the management and operations of the RE Fund the Government needs to consider the following:

- Provide for management and operation of the Fund along commercial lines and ensure that the policy objectives of the Government are incorporated into the process of fund operation. Provide for the implementation of internationally accepted standards and procedures. Develop and implement detailed operations procedures and manuals
- Provide for the participation of all major stakeholders in the decision making process, including local authorities, consumer associations, private sector and investors associations, and, as desired, the regulator and principal donors in the Fund
- Provide for open economic evaluation and competition in the process of financing project proposals and implement incentive/disincentive policies without exceptions and/or political interference

Determining the ownership structure is extensively intertwined with the design of the financing structure and management of the RE Fund. These items should be continuously modified through an iterative process through the implementation phase.

Community participation in any funds established with the sponsorship of the governments is not only desirable but should be a necessary condition. All too often the structures of government funds do not involve community representatives and, thus, lack the necessary credibility. Also, they are unable to meet the community needs as a

lack of participation by the community limits the fund managers to have a keen sense of the community needs.

Box 7 provides an example of an excellent project in Lesotho that has maximized community participation at all levels. The Lesotho Fund for Community Development is managed by a Board that includes members of the community, the private sector and the NGO community.

Box 7: Community Participation in Lesotho

The government has reformulated the Lesotho Highlands Revenue Fund. The new fund, the Lesotho Fund for Community Development (LFCD) shall be demand-driven and shall finance projects that have been identified and prioritized by communities. A legal notice establishing the Fund was announced in 1999. An Operations Manual outlining the principles and operational procedures of the LFCD has been prepared. This was based on feed back from a series of consultations with stakeholders, which were carried out at central, district and village levels. A Board has since been established to set policies for the Fund. It is composed of representatives of communities, government, non-governmental organizations and the private sector. The LFCD is decentralized and has district and regional offices.

Whilst the lowland districts have regional offices, the poor mountain areas have district offices. The purpose was to bring services close to poor communities and create employment in these regions.

Source: Interim PRSP for Lesotho, IMF, 2000

Box 8 provides a summary of another interesting example in South Africa. The Local Government Electrification Fund in South Africa was created to assist Local Governments in defraying the cost of electrification. Two interesting points to note in the management of this Fund are (i) the Fund is being managed by the national regulator not the Government of South Africa, and (ii) an external Electrification Funding Evaluation Committee (EEFEC), a committee comprising members representing the Department of Minerals and Energy, the regulator, South African Local Government Association (SALGA), the Development Bank of Southern Africa (DBSA) and Eskom has the sole authority to approve all projects selected to be financed under the Fund.

Box 8: South Africa -- Local Government Electrification Fund

South African Government, through its Department of Minerals and Energy, has mandated the South Africa National Electricity Regulator (NER) to manage and administer this fund. The fund was created to assist Local Governments in defraying the cost of electrification. The criteria for allocations and the ranking of projects in accordance with demographics and needs in the respective provinces are done by the External Electrification Funding Evaluation Committee (EEFEC) a committee comprising members representing the Department of Minerals and Energy, the NER, South African Local Government Association (SALGA), the Development Bank of Southern Africa (DBSA) and Eskom. The EEFEC submits its recommendations for the allocation of funding to electrification projects to the NER Board for approval.

General Criteria

- Preference is given to Presidential focus areas to support and enhance other infrastructure development in an area, with special attention to rural and semi-urban projects in the respective provinces.

- Projects with existing formal and/or informal housing receive higher priority compared to projects where houses still had to be built.
- Ample credit given to municipalities that had a sound track record with electrification and those who could demonstrate that they had the capacity to complete their projects within the one year time span.
- Projects are limited to ensure that no single project was allocated funds for more than 2000 connections. The intention is to spread the available funds as widely as possible to maximize the benefits to a larger number of communities.
- The allocation amount per connection would be limited to Rs 2430 per connection with the same objective as in the previous indent.
- The projects would be ranked per province from the smallest capex per connection upwards.
- The biggest project in connection numbers per applicant would be ranked secondly.
- Allowance would be made to treat the municipalities within metros separately to avoid metros being regarded as one applicant to the detriment of the various municipalities within a metro.
- Care would be exercised to ensure that each qualifying applicant would be assisted with at least one project.
- Disqualification and penalization criteria would be applied in the following ranked order:

    - ✓ projects that are not for new connections.
    - ✓ the Local Government is not licensed for the specific area.
    - ✓ the relevant Local Government experiences serious problems to pay its bulk account to Eskom.
    - ✓ the Local Government has a history of poor performance in respect of electrification or electricity supply.
    - ✓ the Local Government applies electricity tariffs that were not approved by the NER.

In addition to the above criteria, the EEFEC decided to take into consideration the real needs of the respective provinces and to make provision for these when allocating funds.

Source: South Africa National Electricity Regulator, 2002, Adopted

6. National Rural Electrification Fund (NREF) in Lesotho

During the fact-finding mission to Lesotho the Government shared its strategy for rural electrification with representatives of CORE International. The Government has embarked upon a serious power sector reform process and has closely worked with LEC which has turned around the performance of LEC through a management contract. The Government considers wide-scale electrification as a priority and as a driver to the country's economic and social sustainable development. There exists a strong political commitment towards electrification and at the same time people have high expectations regarding electrification.

Based on our discussions with the Government and a review of the Draft Regulations for National Rural Electrification Fund in Lesotho it is clear that the Government has made significant headway in planning a sound rural electrification strategy for the country. The following are a few of the initial impressions of the NREF which will be discussed in more detail during the workshop.

- In order to ensure transparency, equality, and accountability, as well as to be able to attract donors' support and participation, the Fund will need to be managed and operated along commercial lines with full transparency and accountability. This does not prevent the Government from exercising its legitimate role of policy making, strategy development and supervision through adequate participation in the Board.

- Rules and procedures for the management and administration of the Fund should be based on widely accepted international best practices. This can be achieved by the Government through seeking donor input and outside input from consumer groups and other private sector entities in Lesotho. Such a process will help the Government in developing practical and rational procedures and rules for the design and implementation of the Fund.

- In order to facilitate least cost electrification, it may be important to provide for an open Fund to all entities that will meet the eligibility criteria established by the Board of the Fund. The Government will need to address the issue of LEC's participation in the Fund depending upon the status of the LEC (state-owned utility or a privatized utility). For example, if LEC continues to remain as a state-owned utility will it be allowed to participate in the Fund to bid for off-grid electrification projects.

- It might be appropriate to allow the Fund to provide financing for electrification of LEC service areas if the Government policy will be to advance electrification

faster than anticipated and LEC will be not able to finance such investments from its internal revenues alone.

- Ministry of Natural Resources (MNR) and, to some extent the Regulatory Authority, should be assigned a wider role and undertake greater responsibility for and authority on the Fund in terms of policy implementation, Board members' appointment, and Fund management supervision. It needs to be clear that energy policy making, strategy development, and supervision of Fund implementation are the responsibilities of Ministry of Natural Resources and the Department of Energy.

- It may be that the Fund would need to be established by a Government Decree. Under this approach, the Fund would act as legal independent public entity. The Government needs to clearly provide for contribution into the Fund through its Budget. A part of the privatization proceeds from the sale of LEC may be dedicated to the Fund as well.

- The Board of the Fund should exercise supervisory authorities and policy functions and shift the day-to-day operation and management in the hands of a "Fund Director/Manager". This should be accomplished through the adaptation of internationally accepted rules and procedures for fund operations and management.

7. Role of Stakeholders (Private Sector, NGOs, ESCOs, Local Governments)

Many rural electrification programs are run by a single institution, usually the state-owned electric utility which supplies power to both urban and rural areas. The utility, which seeks to provide all customers with similar levels of service, is responsible for planning all rural electrification programs. In urban areas, this model has worked well. In rural areas, however, it is often unworkable because most rural electrification programs center on grid extension, which is only one option among many that can meet the energy needs of rural populations.

RE projects need to be implemented with the active involvement of supporting government and private sector entities such as line ministry departments, banks, training and research centers, women and youth councils, as well as NGOs, national NGO federations, and small development-oriented organizations.

7.1 of Private Sector in RE

Private participation in financing, construction, operation and maintenance of rural energy services systems should serve the following purposes:

- Participate in the expansion of the RE infrastructure stock at lower costs

- Introduce greater efficiency in the construction and operation of systems

- Provide better quality services with the benefits of competition being passed on to the consumer

- Allocate risks according to the level of mitigation control for each party involved in the RE processFill in funding gaps to complement funds provided by the public budget

The principal advantages of private participation include (i) increased efficiency, and (ii) iimproved quality and reliability of service and improved and enhanced common social services such as health, education, etc. In addition, private initiative lowers costs, improves service efficiency, and very likely reduces capital and operational costs.

Box 9 provides a very good example of a solar project in Lesotho that is being implemented by a private entity. It has installed solar systems in all the districts of Lesotho, including the remote mountain areas. It designs and installs PV or solar electric systems for lighting, radio, TV, satellite dishes, sewing machines, computers, radio communications and street lamps for private homes, schools and clinics. This program needs more support in order to increase its coverage. It has already demonstrated cost recovery and consumer satisfaction, two complex challenges in rural electrification.

Box 9 Solar Energy Services in Lesotho -- The Case of Solar Matla Lesotho (Pty) Ltd.

Solar Matla Lesotho (Pty) Ltd. is a company registered in Lesotho, which has been operating since 1989. It represents the Solar business of the longest standing in Lesotho, and one of the oldest in the region. It has installed Solar Systems in all the districts of Lesotho, including the remote mountain areas. It designs and installs PV or Solar Electric Systems for Lighting, Radio, TV, Satellite Dishes, Sewing Machines, Computers, Radio Communications and Street Lamps for Private Homes, Schools and Clinics. It has developed a method of theft prevention for PV Panels. All the Systems are guaranteed and installed in accordance with the "Photovoltaic Code of Practice" and "Technical Standards" for Lesotho which was written in 1996. Over the years, Solar Electric Water Pumping Systems have been installed for Private Homes, Schools, Clinics and Villages, including one of the biggest in the region,

Solar Matla Lesotho (Pty) Ltd installs the indirect type of Solar Water Heaters, which are appropriate for the severe climatic conditions in Lesotho - frost, hail, and hard water. They are durable and have a 3 year guarantee from the manufacturer. These have been installed for Private Homes, Community Projects, Clinics and Missions. It demonstrates and promotes the use of Solar Cookers and have attended various exhibitions over the years.

Solar Matla Lesotho (Pty) Ltd deploys its systems by offering a credit system

for its customers. It has operated with a slow but steady growth over the years. By early 1998 it has expanded to 3 installation teams. Solar Matla Lesotho (Pty) Ltd is a founder member of LESES, Lesotho Solar Energy Society. It conducts Photovoltaic Training Workshops for technical instructors in Lesotho. This is Sustainable Development in the true sense of the words, and Solar Matla Lesotho (Pty) Ltd continues with its Quest to serve Lesotho.
Source: Adopted based on Solar Matla Lesotho (Pty) Ltd. Brochures, 2003

Private participation in the power sector may be introduced in three main ways:

- By divestiture of state ownership through sale of shares in power companies, or sale of their assets such as generating plants and distribution systems,
- By concessions for the use of state-owned assets by private operators,
- By encouraging investment in green-field projects, as Independent Power Projects (IPPs), and
- Leases, management contracts and service contracts.

Privatization options and their features are shown in the Figure 5.

Figure 5: Privatization Options and Features

Option	Asset ownership	Operations & Maintenance	Capital investment	Commercial risk	Typical duration (years)
Service contract	Public	Shared	Public	Public	1-2
Management contract	Public	Private	Public	Public	3-5
Lease	Public	Private	Public	Shared	8-15
Concession	Public	Private	Private	Private	25-30
Build-operate-transfer (BOT)	Shared	Private	Private	Private	20-30
Divestiture	Private	Private	Private	Private	++

Source: Neil Roger, The World Bank

Private sector institutional participation may be achieved through a consultative committee and by extensive stakeholder meetings. The consultative committee should develop a plan for private sector participation in rural electrification and make specific recommendations to the Government designed to enhance private participation.

The consultative committee can assist and support the decision-making bodies in meeting their objectives in the areas such as (i) promoting RE infrastructure projects, especially those with a major development impact, (ii) providing overall follow-up and monitoring of projects intended to involve the private sector, (iii) publishing and distributing information on private participation policy for rural electrification, (iv) identifying potential private investors and operators, and (v) sponsoring public awareness and outreach activities.

7.2 Role of NGOs

A local NGO or a government agency, or a partnership of both, can be an effective channel for implementing rural electrification projects. NGOs with experience at the grassroots level might be more suitable than government departments as agents of rural energy delivery. Experience confirms that NGOs usually have closer ties with the consumer and are less hierarchical and bureaucratic which enables them to provide services more efficiently and with greater consumer satisfaction.

The local NGOs play a vital role in educating and persuading the rural poor to effectively participate in rural programs. NGOs carry out community mobilization in order to mobilize local resources and skills and experience for implementing energy service delivery. They can assist the rural consumer to actively contribute to activities in areas such as community forest management, environment, health, income generation, infrastructure and development of institutions at the grassroots level for poverty alleviation. NGOs also provide training and educate people through sensitizing them on various issues.

NGOs have shown remarkable success worldwide in the rural sector. They are especially geared to act as successful agents of outreach and consumer acceptance as they are viewed by the rural population as independent. They can be very instrumental in a number of ways: (i) recognizing the importance of energy to household, community development, and income generation, (ii) identifying the need for energy on the top of the priority list of the rural consumer, and (iii) helping in the emergence of rural poor groups to have a say in rural development planning and implementation.

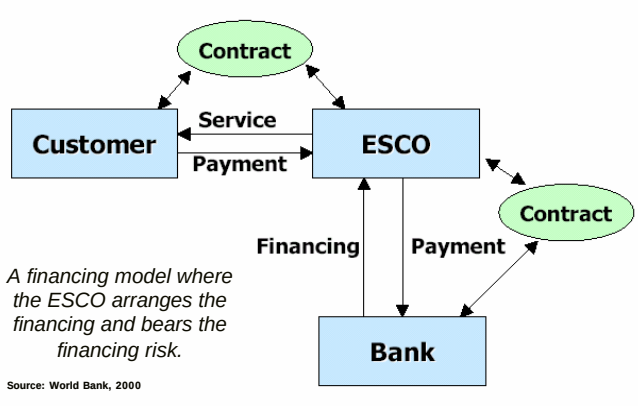
7.3 Role of ESCOs as Rural Energy Providers

The ESCO business is customer-focused and project-based. This business is about finding, developing, and implementing projects in customer's facilities that benefit the customer by reducing energy costs and are profitable to the ESCO. It is focused on finding solutions to customer problems, not on deploying technology. Access to customer decision-makers is vital to this business. Finding finance for the projects is also an essential part of the ESCO business. The individual ESCO business is shaped by its projects. The projects define the business in terms of sectors served and actions implemented.

ESCOs can serve as alternative financing agents and bridge the gap between the consumer and traditional sources of financing. There are two basic financing models

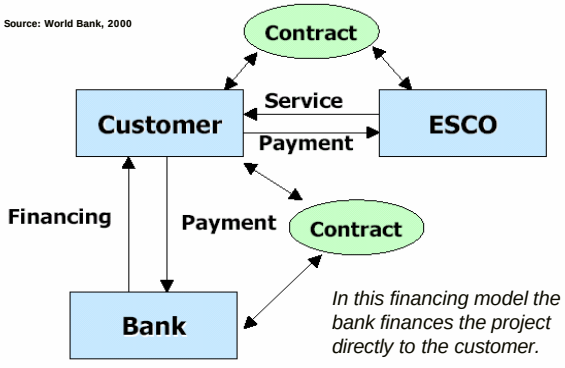
applicable to ESCOs as shown in Figure 6 and Figure 7. Under the first model, a bank provides the necessary project financing to the ESCO via a loan, the ESCO provides the service via a performance contract, the customer pays the ESCO if the project meets its performance standards, and the ESCO repays the bank for the project loan. The ability of the ESCO to bring financing to the deal enhances the role of the ESCO and its desirability for financing rural electrification projects at the individual consumer level.

Figure 6: Bank Provides Loan to ESCO



The second model features two contracts by the customer: an energy performance contract with the ESCO and a project finance loan with the bank. In this model it is the customer who is responsible for repaying the project loan not the ESCO. Consumer gets the loan from a bank and requires adequate creditworthiness guaranteeing the payback of the loan. If the project doesn't succeed the ESCO has to pay the customer which is agreed to in the performance contract.

Figure 7: Bank Provides Loan to Consumer



7.4 Role of Local Governments and Community Participation

Decentralization of power and empowerment of local government and communities are important components of democratic functioning and extension of democracy to the grassroots level. Community participation in the development process at the local level directs the bias of development towards local problems and the local poor. There are two aspects of empowerment. One is political power delegated to local bodies through appropriate legislation. The other and an equally important aspect of empowerment is the devolution of financial resources through the national budgeting process

Box 10 provides an example of a decentralized rural energy planning project in Nepal. The project is based on the principle that community mobilization is the key for sensitizing and mobilizing the community for planning, implementing, operating and managing rural energy systems. The community mobilization process is based on six basic principles: organization development, skill enhancement, capital formation, technology promotion, women empowerment and environment management

Box 10: Decentralized Rural Energy Planning in Nepal -- Rural Energy Development Program (REDP)

The traditional approach to energy development is characterized by external agencies determining the suitability of selected technologies to the beneficiary population in rural areas. Therefore the typical rural energy planning begins with the assessment of available energy technologies and then proceeds to implement these technologies. This gives little or no flexibility to adjust the program according to the local situation, the users' needs and preferences. Furthermore, the beneficiary community members do not participate in the planning and implementation phases of the project. Therefore, the beneficiaries are neither able to build up their capability to operate and manage the system nor do they develop a sense of ownership towards the scheme. Consequently, technological successes are limited, with most technologies being rejected by the users. Furthermore, because of insufficient follow-ups the project is abandoned once the 'project targets' are met.

REDP has adopted a different approach for effective rural energy planning. In this approach:

- Community mobilization is the basis for sensitizing and mobilizing the community for planning, implementing, operating and managing rural energy systems. The community mobilization process is based on six basic principles, viz. organization development, skill enhancement, capital formation, technology promotion, women' empowerment and environment management.
- Planning is based on what the communities feel they need.
- Project identification is done through a local participatory approach.
- The rural energy needs are met by matching energy resources (technically, socially, economically and environmentally) with energy technologies.

REDP has implemented this approach when supporting the DDCs in the program districts to formulate their district energy development plans and program. This

energy planning process forms an integral and important part of the DDC's district planning process.

RE programs and projects are more likely to be viable and sustainable if local stakeholders are involved in their design and implementation. One way to approach this is to set up a Rural Electrification Committee to help assess the level of demand, educate consumers, and promote wider use of electricity. In some cases the community may make contributions of capital or labor, thereby helping to defray the costs of the program. The establishment of appropriate institutional and organizational procedures for project planning, financing, procurement of goods and construction services is very important for the successful implementation of RE projects involving small communities. An adopted version of US Rural Electricity Cooperatives - a distribution system based on member-owned rural electric cooperatives - has been successfully used in other countries, most notably, in Bangladesh.

8. Role of the Regulator -- Regulatory Frameworks

If the private sector and NGOs are to assume greater responsibility for planning and implementing rural electrification projects, they will need a transparent, enabling institutional and regulatory framework. Governments should ensure fair, and not overly restrictive, credit laws and regulations. Governments can also help develop appropriate technical standards, encourage a diversity of rural electricity service providers, assume responsibility for monitoring and oversight, and disseminate information. In more details these functions are as follows:

Setting Technical Standards: Baseline quality and safety standards can be used by the implementing organizations that procure systems, by the financial institutions that appraise loans, by local equipment suppliers, and by solar home system users in making their purchases.

Encouraging a Diversity of Service Providers: In some countries, regulations governing rural electrification programs effectively rule out service providers other than the public electrical utility. If a PV market is to develop, such restrictions must be lifted.

Providing Monitoring and Oversight and Information Dissemination: Monitoring and oversight of RE programs are important to gauge progress and to identify successful practices to replicate elsewhere. Governments should collect and disseminate such information and promote RET technology (but not specific products). These functions are especially important in new markets in which the private sector is weak.

The Regulator in various cases may need to catalyze the consideration of issues such as (i) electricity concessions rather than simple and investor friendly legislation, (ii) minimum guidelines concerning tariffs for isolated rural areas, which could be used as points of reference for private investors or in the management of services, (iii) exemption of very small rural energy service companies from certain taxes, as is the

practice with other ventures with small incomes, and (iv) legal standards regarding property and taxes, tariffs, sale of energy to the grid, etc.

Box 11 provides some guidance on basic practices for regulating off-grid rural electricity systems.

Box 11: Best Practice for Regulation of Off-Grid Systems

- Regulation should aim to produce a structure of incentives that result in the needs of consumers being met most cost-effectively. It should be technologically neutral, and at costs that are in keeping with the scale of the investment and the ability of the various parties to pay.
- Regulation should be transparent, stable and free from arbitrary political interference so as to foster competition between suppliers of technology, services and finance.
- Regulation should set standards that are appropriate to the project cost and the ability of the various actors to pay.
- Quality and safety standards should be enforced to prevent the users being exploited by shoddy equipment and installations.
- Regulations should be set so that: independent power producers can supply power to the grid at 'realistic' prices; and connection standards are appropriate for the power to be sold. Rules should be transparent and stable.

Source:http://www.itdg.org/html/energy/docs/bestpractsynthe.pdf, adopted, 2002

One of the key functions of the regulator is to approve tariffs. The designing of a rational system of cost recovery is of great importance. It should take into account capital investment costs, level of local contribution, number and density of consumers, likely demand for electricity, the willingness to pay, and payment capability of the population. The new tariff regime should ensure that RE programs are financially sustainable and will not drain operational resources.

Box 12 provides a discussion of the best practices for setting tariffs for off-grid electricity systems.

When people are poor and the provision of electricity is so expensive that rural households cannot afford it, rural electrification subsidies will be required for a time. The tariff structure needs to ensure that any subsidies are targeted, fair, equitable, and sustainable. Successful subsidy programs should encourage the rural electrification business. A portion of the capital investment may be subsidized, obtained at concessionary rates, or as a government/donor grant. Experience shows that subsidies

should be avoided for operating costs. A low lifeline tariff is acceptable on income redistribution grounds.

Box 12: Best practice and Tariff Setting for Off-Grid Systems

- The financial performance of off-grid systems can be improved if the average tariff is kept in line with local inflation.
- Life line tariffs under which the richer consumers cross subsidize households that cannot pay spread the poverty reducing benefits of of-grid systems - as long as the total revenue is adequate.
- While there is clear evidence that demand is sensitive to the tariff charged (many potential users may be excluded by full cost covering tariffs in many locations), there is also evidence that the ability of some people to pay is higher than originally thought.

Source: http://www.itdg.org/html/energy/docs/bestpractsynthe.pdf, adopted, 2002

Subsidizing part of the capital investment should not be hard to justify considering that investment in rural electrification contributes to development in terms not only of the opportunity to generate more income but also of the different social benefits such as education, healthcare, communications, integration, and so on. Any subsidies, however, should be minimal and well targeted. Small projects in isolated areas have higher specific costs associated with identification, feasibility studies, and operator training. If these tasks are carried out well, a considerable drop in overall costs and consequently greater sustainability could be achieved. For communities or local entrepreneurs who might otherwise be able and willing to finance a large part of the investment costs, it would make a big difference if these "set-up" costs were financed by the government.

Box 13 provides some guidelines for subsidies for off-grid systems.

Box 13: Best Practice for Smarter Subsidies for Off-Grid Systems

- Subsidies should be designed to achieve clearly stated objectives and should develop rather than destroy markets.
- A particular problem with current subsidies provided by bilateral donors is that they have a tendency to 'pollute the market environment' - that is, they use their subsidies to spoil the market for others.
- Smart subsidies should:
  - follow pre-established rules that are clear, and transparent to all parties;
  - focus on increasing access by lowering the initial costs (technical advice, capital investment) rather than lowering the operating costs;

- Provide strong cost minimization incentives such as retaining the commercial orientation to reduce costs;
- remain technologically neutral;
- cover all aspects of the project including end-use investments, particularly to encourage pro-poor end-uses; and
- use 'cross subsidies' within the project to pay for life line tariffs and other 'pro-poor' recurrent cost subsidies (e.g. enable transfer from richer sections of the community, and commercial users to marginal connections).

Source: http://www.itdg.org/html/energy/docs/bestpractsynthe.pdf, adopted, 2002

Argentina, for example, has pioneered the use of concessions coupled with subsidy schemes for the provision of electricity in rural areas as a way to both provide energy services to rural areas and stimulate domestic PV sales. Box 14 provides a summary of the Argentina approach to subsidizing rural electrification.

Box 14: Subsidy and Concession for Rural Electricity: Argentina's Approach

As part of the electric utility privatization process in Argentina, provincial governments are bidding out concessions for the provision of electricity in rural areas where there is no grid power.

So far, two provinces - Salta Province and Jujuy Province - have sold rural concessions to bidders who also purchased the on-grid power concession. The private utilities are now starting to provide electricity, mainly with solar PV home systems, to the unserved populations. They charge the households for the electricity in the same manner as they would charge on-grid customers-that is, the households do not enter into loan or lease agreements, but pay a monthly fee to the utility for the electricity for as long as they have the systems. The utilities own the PV systems and are responsible for all maintenance.

In order to accelerate the establishment of the program and give the utility some operating experience, the government of Salta Province is guaranteeing that it will purchase 450 PV systems from the utility for various public facilities. The government in Jujuy Province has established a *fund to subsidize* modestly each PV installation, thereby keeping monthly consumer fees down while allowing an adequate return for the utility. It is not clear whether this subsidy approach will be sustainable.

So far, there is insufficient operating experience to gauge how well the rural concession approach is working. Nonetheless, other countries, most notably Brazil, are already preparing to implement some variation on it. One of the potential problems is that even though the program is being run by private institutions, the provincial governments have a strong regulatory role. It may be reasonable for a provincial government that regulates on-grid retail tariffs to also set the off-grid tariffs and specify minimum quality and service standards. However, a problem arises that if the tariff is set too low, the utility will earn an insufficient return and will not adequately promote, market, or service the PV systems. This problem is already materializing in Argentina's Salta Province.

Source: Michael Philips, "Accelerating PV Markets in Developing Countries", USA

ANNEXES

Annex I: Selected Reference Materials

RURAL ELECTRIFICATION IN THE DEVELOPING WORLD: LESSONS FROM SUCCESSFUL PROGRAMS

B*y: Douglas Barnes and Gerald Foley*

The pace of rural electrification over much of the developing world is painfully slow. In many African and South Asian countries, it is even lower than rural population growth.

Well-publicized reports on the problems of some programs are also leading to increasing wariness about rural electrification among energy policy makers. The highly subsidized Indian program, for example, has drained the resources of many of the state power companies, with highly damaging effects on their overall performance and quality of service.

Rural electrification programs can undoubtedly face major obstacles. The low population densities in rural areas result in high capital and operating costs for electricity companies. Consumers are often poor and their electricity consumption low. Politicians interfere with the orderly planning and running of programs, insisting on favored constituents being connected first and preventing the disconnection of people not paying their bills. Local communities and individual farmers may cause difficulties over rights of way for the construction and maintenance of electricity lines.

Yet in spite of these problems, many countries have been quietly and successfully providing electricity to their rural areas. In Thailand, over 80 percent of rural people has a supply. In Costa Rica, cooperatives and the government electricity utility provide electricity to almost 95 percent of the rural population. In Tunisia, 75 percent of rural households already has a supply and the national electricity company confidently expects the proportion to rise to well over 80 percent by the year 2001.

The World Bank is carrying out a series of case studies to identify the crucial factors determining the success of such programs. Certain clear lessons are already emerging. Some reinforce what is already well-known, but others run counter to much of the conventional wisdom. There is no doubt that applying these lessons to future programs will bring a significant increase in the rate of rural electrification and the provision of significant and sustainable benefits to increasing numbers of rural people.

Setting up effective institutional structures

Large scale grid-based rural electrification is a relatively complex business and an effective implementing agency is one of its most basic requirements. The exact institutional structure, however, does not appear to be critical, as a variety of approaches have been successful. They include a separate rural electrification authority (Bangladesh); setting up rural electric cooperatives (Costa Rica); allocating rural

electrification to a department of the national distribution company (Thailand); or delegating it to the regional offices of the utility (Tunisia).

Although no one institutional model appears unquestionably superior, there are common factors between those which have worked well. A high degree of operating autonomy--in which the implementing agency can pursue rural electrification as its primary objective--seems to be essential. But with autonomy must come responsibility as well. A typical example was Ireland, where the rural electrification agency had its own budget and control over access to materials and labor, and worked to its own realistically drawn up and costed plans, but it also was strictly accountable for meeting its targets.

Less tangible but even more important, experience shows that implementing agencies need dynamic leadership with a capacity to motivate staff and bring a sense of dedication to the task of rural electrification. In Thailand and other countries with successful programs, the extent to which the staff of the implementing agencies felt they were laying the foundation for the development and advancement of their country is notable. A sense of security and clear career prospects within the implementing agency can contribute significantly to the build-up of such attitudes among staff.

Dealing with the political dimension

The use of public funds for rural electrification often leads to political interference at national and local levels. The politicians regard public funding as giving them rights to interfere, but experience shows that nothing is more damaging.

Once technical and financial decision-making in the implementing agency becomes based on political string-pulling, professional discipline is destroyed and the organizational structure is undermined. Waste of resources, low staff morale and operational ineffectiveness are the characteristics of rural electrification programs suffering from a high degree of political interference.

Sometimes this can be turned into a positive force as in Thailand where local politicians were encourage to raise and contribute funds, so that their constituents could receive electricity before the planned time. It is even more important to ensure that rural electrification planning is open and objective. Successful programs use clearly defined criteria to rank areas in order of priority for electrification, so that the decision-making is clearly seen by all to be fair.

Criteria for rural electrification

Countless failed initiatives show the futility of premature rural electrification. Providing an electricity supply will only make a significant contribution to sustainable rural development when the other necessary conditions are present.

Security of land tenure, availability of agricultural inputs, access to health and education services, reliable water supplies, and adequate dwellings are among the more obvious of these conditions. If farmers are to invest in increased agricultural production they must have access to markets where they can obtain fair prices for their higher outputs. Families must have a level of disposable income which allows them to place improved lighting, and ownership of TVs and other electricity-using appliances among their expenditure priorities before they will pay for a supply.

Successful rural electrification programs have all developed their own system for ranking or prioritizing areas for obtaining a supply. Capital investment costs, level of local contributions, numbers and density of consumers, and the likely demand for electricity are among the factors normally taken into account. In Costa Rica, the ranking of communities was based on their population density, level of commercial development, and potential electricity load. Thailand developed a numerical ranking system taking account of a variety of factors such as level of income, the number of existing commercial enterprises, and the government's plans for other infrastructural investments in the area.

Importance of cost recovery

Cost recovery is probably the single most important factor determining the long-term effectiveness of rural electrification programs. When cost recovery is pursued, most of the other program elements fall easily into place. All the successful programs reviewed in the case studies placed a strong emphasis on covering their costs, though there is a wide variation in how it was approached.

In contrast, electricity supply organizations depending on operational subsidies are critically vulnerable to any downturn in their availability. When the subsidy is reduced, as inevitably happens, the virtue of increased sales turns into the vice of greater losses, creating a significant disincentive to extend electricity to new customers, especially poor people. The contradictory signals to management make proper running of the organization impossible.

In Kenya, for example, where the rural electrification program depends on the availability of grant funds from donors, progress has been slow and intermittent. In Malawi, the state electricity company states flatly that it has no interest in rural electrification, because electricity prices, by government order, are too low to cover even operating costs.

Capital investment subsidies raise different questions. In most successful programs, a substantial proportion of the capital has been obtained at concessionary rates or in the form of grants; at commercial rates of return a substantial proportion of the rural areas in would never be electrified. The program in Costa Rica started with low interest loans from USAID. In Ireland, a proportion of the investment costs, which varied depending on the state of the national exchequer, were covered by government grants.

Provided it is used wisely, and operating costs are covered, having access to such concessionary capital need have no ill-effects on the implementing agency or the rural electrification program. But concessionary capital should never be provided to organizations which are not covering their operating and maintenance costs; it will simply worsen their financial position.

Charging the right price for electricity

There is a widespread belief that electricity tariffs need to be extremely low, often well below their true supply costs, if rural electrification is to benefit rural people. The facts do not support this.

Rural electrification only makes sense in areas where there is already a demand for electricity-using services such as lighting, television, refrigeration and motive power. In the absence of a grid supply, these services are obtained by spending money on kerosene, LPG, dry-cell batteries, car battery recharging and small power units, all of which are highly expensive per unit of electricity supplied. Recent surveys in regions without electricity in Uganda and Laos indicate that people spend approximately 5 dollars per month on these energy sources. Private suppliers often find a ready market for electricity at more than one US dollar per kilowatt hour.

Rural electrification tariffs set at realistic levels do not prevent people making significant savings in their energy costs, as well as obtaining a vastly improved service. Charging the right price allows the electricity company to provide an electricity supply in an effective, reliable, and sustainable manner to an increasing number of satisfied consumers. In Costa Rica, the price of electricity is set through a regulatory process, but it is high enough for the cooperatives to make a modest profit. In 1996, the price for residential electricity starts with a fixed charge of USD 2.59 for the first 30 kilowatt hours of service, and increases steadily to over 25 cents a kilowatt hour for people consuming over 150 kilowatt hours of electricity per month. This also focuses the attention of the electricity company on consumer service and the need to provide value for the price it charges.

Lowering the barriers to obtaining a supply

The initial connection charges demanded by the utility are often a far greater barrier to rural families than the monthly electricity bill. Reducing these charges, or spreading them over a several years, even if it means charging more per unit of electricity, allows larger numbers of low income rural families to obtain an supply.

In Bolivia, for example, a small local grid, in spite charging 25 to 30 cents per kilowatt hour, immediately doubled its number of consumers when it offered them the option of paying for the connection cost over 5 years. By contrast, in Malawi where the electricity company charges the full 30 year cost of line extension to new customers, the rural electrification rate is just 2 percent.

Benefits of community involvement

Traditional thinking in many utilities is often oblivious to the importance of local community involvement. Rural electrification is seen simply as a technical matter of stringing lines to grateful consumers. The case studies show clearly that rural electrification programs can benefit greatly from the involvement of local communities - or suffer because of its absence.

Setting up a rural electrification committee to represent the local community can do, much to smooth the implementation of the program. The committee can play a crucial role in helping assess the level of demand, educating consumers in advance, encouraging them to sign up for a supply, and promoting the wider use of electricity.

In Bangladesh consumer meetings were held before the arrival of the electricity supply, helping to avoid costly and time-consuming disputes over rights of way and construction damage. Community contributions, in cash or kind, were often the decisive factor in bringing areas within the scope of the rural electrification program in Thailand. The efforts to recruit customers made by parish rural electrification committees in Ireland ensured that the utility received an adequate return on its investment and contributed to the rapid implementation of the country's rural electrification program.

Reducing construction and operating costs

There are major opportunities for the reduction of construction and operating costs of rural electrification in most countries. In many cases, careful attention to system design enables construction costs to be reduced by up to 30 percent, contributing significantly to the pace and scope of the rural electrification program.

Where the main use of electricity is expected to be for lights and small appliances, typical of many rural areas, there is no reason to apply the design standards used for much more heavily loaded urban systems. The rural distribution system can be designed for the actual loads, often no more than 15 kilowatt hours per month, imposed on it by rural households. Although consumption normally grows, this is usually at a slow pace and provided the necessary design provisions are made, systems can be relatively cheaply upgraded later.

Each country will have its own cost-saving opportunities for rural electrification planners. In Thailand, materials were standardized and manufactured locally, reducing procurement, materials handling, and purchasing expenses. In Costa Rica, the Philippines and Bangladesh, adoption of the well proven single-phase distribution systems, used in the US rural electrification program of the 1930s, brought major savings over the three-phase system still widely used in Africa and elsewhere. The case studies show that careful and critical analysis of design assumptions and implementation practices invariably reveals potential for significant cost savings.

Alternatives to the grid

Grid-based rural electrification is often portrayed as being in competition with alternatives, especially photovoltaic systems. This is a mistake as there is little conflict between the two.

The grid allows people to use standard electrical equipment and appliances without any practical constraint on the quantities of electricity they consume. It provides a level of service which cannot be approached by the alternatives and where technically and financially feasible will always be the first choice among consumers.

In remote or hard to reach areas where grid supplies are impractical on cost, technical or institutional grounds, people generally meet their need for lighting and electricity-using services by using kerosene, LPG, dry-cell and car batteries, and, occasionally, small diesel or gasoline generators. Photovoltaic systems are increasingly demonstrating that they can be competitive on cost and service grounds with these conventional energy sources.

Looking forward

Well-planned, carefully targeted, and effectively implemented rural electrification programs provide enormous benefits to rural people. Indeed, once an area has reached a certain level of development, further progress in raising standards of living to socially and politically acceptable levels will depend on the availability of a public electricity supply. As radical restructuring of national power utilities gathers pace around the developing world, it is essential that this is borne in mind and the appropriate institutional frameworks and incentives are created to ensure that rural electrification takes place.

The main message from the World Bank's best practice case studies is positive. There are major opportunities for increasing the pace and widening the scope of rural electrification. If these opportunities are grasped, it will enable large numbers of new consumers to enjoy the benefits of an electricity supply at acceptable costs and without burdening national governments and power utilities with unsustainable subsidies.

Rural Electrification: Lessons Learned

Based on the World Bank's experience to date, Rural Electrification (RE) programs rarely support themselves financially. However, there are *external benefits* that rural populations derive from key synergies facilitated by the introduction of electricity (such as improved access to communication, education and economic opportunities, extended and more reliable health services, and improved security). RE programs should seek to maximize both economic and social benefits. Some lessons learned and good practices (drawn from the sources listed on page 3) are summarized below.

Lessons Learned

- Key to scaling-up are *conducive macro-economic conditions*, sustained *government commitment* to the project objectives, *competent public institutions*, and *decentralized decision-making*.

- Grid extension is sometimes not the most cost-effective solution; *decentralized delivery options* and *alternative energy sources*--such as solar PhotoVoltaics (P.V.), mini-hydro and other renewable energy sources--should be considered, following the principle of least-cost development. There remains considerable potential to lower the unit network costs of new connections by introducing equipment standards, reticulation design, and construction, operations and maintenance practices that are better suited for rural area conditions, instead of relying on high cost and "gold-plated" practices more appropriate for use in urban areas.

- *Criteria for selection and priority-setting* for RE should be open and objective. *Political interference* in the implementation of RE programs can add considerably to the costs of system expansion.

- The benefits of electrification are directly related to the uses to which it is put and to the costs of alternative sources of power and energy. RE should ideally be introduced in areas where there is already a *demand* for electricity-using services--usually where there is agricultural growth, rural businesses and rural incomes. However, to increase and accelerate the development impact, technical assistance and rural business services could be provided to stimulate demand.

- *Pricing policies* play an important role in determining project viability. A rational system of *cost recovery* (coupled with smarter ways of allocating subsidies where needed) is the most important factor determining the long-term sustainability of RE programs.

- *Initial connection charges* are a greater barrier to rural families than the monthly electricity bill. Extended financing arrangements are necessary to make connection more affordable.

- *Subsidization of operating costs* has widely proved to be counter-productive and to undermine the utilities' financial position, their ability to extend service, and ultimately the RE programs themselves.

- The *private sector* can be attracted to participate in rural electrification schemes, even in a poor country, if an appropriate legal framework and risk management options are in place, including the assurance of a level playing field in terms of competition and the ability to charge full cost-recovery tariffs.

- RE programs can benefit greatly from the *involvement of local communities* - or suffer because of its absence.

- RE will stimulate economic growth and employment, if other necessary conditions are met. RE reduces *rural poverty* mainly through a general rise in income, obtained by productive uses.

- Evidence from successful rural electrification projects shows that, once electricity becomes available in an area, upper middle class and wealthy households are the first to adopt it. But if the project focuses on promoting electricity for poor households--through low connection fees and lifeline rates--the rate of electricity adoption grows significantly, even among the poorest households. Surveys reveal that, in regions with high overall adoption rates, the poor benefit significantly from rural electrification programs, and *although they may lag behind wealthy households, the poor will adopt electricity if the connection policies are appropriate*. Without a rural electrification program, or other program aimed at encouraging extensive coverage of the poor, the poor are left paying for kerosene, a meager and high-priced source of light.

- It is difficult to estimate *suppressed demand* and the *ability and willingness to pay*.

- *Demonstration projects* (the typical donor approach) are *not* a fair test of viability.

Good Practices

- Power sector reform (ideally on-going at time of project appraisal):

- Establish a transparent, arms-length *regulatory framework* with legal guarantees that utilities can operate with autonomy-e.g. through management/concession contracts.

- Enforce *regulatory principles* to ensure financial discipline, adequate tariffs, and incentive-based, competitive contracting of services.

- *Separate responsibilities* between regulating authorities and operating companies.

- Open the market to *private investment and operators*.

Priority-setting

- Successful rural electrification programs have all developed their own - transparent - *system for ranking* or prioritizing areas for obtaining a supply.

Financial viability/cost recovery

- Identify *economic limits* to extensions to the grid and the economic potential of *lower-cost options* and *alternative energy sources.*

- Ensure *commercial viability* to assure RE's sustainability.

- A rational system of *cost recovery* should take into account capital investment costs, level of local contribution, number and density of consumers, likely demand for electricity; also, the willingness to pay and payment capability of the population.

- The *tariff regime* should ensure that RE programs are financially sustainable and will not drain operational resources. Tariffs should cover the full cost of medium-voltage generation/transmission, plus low-voltage operations/maintenance costs, and should provide for eventual capital replacement costs.

- The tariff structure needs to ensure that any *subsidies* are fair, equitable, and sustainable. A "good" subsidy scheme enhances access for the poor (improving the quality of life/reducing energy expense); sustains incentives for efficient delivery/consumption; and must be practicable within the financial/human resource constraints of government/power utility. Successful subsidy programs encourage the rural electrification business. A portion of the capital may be subsidized, obtained at concessionary rates, or as a government/donor grant. Subsidies should be avoided for operating costs. A low *lifeline tariff* is acceptable on income redistribution grounds.

- *Minimize construction/operating costs:* assess technology and available standards during the planning stage; deploy low-cost equipment; use innovative technologies/approaches and local suppliers; standardize materials. Consider the use of "ready-boards" to reduce connection costs. Design the system for expected loads (much lower in rural than urban areas) to reduce construction costs; provide for future upgrades.

- Consider the provision of *financing* to spread the costs of connection fees over an extended period, or lower connection rates for the poor, so that the benefits of

electrification may reach larger numbers of people; consider also arranging financial assistance for the credit/hire purchase of electrical appliances.

- *For grid electrification, it is generally important to meter all electricity consumption*. There may be some exceptions to this rule for households with very low consumption rates that are being provided electricity service by a small local generator during evening hours only. Under such circumstances, it may be necessary to charge a fixed amount for each appliance, as they can only be used for a particular period of time. This avoids unnecessary expenses involved in reading meters and the cost of the meters.

- Include *demand-side management programs* in project design to shift some of the rural load to off-peak time periods.

Implementation agency

There is no single model for an institutional structure. However, in all countries with successful RE experience, the implementing agencies had a high degree of operating autonomy and were held *accountable*; leadership tended to be dynamic and employees had job security and career prospects. Clear *contractual arrangements* between the government and implementing agencies are important.

Involvement of local communities

- Projects are more likely to be viable and sustainable if *local stakeholders* are involved in their design and implementation. One way to approach this is to set up a Rural Electrification Committee to help assess level of demand, educate consumers, and promote the wider use of electricity. This may also help reduce potential problems over rights of way for the construction and maintenance of electric lines.
- In some cases (e.g. Thailand), the community has made *contributions of capital or labor*, thereby helping to defray the costs of the program. Labor-intensive activities in the distribution and customer services function may be contracted out to village-level organizations on a fee-for-service basis.
- The establishment of *appropriate institutional and organizational procedures* for project planning, financing, procurement of goods and construction services is very important for the successful implementation of RE projects involving small communities.
- The concept of "Area Coverage Rural Electrification" (ACRE) - a distribution system based on member-owned rural electric cooperatives - has been successfully used (e.g. in Bangladesh).

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The Challenge of Rural Energy Poverty in Developing Countries – World Energy Council

The Way Forward

1. Decentralization and integration in practice

The principles of decentralization and integration should be the starting point in all areas of rural energy development effort. The final section of this report examines what this means in practice both for the key areas of intervention and for the main actors who are tying to make a difference.

1.1 Sustainable forestry

Participatory management of natural forests and woodlands and by extension agro-forestry is probably the most significant outcome of the new thinking. However, recommendations for action should take into account the existing human, financial and institutional resource constraints in developing countries. While joint forest management might seem like an easy and politically popular winner, there are many barriers to successful implementation. For participating communities they include the willingness:

- to co-operate with each other,
- to invest their labor and cash resources, and
- to organize for and learn new management skills.

Government, on the other hand, must be prepared to weaken greatly its own jurisdiction and authority over basic national resources. It thus requires from government:

- a strong commitment to more equitable land tenure or access to land and land-based resources,
- increased local accountability and community powers,
- openness to and policy support for the emergence of non-governmental organizations and private entrepreneurs, and
- willingness to explore many technical and administrative innovations, including the redistribution of tax revenues from the state to local communities.

In addition, legislative reforms are very often necessary to give rural populations the right to participate in the commercial exploitation of the forests and share in the benefit. In many developing countries legislation has already been enacted to that effect, while in others new laws are being drafted. Regardless of the state of advancement of legislation, the subject is being examined widely in the light of experience already gained with pilot projects. Within the legislative framework, the basic implementation instrument is a management contract between the authorities and rural people, spelling

out the conditions of sustainable exploitation, the mutual obligations and the sharing of the benefits.

In many countries, significant issues remain to be resolved with regard to the security of the rights granted, the representation of rural populations, the role of traditional authorities and the links of rural-based production to urban-related transportation and marketing operations. It is important to foresee and plan for the organization by communities of commercial woodfuel production and to avoid the development of uncontrolled and new ecologically damaging forest exploitation practices.

The decision by a community to commercialize the forest in which they live should therefore carry responsibilities and limits. It should be subject to limited technically-dictated constraints and to practices that conserve sufficient forested area to ensure the continued supply of the community's own basic needs for fuel, fodder, medicines etc. These obligations are thus not just designed to protect the forests, but to protect the poorest in the community from powerful individuals and groups within a highly unequal rural society, from powerful urban interests, and even from the government forestry agencies, who may owe their allegiance more to the urban leadership than to the rural poor.

However, once these legislative and social guidelines are in place, jointly managed forests have tremendous potential for rural economic growth and development if local populations are given the opportunity to retain surpluses that are normally captured by merchants and state institutions higher in the woodfuels marketing chain. If surplus revenues from commercial forest exploitation are collected by a representative and locally legitimate organization, they can be used to support local development and forest maintenance. The central notion of such an approach is that participatory forest management should provide more than subsistence labor opportunities.

In addition to economic efficiency, local retention of benefits from forest exploitation increases the incentives to maintain and manage the forest resources. If those benefits come not only from the sale of products, but also from the collection of taxes on that sale, then this additional retained benefit provides a motive for local populations to engage in tax collection and policing of the resource.

Given their central role as local users of forest resources, a strong case can be made for an explicit recognition of the role of women in the drawing up of local forest management plans, in the approval process and in subsequent implementation. In addition, they should be integrally involved in decisions made by the community on the use of profits and revenues generated from woodfuel sales.

In addition to the above obvious benefits, pilot projects have shown that the training of rural people is often needed in techniques of sustainable production, elementary management and, at later stages, marketing skills.

1.2 Improved stoves

While improved stove programs may not have been as effective as first hoped in conserving woodfuel, they have benefited households on several levels. They have improved cooking environments, and thereby health. Importantly, they introduced households to the potential benefits of technical change. They have also helped identify critical gender issues and mobilize women's groups.

At both technical and institutional levels, future demand-side woodfuel management should reflect, the evolution from a strong technological, efficiency-oriented approach to one that focuses on welfare improvement in the broader sense. Organizations involved in health and other household related activities should take a lead role.

In any case, rural women themselves must participate from the inception in improved stove programs, in identifying the need, in stove selection and design and in arranging the necessary financing. Only with the users' input in this way, can wasted effort be avoided and resources used effectively.

1.3 Rural electrification

The hotly debated issue of what institutional structure for rural electrification has been the most successful, would not appear to be as critical as some would have it be. As we saw in Chapter 3, very different institutional arrangements have worked equally well, including co-operatives in the Philippines, Bangladesh and Costa Rica, the national power utilities in Ireland and large parts of Costa Rica, and a separate utility in Thailand. Whatever institution takes on rural electrification, much more important to its success in carrying out its task are:

1. general freedom from political interference in engineering and financial matters;
2. a clearly defined budget which it is allowed to control fully, and
3. a high degree of accountability.

Also essential is an effective regulatory framework specifying which tariff and cost increases must be justified. Operating cost subsidies should be avoided and, although initial capital subsidies can sometimes be justified, cost recovery of all operating and grid expansion costs should, as far as possible, be pursued as an objective.

A model for integrated initial electrification

For communities of a certain size (in the range of 1000 to 100 000 people) with a rudimentary cash economy, a promising approach being developed combines proven technologies and new financing strategies with a community-based approach. Drawing on concepts derived from shipboard power supply systems, the Tennessee Valley Infrastructure Group, a US-based private sector consortium, engineers and manufactures prefabricated "Integrated Infrastructure Platforms" (IIP). Constructed in

sea-land shipping containers, or on skids or barges, IIPs can be set up and operated to build up the local economy until larger national systems can be brought in. IIPs can range from 500 kW to over 30 MW in power generating capacity and can combine renewable and fossil-fuelled energy sources. They use the waste heat from power generation for water purification and can provide telecommunications, healthcare clinics with a telemedicine capability and educational facilities. IIPs combine proven technologies in different configurations to meet the specific needs of each community.

The critical element is the economic development model. As part of the initial feasibility study, a "business plan" for the community looks at job creation, industrial recruitment, micro-finance options, etc. involving the owners and officials at both the local and national levels. Community leaders are involved in IIP design and construction, from project inception through several years of operation. The consortium offers services for establishing local entities - either municipal or private sector - capable of owning and operating the Platform. The local community is expected to take a small (at least 5%) equity share, to ensure commitment to the project and self-policing. Negotiations are currently under way between the consortium and the governments of Côte d'Ivoire and Senegal to choose four demonstration-project sites.

The advantage of this scheme is that it offers a way to build a domestic ownership base of infrastructure and direct community involvement and co-ownership of the IIP. In addition to the educational, health and energy services that the unit provides, the members of the community also acquire the skills to maintain and operate the projects, and access to regional education and medical facilities through the telecommunications unit. It is also flexible, in that once a community's economic growth makes replacement of the IIP by the national infrastructure systems economically viable, the platform can be altered and transported to a new community. The drawback is that the concept may not be applicable to very poor and remote communities without subsidies.

Rural Electrification In America (USA) in Thirties

Although nearly 90 percent of urban dwellers had electricity by the 1930s, only ten percent of rural dwellers did. Private utility companies, who supplied electric power to most of the nation's consumers, argued that it was too expensive to string electric lines to isolated rural farmsteads. Anyway, they said, most farmers, were too poor to be able to afford electricity.

The Roosevelt Administration believed that if private enterprise could not supply electric power to the people, then it was the duty of the government to do so. Most of the court cases involving TVA during the 1930s concerned the government's involvement in the public utilities industry.

In 1935 the Rural Electric Administration (REA) was created to bring electricity to rural areas like the Tennessee Valley. In his 1935 article "Electrifying the Countryside," Morris Cooke, the head of the REA, stated that

> In addition to paying for the energy he used, the farmer was expected to advance to the power company most or all of the costs of construction. Since utility company ideas as to what constituted sound rural lines have been rather fancy, such costs were prohibitive for most farmers.

Many groups opposed the federal government's involvement in developing and distributing electric power, especially utility companies, who believed that the government was unfairly competing with private enterprise. Some members of Congress who didn't think the government should interfere with the economy, believed that TVA was a dangerous program that would bring the nation a step closer to socialism. Other people thought that farmers simply did not have the skills needed to manage local electric companies.

By 1939 the REA had helped to establish 417 rural electric cooperatives, which served 288,000 households. The actions of the REA encouraged private utilities to electrify the countryside as well. By 1939 rural households with electricity had risen to 25 percent. The enthusiasm that greeted the introduction of electric power can be seen in the remarks of Rose Scearce.

When farmers did receive electric power their purchase of electric appliances helped to increase sales for local merchants. Farmers required more energy than city dwellers, which helped to offset the extra cost involved in bringing power lines to the country.

TVA set up the Electric Home and Farm Authority to help farmers purchase major electric appliances. The EHFA made arrangements with appliance makers to supply electric ranges, refrigerators and water heaters at reasonable prices. These appliances were sold at local power companies and electric cooperatives. A farmer could purchase appliances here with loans offered by the EHFA, who offered low-cost financing.

Rural electrification was based on the belief that affordable electricity would improve the standard of living and the economic competitiveness of the family farm. But electric power alone was not enough to stop the transformation of America's farm communities. Rural electrification did not halt the continuing migration of rural people from the country to the city. Nor did it stop the decline in the total number of family farms.

Mr. Carmody: We Want Lights

> This handwritten note was found on the back of the accompanying photograph in John Carmody's papers, at the Franklin D. Roosevelt Presidential Library. John Carmody replaced Morris Cooke in 1936 as head of the Rural Electrification Administration.

REA--Somewhere near the state line between southeast Tennessee and northwest Georgia, on the edge of TVA Territory. TVA had created a desire for electricity in all adjacent areas. I recall seeing this sign during one of my visits to this area while a project was in the process of being organized. We had some trouble with the Georgia Power Company in those early days about "spite lines," etc. Like other private post companies that "couldn't see the rural market" before REA got started they suddenly blossomed out either to discourage formation of rural cooperatives or to hinder progress by "spite lines." We finally bought some of these for the coops and rural Georgia went to one of the most widely electrified states. Georgia Power Com. (Charles Collier, their public relations chief) did not like it when I would not agree to their plan to take over all utilization of power use for all REA projects in Georgia "and thereby relieve REA of the use of electricity in rural areas." I reminded Mr. Collier I could think of no better way to accomplish what the private power companies were saying, after they discovered they could not prevent formation of farm cooperatives and the building of lines, "We will buy them for a song." I wonder why so many people in private industry think government administrators are simple minded?

Well, we went ahead in Georgia, as elsewhere, minded our own business, fulfilled our obligations and built a strong REA.

--John Carmody

Rural Refrigeration

> The EHFA realized that many farmers were still too poor to afford personal refrigerators. They offered farmers large walk-in coolers, which could be shared by a group of farmers. The British writer Odette Keun wrote about the need for refrigeration in her 1937 book, *A Foreigner Looks at TVA*.

Without refrigeration, the farmer usually has fresh beef and mutton only during the very few cold winter months, although he may have animals to kill. in the hot months, he does not dare to kill for self-use unless he can consume everything at once, for he has no means of cold-storaging the meat, and it goes bad. (Listen to this: in four southern States loss from spoilage of one commodity alone--pork--has been estimated as 25 per cent of the value of all hogs slaughtered on farms, or over eight million dollars for these four States in terms of market value. Isn't such waste wicked! If the farmers had refrigeration facilities it couldn't occur.) With refrigeration, farm families can have fresh meat at any time, regardless of weather conditions. But they don't have refrigeration, for though refrigerators for community storage of fresh meat do exist, they have been designed for retail marketing and not for the farmers, and thus are much too elaborate and expensive for the latter's purse. TVA, full of solicitude, built a unit which is priced at about 650 dollars, so if ten or twelve families get together, they can purchase this "walk-in cooler" at a cost of 55 to 65 dollars per family. Other units are to be used for the cold storage of eggs, vegetables, milk; they meet all sorts of individual farm and community needs. The construction of these units would mean a volume of business of about 200,000 dollars to the manufacturers of the Valley; the elimination of loss from spoilage; and the improvement of the farmers' diet. (That general diet of theirs lies on my own stomach: why, I can't conceive of the poorest of poor French peasants eating as unhygienically, dismally, and barbarically as I've constantly seen American farmers do!)

[From *A Foreigner Looks at TVA*, by Odette Keun, Longmans, Green and Co. (New York, 1937), p. 47, 48.]

Electric Appliances on the Farm

By Odette Keun

To put electricity and electricity-using appliances in every American home and farm is an objective the necessity of which no sane person will dispute. Take the farms. There are about six million five hundred thousand of them in the United States.

Thirty million people, out of a population of one hundred and twenty-seven million dwell in them. Now the less I say about the American farms in general, the more wholesome it will be for my temper, for I've been so grossly misinformed with regard to the average living condition of the agricultural classes in this country, by the Americans I met in Europe, that I haven't got over my bitter disappointment yet.

This may be unpalatable to the Americans who still believe that everything is for the best in the best of all countries: their own; but I can't help that it is true. There are districts in West Virginia, East Tennessee, and Kentucky, where the mode of material existence is not different from that of the first settlers, over a century and a half ago. (Useless to fall back upon the facile plea: "That's the South!" The South is American, isn't it?). Even when I visited the better-off farms, I discovered that a very large percentage of them had kitchens with ovens burning wood -- the poor cooking in pots and pans over a little fire on the hearth, as in the Middle Ages; that they were lighted by dim, smoking, smelly, oil lamps, that the washing of clothes was done by hand in antiquated tubs; that the water was brought into the house by the women and children, from wells invariably situated at inconvenient and tiring distances, for it appears to be one of the milder manias of the American farmer, to sink his well as far away as possible instead of near the front door, under trees, as the European peasant does.

Ordinarily there is no icebox, so many products that might be grown to vary the horribly monotonous diet are out of the question: they could not be stored. (Nothing could be stored in the warm regions if it weren't for the springhouses. And not everybody has them!). Of the fifty million horsepower required by farms, 61 per cent is still furnished by animals and only 6 per cent by electric stations. About ninety per cent of the citizens on farms, say the statistics, do not have the lighting and the simple comforts that have become a commonplace in most middle-class dwellings in urban communities. It's nothing to brag about, you know.

New Products for New Consumers

Just like today, advertisements from the thirties did more than simply introduce consumers to products. Advertisements told the reader how a product might make them more sophisticated and more modern. How that product might change their lives. Advertisements also tell us something about the roles men and women were expected to assume during the thirties.

The following selections are from advertising pamphlets found among the papers of Rural Electric Administration director John Carmody at the Franklin D. Roosevelt Presidential Library. The REA, under John Carmody, was committed to assuring that farmers received not only electricity but also the appliances that electricity made possible.

- The Graybar-Crawford Electric Range
- The Electrolux

The REA also promoted the use and effectiveness of modern electric devices in public relations photographs. These photographs contrast old methods of washing clothes and cooking with modern electrical appliances.

America's Cooperative Electric Utilities The Nation's Consumer Owned Electric Utility Network

Electric cooperatives are:

- private independent electric utility businesses,
- incorporated under the laws of the states in which they operate,
- established to provide at-cost electric service,
- owned by the consumers they serve,
- governed by a board of directors elected from the membership, which sets policies and procedures that are implemented by the cooperatives' professional staff.

Distribution cooperatives deliver electricity to the consumer. Generation and transmission cooperatives (G&Ts) generate and transmit electricity to distribution co-ops. In addition to electric service, many electric co-ops are involved in community development and revitalization projects, e.g., small business development and jobs creation, improvement of water and sewer systems, and assistance in delivery of health care and educational services.

Facts At A Glance

900 distribution and 60 G&T cooperatives serve:

- 34 million people in 46 states.
- 13 million businesses, homes, schools, churches, farms, irrigation systems, and other establishments in 2,500 of 3,128 counties in the U.S.
- 11 percent of the nation's population.

To perform their mission, electric cooperatives:

- own assests worth $70 billion,
- own and maintain 2.3 million miles, or 44%, of the nation's electric distribution lines, covering three quarters of the nation's landmass,
- deliver 7.9 percent of the total kilowatt-hours sold in the U.S. each year,
- generate 4 percent of the total electricity produced in the U.S. each year,
- employ nearly 60,000 people in the United States.
- During 1997, electric cooperatives paid more than $707 million in state and local taxes.

Compared with other electric utilities:

- Co-op sales grew twice as fast as the total electric industry average in 1998.
- Co-ops serve an average of 6 consumers per mile of line and collect annual revenue of approximately $7,900 per mile of line,

- Investor-owned utilities average 33 customers per mile of line and
- collect $61,000 per mile of line,
- Publicly owned utilities, or municipals, average 43 consumers and
- collect $71,000 per mile of line.

Statewide Associations

In 38 of the 46 states in which electric cooperatives operate, statewide associations provide a unified voice that speaks to the general public, regulatory bodies and state legislatures on behalf of their members. These associations are voluntarily supported, governed by representatives of the member cooperatives and offer commonly desired services. Thirty-two statewide associations publish newspapers or magazines for the co-op consumer-owners, reaching more than six million readers each month.

National Representation

The National Rural Electric Cooperative Association (NRECA) represents the national interests of cooperative electric utilities. NRECA provides legislative, legal and regulatory services; and programs in insurance, management and employee education, training, consulting, public relations and advertising. NRECA and its member cooperatives also support energy and environmental research and administer a program of technical advice and assistance in developing countries around the world.

Cooperative Businesses

More than 100 million people are members of 47,000 U.S. cooperatives, enabling consumers to secure a wide array of goods and services such as health care, insurance, housing, food, heating fuel, hardware, credit unions, child care and utility services.

Cooperative Principles

Cooperative businesses adhere to seven guiding principles:

1. Voluntary and Open Membership -- Cooperatives are voluntary organizations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political, or religious discrimination.

2. Democratic Member Control -- Cooperatives are democratic organizations controlled by their members, who actively participate in setting policies and making decisions. The elected representatives are accountable to the membership. In primary cooperatives, members have equal voting rights (one member, one vote) and cooperatives at other levels are organized in a democratic manner.

3. Members' Economic Participation -- Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership.

Members allocate surpluses for any or all of the following purposes: developing the cooperative, possibly by setting up reserves, part of which at least would be indivisible; benefiting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.

4. Autonomy and Independence -- Cooperatives are autonomous, self-help organizations controlled by their members. If they enter into agreements with other organizations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.

5. Education, Training, and Information -- Cooperatives provide education and training for their members, elected representatives, managers, and employees so they can contribute effectively to the development of their cooperatives. They inform the general public, particularly young people and opinion leaders, about the nature and benefits of cooperation.

6. Cooperation Among Cooperatives -- Cooperatives serve their members most effectively and strengthen the cooperative movement by working together through local, national, regional, and international structures.

7. Concern for Community -- While focusing on member needs, cooperatives work for the sustainable development of their communities through policies accepted by their members.

Electric Utility Comparisons

	Investor Owned	Publicly Owned	Cooperatives	Industry
Number of Organizations	239	2009	930	3,178
Size (median number of customers)	386,000	1,800	10.200	
Customers, % of total	74%	15%	11%	
Revenues, % of total	77%	14%	9%	
kWh sales, % of total	75%	15%	9%	
Sales (billions kilowatt hours)				
Residential	793	171	163	1,127
Commercial	767	150	51	968
Industrial	796	145	60	1,001
Other	65	26	6	97
Total	2,421	492	280	3,193
Density (consumers/mile of line)	33	43	6	32
Revenue/mile of line (dollars)	60,921	70,670	7,873	57,345
Distribution plant investment per consumer (dollars)	1,890	1,870	2,352	1,929
Assets ($ billions)	606	126	70	802
Equity ($ billions)	188	38	20	246

*900 Distribution, 60 Generation &Transmission cooperatives

kWh = kilowatt hour

source:1998 Dept. of Energy/Energy Information Agency/NRECA Strategic Analysis. March 1999

Financing Village Electrification

Background

Demand for electricity in industrialized nations, with well-established electric power systems and relatively steady per capita electric consumption, is unlike the increased demand experienced by the developing nations. As rural electrification continues to assume global proportions, the world's population grows. Well into the next century, the axiom that eventual demand outpaces current demand will surely to be true for electrical consumption. Still, there is long term potential for profitable business, only if local economies can afford to pay an asking price above real cost of supply.

Therefore, any source of electricity must compete economically, with delivery technologies that both reflect and satisfy local demographics. Power for water delivery to agriculture, access to telecommunications, area lighting, and wide scale education as well as dental and medical attention combine to provide the roots of economic growth. Over the next decade virtually all of the developing countries will account for increasing shares of installed electric power.

Internationally, electricity is industrial society's prehensile appendage, limited only by its marginal cost of delivery. Currently local needs, fossil fuel prices, as well as initial costs for conventional and renewable technology systems, combine to determine the types of electric plants to be built. Electric power delivery is highly capital-intensive, and therefore the major requirement, for the foreseeable future, is capital.

Availability of credit / financing -- Historical perspective

In the years before World War II, most capital for electric plants was financed through private means. Most power companies were privately owned and sought foreign and domestic markets for their capital needs.

After the war, popular demand combined with wide scale government recognition of the electric delivery sector to champion economic growth. This paradigm shift resulted in a massive trend, in the industrialized nations, toward electric companies becoming state and municipal enterprises, thereafter relying on government programs and credit to finance expansion.

In the developing countries most installed base of power delivery systems received substantial support from the World Bank as well as other multi and bilateral funding institutions.

As the developing nations urbanize and industrialize, the capital requirements for electric power accelerate compared to those for rural societies just beginning the growth process.

This accelerated growth has traditionally placed huge demands on the limited resources of the public sector. between 2000-2002 it will not be unusual to see as much as one-third of all public investment resources going to electric power.

There are advantages and disadvantages to relying on public-sector ownership and public-sector credit. For example, in many developing areas, isolating the power sector from the inefficiencies of local government has been very costly. In such cases, inadequate maintenance of capital-intensive equipment has resulted in equipment losses compounded by the loss of output revenues to local industry, compounded by loss of critical electricity to power local industry.

Lessons learned from early prototypes show most advantages gained have been due to proper systems integration, followed by local infrastructure development & training blended with ongoing monitoring and maintenance programs. When these latter components are financed in the original mix, alongside initial capital requirements, there is a higher likelihood for project sustainability.

Rural Electrification: a hard look at costs and benefits -- World Bank

In a study of rural electrification (RE) in Asia, OED notes that while RE projects supported by the World Bank have had a satisfactory record overall, their economic returns have been considerably lower than projected and a wide range of expected indirect and external benefits have not materialized. In India RE has had a crucial role to play in the spread of irrigated farming, in conjunction with other agriculture development programs. But experience in general shows that RE does not provide a primary stimulus for regional development through industrial growth. The study recommends more rigorous economic and financial analysis and improved tariff and demand management policies.

The introduction of electricity often profoundly affects village life. Electric lighting expands the productive and social hours in the day. Radios and television provide accessible, affordable entertainment and education. Power machinery can raise productivity and improve working conditions. Most important, electrification brings with it expectations for progress and a better future.

Yet in many countries, where other infrastructure such as roads, drinking water, and sanitation is also needed, village electrification does not receive the priority allocations for subsidized funding that its advocates would wish to see. Experience in Asia suggests that the main reason is that most RE programs have cost more and yielded fewer benefits than expected. (See Box 1)

Box 1: Scope of study

The study focused on Asia because of the substantial experience gained through Bank-financed projects in this region over many years. It examined ten completed RE projects in Bangladesh, India, Malaysia, the Philippines, and Thailand, drawing on OED performance audits, World Bank country sector studies, and recent evaluations of RE investments in Asia undertaken by national, bilateral, and international sources.

Costs

It costs more to provide electricity to rural than to urban communities. Economic and financial appraisals of RE projects have consistently ignored the financial implications of this difference for the supplying utility.

Investment costs

The higher rural investment costs--measured as capital infrastructure costs per kilowatt hour consumed--partly reflect the lower density of rural connections and the smaller amounts consumed by those connected. These costs depend on the community's distance from the existing medium voltage grid, and on the community's size and potential demand pattern. Since RE programs can easily overextend themselves,

project appraisal needs to focus more attention on identifying the economic limits of extensions to the grid and on the economic potential of alternative energy sources, particularly solar energy.

Investment costs per unit of demand are higher in rural areas because the bulk of demand in rural areas is for lighting during the early evening. Thus the ratio of average demand (which determines financial and economic benefits) to peak demand (which determines investment cost) is much lower in rural systems than in urban, where there is considerable daytime electricity use.

Generation costs

Largely because rural demand is concentrated at the time of the national system's peak load, generation costs are higher for rural than for urban consumption. The cost of generating electricity to meet peak load demand is often more than double the long-run marginal cost (LRMC) averaged over the entire day (or year).

Benefits

Many of the benefits claimed for RE have not materialized, or have been much smaller than expected. One of the most persistent claims for RE is that it can induce industrial growth in otherwise lagging low-income rural economies. The evidence from developing countries does not support this claim; RE has not, by itself, triggered industrial growth or regional development. In certain circumstances, however, it has supported growth led by a dynamic agricultural sector.

The study found that where other prerequisites of sustained development were absent, demand for electricity for productive uses did not grow. (An important exception is demand for electricity for water pumping to spread irrigated farming.) Without agricultural growth, the use of electricity in rural areas has remained low, and many of the expected economic benefits of electrification have not been realized.

OED's findings support that of the World Bank's 1975 Rural Electrification Policy Paper: investment in RE is economically justified only when the emerging uses of electricity are strong enough to ensure sufficient growth in demand to produce a reasonable economic rate of return on the investment. The Bank has not fully applied this criterion in appraising its RE projects in Asia.

- Although RE in Asia may not have been an engine for economic growth, it has provided significant benefits. Many of these benefits have been underestimated, for three reasons:

- Where tariffs are far below economic costs, and demand is constrained by non-price factors, conventional rules of thumb for establishing the demand curve often underestimate the benefits that consumers derive from electricity. The most

common error is to assume that the observed consumption level represents a point on the demand curve, when in fact it may be far below the demand curve because consumption is being held down by inadequate supply.

- The economic benefits of electricity may be difficult to measure on the basis of the cost of substitutes. For instance, because electric lighting provides an order of magnitude improvement over lighting from candles and kerosene, electric light is much more than a simple replacement for kerosene.

- Even if a substitute is deemed to exist for electricity (as with the use of diesel pumps in irrigation, for example), microeconomic rate of return calculations may be flawed for two reasons. First, observed consumer behavior and underlying prices are often distorted by taxes, subsidies, and lack of information about access to rural credit. Second, assumptions about RE and its substitutes that may be valid for a small project, taken in isolation, do not necessarily apply to a massive RE program; on that scale, diesel fuel may not be available, and prices and benefits may differ.

- When this happens, RE may be in a unique position to promote a paradigm shift in agricultural production, by making possible irrigation and associated modern technology and practices. This occurred in the Indo-Gangetic plain of the Indian subcontinent and in some areas of China. Project analyses have failed to evaluate the alternatives and to account for the indirect benefits of national and regional food security and the accompanying low and stable food prices that may flow from RE.

Cost recovery

All the evidence to date, including that from Bank-financed RE projects in Asia, shows that RE does not directly reduce poverty by helping the poorest rural people. Most of the direct benefits from rural electricity go to wealthier people. Even when tariffs are low, potential consumers cannot always afford the initial connection and household wiring. Once connected, the amount of electricity consumed, and therefore the benefits obtained, depend on the ability to buy electrical equipment, whether light fixtures, televisions, fans, water pumps, or motor-driven machines. Evidence from Indonesia suggests that the poorest 25-50 percent of the population could not afford electricity, even if connections were to be financed through power company loans. Direct observation tends to support this supposition for most countries with per capita rural incomes of less than $200 a year.

RE reduces rural poverty only through a general rise in rural income obtained by productive uses. And -- again with the exception of irrigation pumping -- these productive uses of electricity appear to come about only when other factors are already raising rural and national per capital income, as has been the case, most noticeably, in Malaysia and Thailand.

Hence the justification for investing in and subsidizing RE programs needs to be based on their ability, after a start up-phase, to elicit a sufficient level of consumption at an economic price. All proposed projects should therefore provide estimates of expected consumption growth.

Although most RE schemes in Asia have generated substantial economic benefits, they have had a dismal cost recovery record, even without taking account of peak load generation costs. While the capital and operating costs of generation, transmission, and distribution are significantly higher for rural communities than they are for urban, rural tariffs have been at best equal to, and in many cases much lower than, urban tariffs. Only 10 to 50 percent of the economic cost is generally recovered. Thus RE has usually been highly subsidized, either indirectly by urban industrial users or directly by government allocations.

Implications

Implicit subsidies of RE programs can significantly depress a utility's financial performance. Unfortunately, many of the Bank's appraisals of power projects have failed to analyze the financial implications of subsidies to RE, particularly where apex institutions are used to on lend to utilities.

Where cross-subsidization from urban/industrial consumers has been inadequate, power companies have suffered debilitating financial losses--often with serious national economic consequences.

Where struggling power utilities cut service at the national or regional level, the impact on the country's economic growth can be serious. In India and the Philippines, for example, financial difficulties have made utilities less willing and less able to support the growth of rural networks. More important from a national economic development perspective, revenue shortfalls have also made it difficult to maintain acceptable power supplies for urban/industrial consumers. And the subsidized bulk supply of grid electricity to RE systems can stifle the emergence of alternative energy supply that would make economic sense in an undistorted market.

As with other power sector projects, a rational system of cost recovery is a key policy ingredient of any RE project. (See Box2)

Box 2: Recommendations for the Bank

- Strengthen economic and financial analysis of RE projects during appraisal.
- The rationale for supporting projects should be based on the real economic benefits they create; a rigorous quantitative analysis is needed to reflect the specific benefits expected from the project, including, most importantly, a projection of the expected growth in electricity consumption in the project area.

- Calculations of the cost of providing electricity to the RE distribution grid should be based on the cost of meeting the anticipated load curves, including providing peak load power for rural consumers.
- The Bank should carry out detailed financial analysis of ultimate beneficiary utilities. It should include a calculation of the financial returns from future projects and a full analysis of the implicit and explicit subsidies required.
- On tariff policy, lending for RE should be subject to the same rules as lending for other power projects.
- Tariffs should be set high enough to avoid the need for ongoing operating subsidies to RE programs. They should cover, at a minimum, the full cost of generation and transmission to the medium voltage transformer station, plus operating and maintenance costs.
- Subsidies should be limited to a portion of the distribution system's initial capital investment costs, which can be controlled by the funds available at the time of the investment.
- Low lifeline tariffs are an exception to the above rule, justified on income distribution grounds, but they should cover only a small block of electricity related to a minimum use level.
- To implement these recommendations and promote conservation all consumption should be metered.
- Utilities should be requested to maintain separate monitoring systems, including separate financial accounts, for RE systems, so that individual RE loans, real costs, and monetary implications can be identified and analyzed.

Conclusions

Rural electrification may be economically justified after all the benefits are accounted for and given the value that is appropriate. However, before starting a RE investment program those in charge must consider the following:

- Rural electrification rarely supports itself financially, at least in the first years;
- Government resources available to support RE are very scarce;
- These resources could be used in alternative ways to enhance living standards in rural communities.

Policy implications

- Strictly screen RE investments on the basis of quantifiable benefits;
- Recognize the need for rational cost recovery policies;
- Analyze the project's financial impact and return;

- Carefully review subsidization policies;
- Monitor growth in electricity consumption, to be able to judge project success.

Bank management, responding to the recommendations of the study, noted that many are already incorporated in ongoing operations. However, while acknowledging OED's justifiable concerns about financial accountability, management expressed strong reservations about the practicality of requiring a financial rate of return (FIRR) estimate for borrower utilities or for RE initiatives. It is difficult for utilities to maintain separate financial accounts for RE systems, especially since rural areas become urban over time. And in some countries, preparation of a complete financial appraisal of each beneficiary may be too burdensome for project preparation. Instead, management proposed to continue its practice of concentrating on economic costs and benefits and the financial health of the utility as a whole.

The Joint Audit Committee of the Bank's board of executive directors noted that the study raised the standard against which the board would need to justify approving new RE operations. For further attention by the directors, it highlighted OED's recommendations for strengthening the economic and financial analysis of projects during appraisal. On tariff policy, the committee noted the need for further research, to assess the results of various tariff options. It noted that if tariffs are high enough to ensure the utility's financial health, and cross subsidies do not greatly distort demand or worsen the access of poor people to electricity, then the Bank should not preclude the consideration of technically and economically justifiable RE projects. Since governments have limited resources available for redistribution to rural communities, rural electrification needs to compete with other worthwhile projects for these resources. This competition should be based on guidelines that are as rational and transparent as possible. Most importantly, they should allow for local participation in the decision making on local infrastructure investment.

The Electric Co-op Business Model: The Cooperative Difference

Ownership - the Fundamental Difference

A fundamental difference between an electric cooperative and an investor-owned utility is the co-op's membership structure.

In a business corporation, the number of shares of stock each investor holds determines control. Electric cooperatives (co-ops) are owned and controlled by the consumers they serve. Members participate in the operation of the co-op by electing a board of directors to determine the rates and type of service(s) they receive. The co-op's board of directors is responsible for establishing the cooperative's basic policies, goals, and strategies. The board also hires a manager to execute those policies.

Local Control

Local ownership makes electric cooperatives directly responsive to the needs of the communities they serve. Within an investor-owned utility, the board of directors must balance the very legitimate for-profit business concerns of their shareholders as well as the concerns of their customers. Similarly, in a co-op, the locally elected board of directors must balance the interests of consumers and corporate responsibilities to ensure the fiduciary health of the co-op.

Generally, because of local ownership and deep community roots, electric cooperatives can help their communities whenever there is a need that can be met with the human and physical resources of a member-owned utility. Co-ops have traditionally provided services directly or facilitated the acquisition of services that the community has no established way to acquire.

Co-ops are Not-For-Profit

Another fundamental difference is that co-ops are not-for-profit organizations. The not-for-profit federal tax status of cooperatives does not mean that they are not confronting the challenges and opportunities that all businesses must consider. Nor does it mean that cooperatives do not pay all of the local and state and other federal taxes that investor-owned utilities and other businesses pay. Cooperatives must provide competitive rates and maintain a high level of service at a price near or at the cost of distributing and sometimes generating power. Again, operating on a not-for-profit basis does not preclude efficient processes, sound accounting standards, and intelligent organization from being key to a cooperative's management practices and ultimate success. Cooperatives must continue to keep abreast of current trends in the marketplace so they are prepared to adjust or grow to meet consumer demand for electricity or other services.

America's Electric Cooperatives Today

The lines of America's nearly 1,000 electric cooperatives traverse nearly 75 percent of this country's landmass - encompassing 2,600 of the nation's 3,136 counties. Electric co-ops serve 32 million people in 46 states; this is roughly 11 percent of the nation's population. Electric co-ops serve millions of businesses, homes, schools, churches and farms. In 1996, cooperatively owned and operated rural electric utilities accounted for 7.9 percent of kilowatt-hours sold and 5 percent of electricity generated by the electric utility industry. Cooperative electric systems own and maintain more than two million miles, or 44 percent, of the nation's power lines.

Sixty generation and transmission cooperatives (G&Ts) provide wholesale power to meet the retail needs of distribution cooperatives. More than 720 distribution cooperatives are members of G&Ts. They own the generation and transmission facilities in order to assure the reliability and consistency of their wholesale power needs. The other 180 distribution cooperatives derive their wholesale power from a variety of other sources.

The Fundamental Utility Difference

The "universal service" feature is the fundamental difference between public utilities and other businesses. Public utilities have traditionally been required to estimate the demand for their services, often years in advance, and implement construction programs to meet that estimated demand. Because it is not feasible to store significant amounts of electricity, electric utilities must also be able to produce and deliver their product on demand.

A major difference between investor-owned utilities and electric cooperatives is in the way in which prices, or rates, are set. An investor-owned entity sets utility rates that are approved by a regulatory body, usually after lengthy consideration of many factors. For most electric cooperatives, the board of directors of the co-op sets rates, although state commissions in 16 of the 46 states in which co-ops serve consumers regulate some aspects of cooperatives' operations. Most utilities, including cooperatives, offer a variety of rates, depending on when electricity is used, what it is used for and what class of consumer uses it. These different classes or rates allow utilities to recover the wide-ranging costs associated with serving a diverse customer base.

Cooperative businesses are special because they are owned by the consumers they serve and because they are guided by a set of seven principles that reflect the best interests of those consumers.

All cooperative businesses adhere to these seven guiding principles:

1. Voluntary and Open Membership - Cooperatives are voluntary organizations, open to all persons able to use their services and willing to accept the

responsibilities of membership, without gender, social, racial, political, or religious discrimination.

2. Democratic Member Control - Cooperatives are democratic organizations controlled by their members, who actively participate in setting policies and making decisions. The elected representatives are accountable to the membership. In primary cooperatives, members have equal voting rights (one member, one vote) and cooperatives at other levels are organized in a democratic manner.
3. Members' Economic Participation - Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following purposes: developing the cooperative, possibly by setting up reserves, part of which at least would be indivisible; benefiting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.
4. Autonomy and Independence - Cooperatives are autonomous, self-help organizations controlled by their members. If they enter into agreements with other organizations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.
5. Education, Training, and Information - Cooperatives provide education and training for their members, elected representatives, managers, and employees so they can contribute effectively to the development of their cooperatives. They inform the general public, particularly young people and opinion leaders, about the nature and benefits of cooperation.
6. Cooperation Among Cooperatives - Cooperatives serve their members most effectively and strengthen the cooperative movement by working together through local, national, regional, and international structures.
7. Concern for Community - While focusing on member needs, cooperatives work for the sustainable development of their communities through policies accepted by their members

Source: National Rural Electric Cooperative Association (NRECA)

Future Energy Requirements for Africa's Agriculture: Findings and Recommendations of an FAO Study

Introduction

Many countries in Africa continue to be among the lowest per capita energy consumers in the world. In all sectors, industry, agriculture, transport, household and commercial, a lack of minimum energy inputs has led to continued low productivity and impaired economic growth. It is also clear that in all sectors, energy is but one of the many important inputs for production, conversion, processing and commercialization.

However - and especially in the agricultural sector of most African countries - increased yields and production due to energy and other inputs, can lead to important benefits such as improved incomes, new employment opportunities and agro-industrial growth, which will in themselves tend to increase energy requirements. In this context, energy can be viewed as a "motor" for development. The energy/agriculture relationship is more complex than a mere econometric one. It has unique social and political elements, and in the case of rural Africa, it affects millions of people immersed in poverty, drudgery and malnutrition, and - in energy terms - outside the development process enjoyed by other sectors of the population.

Food security issues, particularly in Africa, have acquired a revived and new emphasis. Thirty countries in sub-Saharan Africa alone, suffered from low or critically low levels of food security in the period between 1991 and 1993. Many other countries in the region will require emergency assistance due to shortfalls in food production. Achieving the aim that "all people at all times have access to the food they need for a healthy, active life", will necessarily imply increasing the quality and quantity of energy inputs. Particularly where hunger is caused by widespread and persistent poverty, energy can have an impact, both as a direct input, and through the benefits it carries related to rural infrastructure, employment and enhanced level of life.

A new FAO study, "Future energy requirements in Africa's agriculture", analyses systematically the past and present energy situation in Africa's agricultural sector. The study identifies and discusses trends in, and results of, energy development in the region as a whole, develops and applies a methodological approach to five countries (Cameroon, Mali, Sudan, Tanzania and Zimbabwe) and lays the basis for more detailed national, subregional and regional studies.

The main constraint in preparing the study was the lack of data regarding energy consumption in the agricultural sector, especially by small farms and producers. This reflects the scarce attention this energy sub-sector has normally received from energy and agriculture institutions, which is probably one of the main causes of the problems facing rural energy development. The data available is generally incomplete, frequently

unreliable, scattered over different sources and rarely compiled in an organized manner. In order to fill this data gap at least partially, contact was established with a number of national experts, who assisted in the identification and collation of energy and related information for case studies.

The following are the study's main findings and recommendations:

Policies

1. Energy and agricultural linkages

Agricultural productivity is closely associated with direct and indirect energy inputs, and policies are required to consolidate this relationship for the benefit of farmers. Agricultural development plans in most African countries are designed and implemented with little or no regard to this association, thus missing opportunities to enhance production in both quantitative and qualitative terms. Energy development plans rarely take into consideration the present and future energy needs of agriculture, and most rural electrification programmes are mainly directed to households.

2. Energy prices

Energy price policies seldom regard the economic conditions of rural populations. If rural development is to be achieved, energy inputs must be made available, and this might require special efforts from the society as a whole - e.g. subsidizing energy inputs in order to maintain the expected low costs and high quality of agricultural produce, as generally demanded by urban populations.

3. Social equity

Policies promoting social equity between rural and urban populations and between men and women, particularly in rural areas, are generally non-existent, leading to migration, injustice and social instability. In energy terms, what is needed is a reduction in human drudgery (e.g. water and fuel collection) and better services. Facilitating energy and other inputs required by agriculture represents greater recognition, in both economic and social terms, of the vital role played by Africa's rural people in feeding society.

4. Land tenure

Policies on the ownership of land, and regulations to control its use, are beyond the scope of the FAO study, but have important implications for biomass conversion to energy. Legislation regarding property rights - both of land and of produce, such as biomass from forests - is generally weak in Africa and is considered an important barrier to the healthy development of sustainable bioenergy production and use.

Sustainable Agriculture and Food Security

1. Energy requirements for specific objectives

Planners and policy makers need to be able to link energy requirements with specific objectives of agricultural and rural development, such as food security, agro-industry development, and sustainable farming practices. This requires data indicating the energy intensiveness of different farming techniques for important food and other crops.

2. Considering the full "food chain" in assessing energy requirements

In order to promote food security strategies with the necessary energy inputs, policies and methodologies should consider the critical linkages between agricultural production, agricultural-based industries (food, beverage, tobacco, and textiles), distribution and commercialization, and the rest of the economy. Agricultural growth is the most important contributor to manufacturing and service activity in Sub-Saharan Africa, not only stimulating agro-industries, but the rest of the economy as well. In this context, energy from biomass is an added benefit.

3. Energy availability to match food security targets

The goal of regional food security could require a two- to threefold increase in agricultural energy requirements by 2010 relative to 1990/1 levels, particularly if emphasis is made on improving yield through conventional high-input techniques. (This reflects results for Zimbabwe). Agro-industry could become the fastest growing sector, in terms of energy requirements, with the agricultural sector the next fastest growth sector.

4. Energy implications of low-input farming techniques

Low-input farming techniques, such as integrated pest management, low-tillage cultivation, use of residues, green manures, and other organic fertilizers, may play an important role in sustainable agricultural development. There are several local success stories and new initiatives in low-input, high-yield agriculture. However, the energy implications of these techniques have yet to be systematically documented. More research is needed to enable clear comparisons with well-established high-input methods.

5. Planning of energy inputs for specific SARD interventions

The design and implementation of almost all sustainable agriculture and rural development field activities will require some form and amount of energy input. In many cases, this energy input is not considered, leading to unsatisfactory solutions from both the environmental and energy efficiency standpoints. It is necessary to "energize"

agricultural practices with the same sustainability and environmental criteria as the practice itself.

Methodological Issues

1. Coordinate agriculture, energy, electrification and rural development plans

Most sectoral plans are carried out in isolation from other sectors. Integration is particularly important when developing policies and plans for energy in agriculture, due to the close interlinkages. To a great extent, this problem arises as a result of the lack of priority given by the energy sector to rural areas in general, to the lack of a "lobbying" capacity among farmers, and to the lack of mandate and of technical expertise on energy in the agricultural sector.

2. Institutional links and responsibilities

One of the striking features unearthed by this study is the very limited linkages between the various sectors which are to be involved in the definition of energy policies for agriculture, in the actual implementation of energy projects for agricultural activities, and in the development of technologies related to the double role of agriculture as an energy consumer and producer. A national group or task force could be considered as a way of guiding an overall Energy for Agriculture programme. A national framework for action could be designed and adopted, to serve as reference for all involved.

3. Coordinating planning at local, regional and national levels

Methods for agricultural/rural energy planning should ideally be carried out at the local, regional, and national levels. Local needs are best addressed with knowledge of specific local conditions and with effective people's participation.

4. Consider end-use analysis as the basis for planning and projections

Demand-driven, end-use analysis offers several advantages. It is generally based on significant disaggregation among farm types, crops, regions and energy uses, to enable better understanding and projection of energy requirements.

Data requirements and availability

1. Economic potential of energy interventions in agriculture

Greater efforts need to be directed towards understanding the economic impact of energy shortages and shortfalls in the agricultural sector of Africa. Information and data generated by this exercise would provide important and vital guidance for determining the optimum level of resources that should be channelled towards the study and assessment of energy use in the agricultural sector, as well as the design and

implementation of appropriate interventions. At present, resources provided appear to be woefully inadequate. This is particularly striking in a region where agriculture is the dominant economic activity.

2. Collection, generation and collation of energy data

The general scarcity of available data on energy use patterns, combined with the importance of meeting agricultural energy needs, suggests that greater effort should be directed towards compilation of agricultural energy statistics.

3. Normalized regional data base on energy and agriculture

Regional cooperation in the energy and agriculture field would strongly benefit from a data base built from normalized country information. The questionnaire prepared and utilized for the FAO study could be used as a guide.

Technological issues

1. Efficient energy utilization

There is significant potential for cost-effective energy efficiency improvements in key areas such as tobacco curing, agricultural pump sets, and food, beverage, and textile industries, where up to 50%, 20%, and 30% reductions in energy use, respectively, could be economic and achievable.

2. Biomass energy conversion

The potential role of agriculture as a major energy producer will only be tapped if technologies to convert biomass (wood, residues, purposely grown) are developed, tested and economically assessed. Among those technologies, which seem to offer good possibilities are: gasification, pyrolysis, fermentation (alcohol and biogas) and modern combustion.

3. Renewable energy sources

Although efforts have been pursued in many African countries to develop and utilize energy sources such as solar and wind energy, their potential is far from being realized. Among promising solar and wind technologies are water lifting and pumping using solar thermal and photovoltaic systems and wind mills, and heat and cold production for drying and other processes using solar dryers and thermodynamic systems.

Awareness and capacity building

1. Political awareness

There is a general lack of recognition on the part of policy makers of the need to urgently increase energy inputs for agriculture. Rural poverty alleviation is normally high in the policy agenda of most countries, and it would consolidate these efforts if energy were considered a priority in rural development plans and programmes.

2. Expertise in the study and analysis of energy for agriculture

The African region has developed considerable expertise in many energy fields, as demonstrated by the efforts of the African Energy Programme of the African Development Bank, which have mobilized more than 140 energy experts. There is an urgent need to develop a training module on energy and agriculture in order to tap and mobilize that expertise towards this sector.

Acknowledgements

"Future energy requirements in Africa's agriculture" was written by Mr. Michael Lazarus, Mr. Evan Hansen and Mr. David Hill of the Stockholm Environment Institute, Boston, Mr. Stephen Karekezi and Mr. Lugard Majoro from the African Energy Policy Research Network, and Mr. Gustavo Best and Mr. Jeff Tschirley, FAO/SDRN. Members of FAO's Energy Working Group and officers from the African Energy Programme of the African Development Bank contributed comments and inputs. The study represents an FAO contribution to the African Energy Programme of the African Development Bank.

Organizational Structure of Bangladesh PBSs Board/Management Interrelationships Methods to Ensure Transparency

By Ahsan Habib, Eexutive Director, REB.

As in most other development countries, development strategies in Bangladesh focus utmost importance on building of basic infrastructure to accelerate the pace of socio-economic development. Rural Electrification is a major component of overall rural infrastructure in the context of Bangladesh overwhelmingly large rural sector has been identified by the development planner as a key programme.

Based on the universal principle of co-operative, a PBS is a democratic, decentralized and autonomous organization where the member consumers enjoy equal opportunities and are entitled to exercise equal rights. The strict adherence to transparency, accountability and the unflinching support of the GOB, Donor's and the people associated with the programme has set a high level standard in the excellency of work.

I have the honor to present to you this afternoon three topics namely organizational structure of PBSs, Board/Management Interrelationships and Methods to ensure transparency, of course in 25 minutes time.

Let us begin with the organizational structure of PBSs. If we look at the Functional chart of a PBS we shall get basic idea about the organizational structure of the PBSs. By now, we know that a PBS is a Member owned Organization. So, at the top of it's organizational structure stands the Members themselves.

To represent them in the management of the PBS, Members elect a Board of Directors, consisting of a maximum of 15 Members. Each year one third of the Board Directors are elected and each Director holds office for a tenure of three years. To represent the interest of the womenfolk of the PBS, the Board of Directors nominates a maximum of three Lady Advisors to the Board. Women Members are also eligible for election to the Board of Directors and in fact there are such examples.

The primary functions of the Board of Directors is to set policy Instructions for healthy operation and management of the PBS and to ensure that the policies are properly implemented by the management. To this effect, the Board regularly holds a monthly Board meeting and if situation demands they also held special Board meetings.

The Five Major Functions of the Board

1. Establish and maintain legal entity:

a. Registration and Bylaws.
b. Make legal contracts.
c. Defend, protect legal rights.

2. Act as trustee of member's interests with respect to:

a. Soundness of investments.
b. Security of assets.
c. Continuity of enterprise.
d. Quality of service.
e. Prestige and good will.
f. Character and personality of the organization.

3. Plant with respect to:

a. Viewpoints.
b. Objectives.
c. Goals.
d. Policies.
e. Major facilities.
f. Resources.
g. Board and annual meetings.

4. Provide operating requirements:

a. A qualified General Manager.
b. Adequate authority for General Manager.
c. Financial resources in terms of cash or credit.
d. Member support.
e. Community support.
f. Productive Board meetings.

5. Measure and control:

a. Prevent unauthorized actions.
b. Receive, review adequate reports.
c. Set strategic points for warning signals.
d. Establish standards.
e. Arrange for audits and consulting service as needed.
f. Provide reports to members on Board accountability.

Positions of Board Directors and Lady Advisors are honorary. They are paid per diem when called for official business only.

To run the day-to-day affairs of the PBS the Board appoints a General Manager, of course with the approval of REB, the Registration Authority of the PBS. The General Manager is the chief Executive of the PBS. He is responsible and accountable to both the Board of Directors and the Rural Electrification Board. Once appointed the Board of Directors cannot remove the G.M. without the prior approval of REB. But in case of necessity, REB can remove the G.M. without the concurrence of the Board of Directors.

Under delegated authority from the Board of Directors the General Manager's scope of responsibilities includes:

1. Giving advice and assistance to the Board of Directors on objectives, plans, policies and programs in all areas of concern to the PBS.
2. Developing a program and organizing a staff for the engineering, construction and operation of the electric facilities required to meet the needs of the PBS.
3. Managing the affairs of the PBS with the objective of making area coverage electric service available to all farms, homes, commercial and industrial establishments, and community within the PBS service area.
4. Providing at the lowest feasible cost, and adequate supply of dependable electric energy that will add profitability to farming and industry; offer safety, sanitation, and comfort in homes; and develop the local economy.
5. Developing among the members an understanding of their ownership responsibilities and benefits in the PBS, and an acceptance of the PBS objectives and policies in the local communities.
6. Operating the PBS on a non-profit basis for service in accordance with modern principles of management organization and sound human relations.
7. Assuring good working conditions for the PBS personnel and providing them opportunity for maximum creativeness, personal satisfactions, and sense of accomplishments.
8. Advising and assisting the Board of Directors in developing sound written policies and in making informed decisions about objectives, programs and basic controls for the PBS.
9. Reporting to the entire Board and not to any individual Director or group of Directors.

Functions and Duties:

1. Direct and coordinate the engineering design and construction of the electric facilities authorized by the Board of Directors.
2. Develop and implement the house wiring program so that wiring of houses will proceed concurrently with the construction of the distribution lines.
3. Develop and implement the operational directives required to carry out the policies and decisions of the Board of Directors.
4. Establish and direct an organization to operate and maintain the facilities necessary to carry out the objectives of the program.
5. Develop management practices, methods and procedures to assure effective operations of the system.

6. Provide advice and assistance to the organization staff to effectuate an efficient operation.

From functional point of view a PBS has five Divisions. They are;

1. General Services Division,
2. Construction, Operation and Maintenance (COM) Division
3. Finance Division
4. Member Service Division and
5. Engineering Division.

Each Division is headed by an Assistant General Manager.

1. Functions of the General Services Division are:
   - Maintenance of Estates
   - Operation and Maintenance of Transports
   - Legal Affairs
   - Personnel Administration and Logistics

2. Functions of the COM Division are:
   - Operation and Maintenance of the Power Distribution System
   - Meter Fixation and Service Drop
   - Meter Maintenance and Repair
   - Minor Construction Works

3. Functions of the Finance Division are:
   - Preparation of Annual Budget
   - Accounting
   - Billing the Consumers
   - Collection of Revenues
   - Bank Operation
   - Disconnection for Non-Payment
   - Submission of Monthly Reports in Prescribed From

4. Functions of the Member Services Division are:
   - Educate the Member-Consumers About Economic and Safety Use of Electricity
   - Render Technical Advices
   - Record their Complaint and Address them
   - Inspection of Wirings
   - Primary Survey for New Connection

5. Functions of the Engineering Division are:
   - Feasibility Study
   - System Design and Staking
   - Inspection of Distribution Lines

- Oversee the Performance of Local Engineering Consultants and Operation of the Stores.

All the Assistant General Managers are stationed at the PBS Head Quarter.

As the number consumers of a PBS continue to grow, complaint centers, Area Offices and Zonal Offices are gradually set-up to take the facilities for services at the consumers' door-step. Criteria for setting-up of these facilities are:

1. **Complain Center**
   A remote load center having up to 4000 consumers. Staff: One Line Technician, 3 Line men.

2. **Area Office**
   A remote load center having more them 4000 and up to 7000 consumers. Staff: One Junior Engineer, One Line Technician, Five Linemen and One Cashier (in the absence of banking facilities only).

3. **Zonal Office**
   One or more remote police station (thana) having more than 7000 consumers. A Zonal office provides with all sorts of consumer services such as:
   - Receipt of Application for New Connection,
   - Preliminary Survey,
   - Wiring Inspection
   - Service Connection, Meter Reading
   - Billing, Collection of Revenue
   - Disconnections, Address,
   - Operation and Maintenance of Distribution Lines.

The Zonal office is headed by a Deputy General Manager. He is assisted by on AGM (Construction, Operation & Maintenance), Junior Engineer, line crews, billing personnel, meter readers etc.

The Board/Management Interrelationship

Interrelationship between the Board of Directors and the Management can be crudely compared with two organs of a Government viz., the Parliament and the Cabinet. While the Board Directors formulates rules and policy Instructions for the Operation of the PBS, the Management carryout the task of implementing those rules and policy Instructions. Thus, one is dependent on the other for efficient discharge of one's vested functions and responsibilities. Under these circumstances the interrelationship between the Board and Management of a PBS greatly depend upon clear understanding and ardent desire to follow each group's own jurisdiction.

For smooth and efficient functioning of a PBS, complete understanding and close co-operation between the Board and the Management is a pre-condition. In most cases it happens so in Bangladesh. But there are also exceptions. The basic question is who plays the role of the umpire in case there is something wrong in the state of Board/Management Interrelationship? The answer is – REB. REB is the ultimate custodian of the By-laws of a PBS. In case there is something wrong in the interrelationship between the Board and the Management, REB can, through interpretation of the By-law, advice and warn the wrong party and in case of disobedience, take punitive measures against the concern party or both to streamline the situation.

In any case, rivalry between the Board and the Management within the limit of logic is also not undesirable. When one works as the watch-dog against the other, there are likely to be less mistakes and minimum autocracy.

Methods to Ensure Transparency

By transparency we mean the state of affairs of a PBS is known to all parties concerned. To ensure transparency the following methods are practiced in the PBS.

1. The Manuals and Policy Instruction

The DOs and DON'Ts of the day-to-day operations are well documented. All actions to be taken by the management are pre-determined in a series of policy Instructions and manuals, which are known to all, concerned such as relevant consumers, the Board of Directors, employees of the PBS, and the Rural Electrification Board. So, any deviation, willful or by mistake can be easily detected and corrective measures can also be taken.

2. FORM 550 and the MIS Report

Every month PBS management presents to the Board of Directors details of its operational statistics in the prescribed FORM – 550. The FORM contains the Following information:

a. Statement of revenue and expenses.
b. Accounts aging of consumer receivable-electric.
c. Balance sheet.
d. Consumer sales and revenue data.
e. Energy and demand data as per billing meter.
f. Plant and consumer data.
g. Aging of accounts payable.
h. Uncollectibles written of recovered and percentage of recovery.

Summary of the contains is published by the Rural Electrification Board in monthly Management Information System (MIS) Reports and are made available to all concerned agencies.

3. Monitoring

Concerned Management operation Directorate, Office System (Finance Directorate), System operation Directorate and other relevant offices of REB regularly monitor's the activities of the PBSs and Reports in prescribed form are submitted to the REB Management for information and actions are taken where necessary. The monitoring Reports reflect information about all key performance areas (KPA) of the PBS.

4. Management Audit

REB top management conducts Management Audit in the PBS every alternative year. The Management Audit covers all areas of PBS activities in as detail as maintenance of the PBS gardens and water pumps. It is like a routine overhauling of an engine where every part is checked and cleared to revitalize it.

5. Financial Audit

Financial Audit is conducted by two agencies. One, by the Loans and Audit Directorate of REB, and the other by an independent Charter Accounting firm. REB audit reports are presented to the top management for final disposal.

6. Performance Target Agreement

The performance Target analysis reflects areas of achievement and failure every fiscal year and thus, serves as one of the methods of transparency.

7. Annual Report and the Annual General Meeting

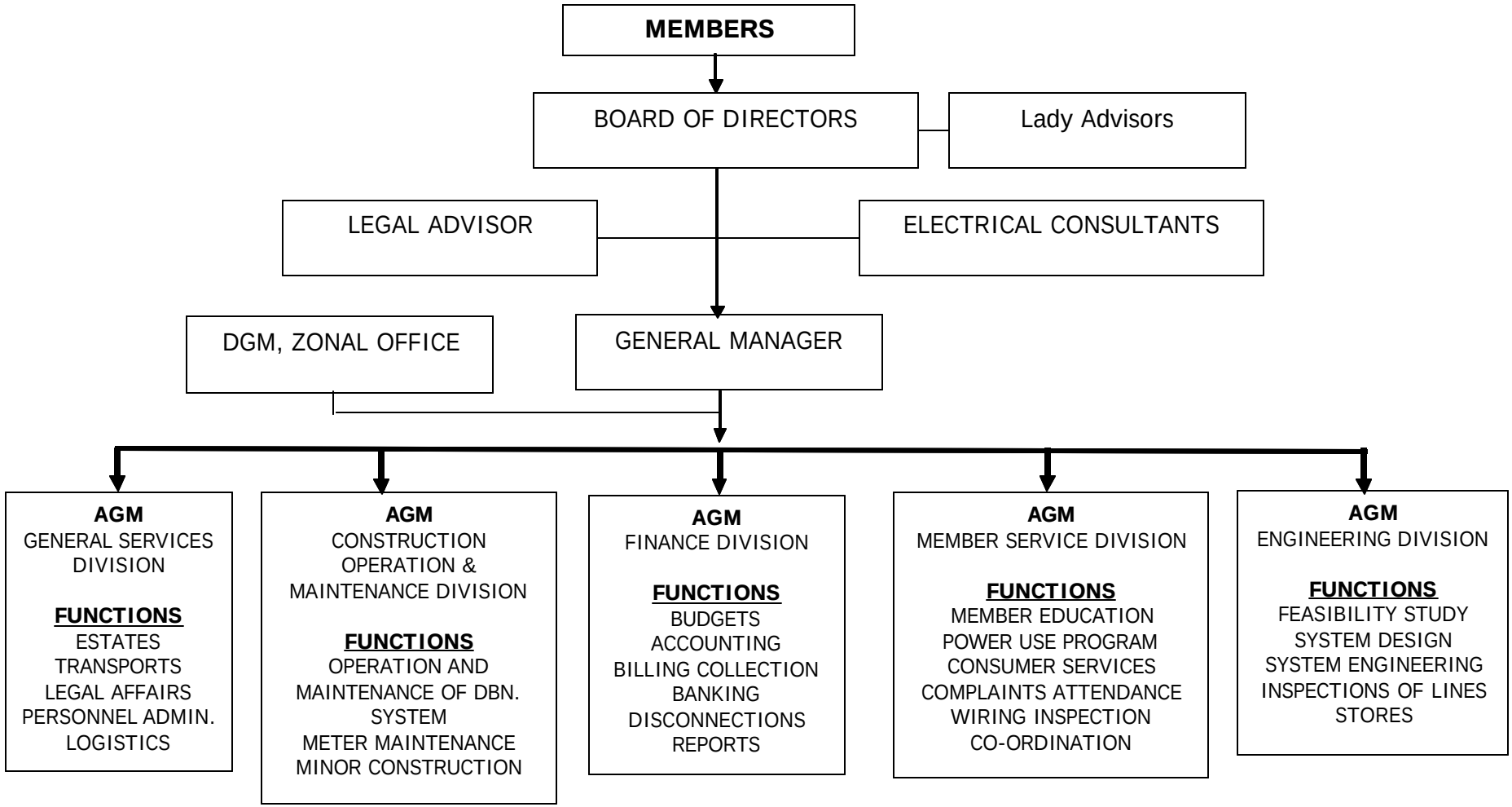
Every year the PBS presents to the Member-Consumers Annual Reports of Performance in the Annual General Meeting. The Report is published in printed form and made public for comments and criticism.

In the question and answer session of the Annual General Meeting, any Member can ask any question regarding operation of the PBS and satisfactory answer is given.

These are the seven major prescribed methods of transparency practiced in the PBS management operations.

Besides, public meetings on the occasion of some ceremonies, consumer education program, and visit by external delegates, seminars and symposiums also act as methods of transparency. There is nothing called SECRET or CONFIDENTIAL in the management of a PBS. Even the Annual Performance Appraisal of on employee is written by the Supervising Officer in his/her presence and his/her signature is obtained in the report.

FUNCTIONAL CHART OF A PBS
(AT FULL OPERATION)



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